THEORY AND EMPIRICAL PRACTICE IN RESEARCH ON SOCIAL AND EMOTIONAL SKILLS

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THEORY AND EMPIRICAL PRACTICE IN RESEARCH ON SOCIAL AND EMOTIONAL SKILLS

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Editorial: Theory and empirical practice in research on social and emotional skills

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Editorial on the Research Topic
Theory and empirical practice in research on social and emotional skills

Introduction to the Research Topic

Social and emotional skills—also called non-cognitive skills, soft skills, character strengths, etc.—have drawn increasing attention from policymakers, practitioners and researchers over recent years. Our ability to manage our emotions, connect with others in a respectful and meaningful way, act responsively and understand and appreciate others' points of view are essential in successfully navigating our social worlds. The importance of these capacities was further amplified by several global trends that are fundamentally reshaping the social fabrics and interpersonal relationships. These include growing interconnectivity, population diversity, complexity and variability of job requirements, the ever-accelerating pace of technological changes, the dismantling of old social networks, etc. The unprecedented social changes introduced by the COVID-19 pandemic have also shown the critical role these skills have in people's ability to adjust to new social and professional situations. With the expected continuation of current societal and technological trends, these skills will likely become even more pivotal in the future (hence they are sometimes also called "21st-century skills").

Research on social and emotional skills is multi-disciplinary, combining a unique mix of academic and practice-oriented research approaches. It features both theoretical and empirical research streams, with lively discussions on the conceptual foundation and structure of these skills, their origin, development, malleability, and relevance. In this Research Topic, we have tried to reflect the diversity of the field's perspectives,

disciplines, and methodological approaches and its unique blend of research and policy. The Research Topic contains empirical and theoretical works representing both streams of research on social and emotional skills. It also presents both academic and practice-oriented studies on a variety of topics in the field. Still, studies presented in this Research Topic place a particular emphasis on the issue of the application of gathered academic knowledge in educational settings. Selected studies do so either through examining current states, developing policy interventions, or evaluating their effectiveness.

Studies presented in this Research Topic examine the concept of social and emotional skills and their malleability and main determinants. The effectiveness of intervention programmes designed for the improvement of these skills is also analyzed. A particular emphasis is placed on the issue of the application of gathered knowledge in educational settings. Finally, several articles investigate the issue of valid and reliable assessment of these skills and the new developments in this aspect. Overall, the Research Topic offers a rich set of approaches, perspectives, methodologies and concepts examined and discussed by some of the leading researchers in the field. We hope that this Research Topic will contribute to the current discussions and developments in this lively field of research, offering new insights and ideas for further research.

Description of published articles

Improving classroom communication: The effects of virtual social training on communication and assertion skills in middle school students

This article (Johnson et al.) focuses on one of the key policy premises regarding social and emotional skills—their potential to improve students' learning in academic settings. The study examined the possibility of improving educational processes and outcomes by training students' social and emotional skills. Findings showed that the use of the training in a virtual social environment could positively impact students' social confidence and behavior in the classroom. The special importance of this study is the possibility of successful training of social skills in an age group in which anxiety, social anxiety, and difficulties in interacting with peers develop very frequently. The involvement of teachers and innovative use of digital technologies are other promising aspects of this study.

Teaching socio-emotional competencies among primary school students

This is another study exploring the possibility of developing social and emotional skills in school settings through formal training programs (Santamaría-Villar et al.). Such studies are badly needed in this area as robust evaluations of intervention programs that aim developing students' social and emotional skills are still relatively scarce. Nevertheless, the study findings are positive, with the designed educational program leading to improvements in social behaviors of third-grade students, accompanied by improved awareness of aggressive behaviors in school and greater coexistence among students. Another important aspect of this study is that the intervention itself-—15 lessons in the form of school classes—is applicable and practical for a wide variety of school contexts.

Social, emotional, and behavioral skills: An integrative model of the skills associated with success during adolescence and across the life span

The authors of this paper offer a new, innovative and thought-provoking understanding of social and emotional skills and how they develop and correspond with various life outcomes. The article (Napolitano et al.) describes a new conceptualization of social, emotional, and behavioral skills outlined in an integrative model encompassing five related functioning domains. The paper discusses some of the key questions related to these concepts, such as their relations with personality traits, the distinction between maximum performance vs. typical performance perspective, skills' developmental trajectories and milestones, their practical importance, etc. One of the interesting features of the suggested model is that it includes only those skills that are found to be malleable throughout life, thus representing a very relevant framework from the policymaking point of view.

Toward a model of personality competencies underlying social and emotional skills: Insight from the circumplex of personality metatraits

This article (Cieciuch and Strus) offers an interesting and thorough theoretical analysis and conceptualization of social and emotional skills. The authors engage in an in-depth examination of various theoretical issues with no hesitation and with the required knowledge and expertise. Readers have a chance to familiarize themselves with a plethora of conceptual approaches and main issues in this area. Authors introduce their model and argue convincingly for the newly introduced theoretical solutions. Interested readers will have plenty of "food for thought" after reading this paper, hopefully inspiring them to examine some of its main postulates further.

Temperament and school readiness—A literature review

The meta-analytic reviews are a very useful and increasingly used approach in summarizing empirical findings in a particular area of research. In this article (Potmesilova and Potmesil), the authors employ the meta-analytic approach to discern whether temperamental characteristics (here defined through concepts of executive function, effortful control and self-regulation) of children are related to their school readiness. Based on a substantive sample of empirical studies, the authors find that both positive and negative emotionality influence school behavior of children (beneficially or adversely, respectively), especially their ability to focus and, consequently, their learning outcomes. Such findings place special importance on the quality of classroom environments, as discussed in the paper.

Age-specific life skills education in school: A systematic review

Life skill programs developed for adolescents may differ in both the targeted skills and the influencing factors on health and wellbeing they have as their focus (Kirchhoff and Keller). This review summarizes the impact of 18 evaluation studies published between 2007 and 2020. The review is timely and critical because, from a policy perspective, one needs to know what is the most sensitive period for particular skills to be promoted at schools, taking into account adolescents' biological and psychological development and changing environmental dynamics. Most programs start in Grades 5–6 or Grades 7–9, but the development of skills was only studied in a few programs, often demonstrating zero effects but also some positive findings. Objectives of health-oriented programs vary depending on student age. The review closes by identifying several research gaps to improve evidence-based work in this flourishing field.

Impacts of social and emotional learning interventions for teachers on teachers' outcomes: A systematic review with meta-analysis

The growing consideration for the development of students' social-emotional learning also directed the attention to teachers' social-emotional skills. Teachers' professional and personal functioning should be a top priority of policymakers, given the importance of teachers for students' academic achievement and the current dearth of teachers in the labor market due to many professionals leaving the job. This meta-analysis (Oliveira et al.) is the first to summarize social-emotional learning interventions reported in 43 empirical studies targeting the skills of teachers. Results are promising, showing small to medium effects of interventions on both teachers' skills and mental health outcomes. These results strongly encourage the implementation of such interventions in teacher training and development programs to strengthen teachers' personal and professional outcomes.

Equity in social emotional learning (SEL) programs: A content analysis of equitable practices in PreK-5 SEL programs

Although most social-emotional learning programs in education target the development of skills in students to foster collaboration and appreciation of diversity and cultural differences, this does not guarantee that the programs and their background, content and methods reflect the values and experiences of diverse populations. This review (Ramirez et al.) proposes a number of key perspectives that should form the basis and can be integrated into social-emotional learning and practice to align social-emotional learning and educational equity better. It is argued that social-emotional learning should be more than just an appreciation of diversity. It also involves a reciprocal process where diversity and equity affect the core of social-emotional learning programs questioning dominant and oppressing positions also aiming for social justice advocacy and positive identity development for all.

Formative assessment of social-emotional skills using rubrics: A review of knowns and unknowns

Social-emotional learning often involves the use of formative assessment tools to examine students' development of skills. Students' standing on various skills is often monitored using rubrics describing increasing levels of mastery of a skill. This paper (Pancorbo et al.) discusses the requirements for skill rubrics, reviews what we know and should know, and sketches a research agenda on how the reliability and validity of rubrics can be enhanced to better serve formative assessment of social-emotional learning in education.

SENNA inventory for the assessment of social and emotional skills in public school students in Brazil: Measuring both identity and self-efficacy

Although several inventories already exist to assess social-emotional skills in students, most reflect a specific model of social-emotional learning and are developed within Western cultures. The SENNA inventory, however, was developed to assess a comprehensive framework of social-emotional skills in students attending public schools in Brazil (Primi et al.). The inventory assesses skills from a dual perspective, i.e., "how well students can manifest a skill (self-efficacy)" and "how typically they use that skill" (identity). Psychometric data are reported from a large-scale assessment program in Brazil, and techniques to reduce answering tendencies are demonstrated to improve the reliability and structural validity of the assessments.

Two forms of social inequality in students' socio-emotional skills: Do the levels of big five personality traits and their associations with academic achievement depend on parental socioeconomic status?

It is common for policymakers to advocate developing socio-emotional skills to accelerate the learning of disadvantaged students. However, what empirical evidence supports these links between socio-economic status (SES), social and emotional skills and academic achievement? In this paper (Lechner et al.), the underlying assumptions of this argument are made explicit and testable, in a unique contribution to the field. The authors report that their empirical study provides little evidence of the link between social inequality and social and emotional skills, as well as of a differentiable relationship, that is, no evidence that social and emotional skills and achievement are strongly related among socially disadvantaged children. A causal relationship such as this would justify the development of social skills as a means to reduce inequality. Curiously the authors found the opposite effect (a slightly strong association between conscientiousness and achievement for students with high SES). It is an inspirational paper to the studies investigating the interplay between SES, social and emotional skills, and children's achievement.

To score or not to score? A simulation study on the performance of test scores, plausible values, and SEM, in regression with socio-emotional skill or personality scales as predictors

This paper makes an important methodological contribution to determining the correct statistical method to use when estimating factor scores when assessing social and emotional skills. Even though all techniques generate highly correlated scores, indicating that students' order on the skills should be roughly the same regardless of the technique used, the authors demonstrated that different methods are important in terms of criterion validity. That is because some methods suppress correlations with external criteria, which have important policy consequences. A unique feature of this study (Bhaktha and Lechner) is the systematic use of criterion validity for determining the psychometric quality of measures. Generally, this judgment is based on internal structural properties only (reliability and item loadings on the intended factor). The authors recommended Plausible Values or the Structural Equation Method among all the tested methods. This study hopefully will encourage programs to consider criterion validity as a systematic method for studying the psychometric properties of social and emotional skill assessments.

Making space for social and emotional learning in science education

With a practical perspective, this paper offers an original contribution based on a highly arousing experience of learning about arthropods in a biology curriculum. As entomologists and educators, the authors ask, "Can you imagine bringing a tarantula or a large insect into a classroom and students NOT having an emotional response? (p. 2). This study (Ingram et al.) aimed to test the integration of social-emotional learning into the STEM curriculum. The program intends to use the experience to promote social and emotional skills, such as empathy (fostering sympathy not only for the arthropods but for all people with a variety of experiences), self-reflection, self-management, etc. Additionally, it seeks to improve student engagement with STEM courses. Students' qualitative responses were analyzed before and after the program. The results demonstrated that students' emotional reactions shifted from negative to positive, and their engagement with the curriculum improved. Such findings are an interesting and creative demonstration that SEL can be incorporated

into a diverse curriculum not commonly studied in the field of SEL.

Social and emotional learning in preschool settings: A systematic map of systematic reviews

A very important target of the development of social and emotional skills is achieved through early childhood education. This study (Djamnezhad et al.) aimed to identify high-quality systematic reviews of early childhood SEL interventions. Surprisingly, the authors found only two well-designed systematic reviews, leading to the critical conclusion that there are few reviews of SEL interventions in early education. In both reviews, the effect of universal SEL interventions was reported to positively impact several outcomes. However, because of methodological limitations, the authors recommend considering these results as tentative interpretations and suggest that this field is a knowledge gap. Hopefully, this study will encourage the development of sounding reviews of SEL interventions in early childhood.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Improving Classroom Communication: The Effects of Virtual Social Training on Communication and Assertion Skills in Middle School Students

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This study examined the relationship between teacher identification of socially at-risk adolescents and baseline student social competency levels. Additionally, the feasibility and effects of an eight-session, virtual social training were analyzed. Upon completion of the virtual social training, the transfer effects from the targeted intervention into the general education classroom were determined. Study participants (N=90) were comprised of sixth, seventh and eighth-grade students from four public middle schools in Dallas, Texas. Data was collected through classroom teacher questionnaires to measure students' baseline social behaviors. In addition, pre-post student performance measures in the areas of affect recognition, social inference, and social attribution were administered. Results revealed that middle school teachers were effective identifiers of students with lagging social skills. Baseline ratings of social skills showed a high positive association between student affect recognition and teacher rating of participant total social skills including communication, cooperation, responsibility, and self-control. A high negative association was found between student affect recognition and problem behaviors. A high negative association was also found between student perspective-taking and hyperactivity and externalizing behaviors. Student pre-post test performance measures revealed significant improvement in affect recognition, attribution, and social inferencing after undergoing the virtual social training. At the time of a 5°week follow up, teachers rated participants' social skills in the areas of communication and assertion as significantly improved. Sixty-eight percent of participants reported increased confidence in social communication skills such as relating, maintaining, adapting, and asserting thoughts after the training. Preliminary findings from this small-scale study provide evidence that a brief eight-session, virtual social training in middle school is a feasible delivery model that can achieve positive effects on social behavior, and that teacher referral was a reliable way to identify students who could benefit from the training. Incorporating teacher perspective aided in translating a previously lab-based training into an ecologically relevant setting while addressing a programming need to meet the social demands of adolescence.

Keywords: social skills, middle school, adolescence, teachers, virtual social training, at-risk

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INTRODUCTION

Middle school, commonly grades six through eight in US education, is an opportune environment for teachers to observe and measure social behavior change. Early adolescence is recognized as a maturational period of learning and development, with heightened receptivity to specific social contexts (Giovanelli et al., 2020). With high demands for communication, cooperation, and assertion, a middle school classroom is rich with social interaction, potentially leading to problem behaviors. In fact, during middle school, students may face considerable challenges ranging from peer pressure, academic competition, and social comparison among peers, which may result in decreased connectedness with teachers, school staff, and classmates (Cappella et al., 2019). Furthermore, how middle schoolers respond to peer-evaluative stress may, in part, influence tendencies to withdraw from social interactions (Kaeppler and Erath, 2017). Given this critical role of peer interaction during adolescence, greater incorporation of efforts to boost positive communication methods and resiliency in the face of negative peer contagion may prove beneficial (Rapee et al., 2019). Educational practices focused predominantly on rudimentary social skill behaviors such as eye contact, greetings, turn-taking, and friendship-building may fall short in building socially confident and capable communicators. The tendency in traditional public education beyond elementary school has been to assume that children will automatically acquire nuanced social skills as part of the developmental process (Ogilvy, 1994). However, since the adolescent brain is still developing, it needs to be molded and shaped to learn and adapt during this window of neural reorganization (Blakemore et al., 2010).

As early adolescents develop, between 11 and 14˚years of age, the social rules and demands become more abstract and require higher levels of social information processing. According to the Crick and Dodge (1994) model of social information processing (SIP), individuals in social situations: 1) perceive and encode the situational and social cues, 2) form a mental representation and interpretation of the situation, 3) select a goal or desired outcome for the interaction, 4) recall or construct possible reactions to the situation, 5) evaluate these reactions, and, finally, 6) initiate what they expect to be an adequate action. Additionally, developing complexities of social competency in adolescence include an awareness of another person's needs, a gradual increase in perspective-taking skills, and an ability to decode others' emotional cues to understand intentions (Ma et al., 2020).

Of particular interest in recent research is the social performance and behavior of adolescents that attend middle schools predominately with low social-economic status who may be at risk for delayed or stalled social reasoning skills. With 155,000 students and 239 schools, the Dallas Independent School District (DISD) is one of the nation's largest districts with 92% of its students Black or Latino and overwhelmingly low-income (Gándara and Orfield, 2021). Previous research within DISD has found that investing time in cognitive training during regular school hours with at-risk middle school students, could serve to enhance the development of higher-order thinking, thereby promoting the developmental trajectory of cognitive skills (Gamino et al., 2014). As such, utilizing a socially based cognitive training for students who lack social engagement or have difficulty with social perception and reasoning, could mediate a variety of cognitive breakdowns, both internally in terms of confidence and comfort level, and externally in regards to school-specific relationships and social communication. If left unaddressed, these breakdowns are likely to persist in at-risk populations during the development of the social self.

A systematic review on Social-Emotional Learning (SEL) programs conducted by the Collaborative for Academic, Social, and Emotional Learning (CASEL) among others found that SEL programs yield many benefits for children and adolescents, however, as of 2018, only 11 out of 50 states had freestanding K-12 SEL standards (Payton et al., 2008; Eklund et al., 2018). In a summary of randomized, controlled trials heavily focused on social-cognitive theory, it was suggested that youth are most likely to benefit when receiving individual-level behavioral skills, family level support and communication, and autonomous motivational support from the broader social environment, which could include the school system and educators (Wilson et al., 2017). Likewise, an additional meta-analysis revealed continued long-term benefits following program participation when investigating the longer-term impact of exposure to SEL programming in the school (Taylor et al., 2017). Finally, Mahoney and colleagues examined four large-scale meta-analyses on student outcomes related to participating in school-based SEL programs and found that although SEL programs can result in positive student outcomes socially and academically, it is prudent that multiple stakeholders (policymakers, funders, educators, researchers, and families) work together to ensure that as many students as possible benefit from well-conceptualized and well-implemented SEL programs (Mahoney et al., 2018).

Two large-scale studies of more than 25,000 students across elementary, middle, and high school found that students in lower grades reported greater cognitive-behavioral and emotional engagement than those in middle and high school (Wang and Eccles, 2012; Yang et al., 2018). Additionally, when examining recent trends in student social-emotional learning, it was found that self-efficacy, social awareness, and, to a lesser degree, self-management decrease after Grade 6 (West et al., 2020). Furthermore, teachers are recognized within the school setting as first identifiers and responders to the social needs of students, yet several studies point to a lack of help from school policies or clear lines of support once educators have observed social difficulties (Solberg, et al., 2020; Nyborg, et al., 2020). As such a process to accurately identify and then refer for social support in middle school may be lacking. A group of researchers conducted an analysis of available social skills assessments to assist middle school teachers in the accurate identification of students struggling socially and found that only 10 out of 73 potential tools were identified as a strong assessment choice (Haggerty et al., 2011). One measure identified as appropriate was the Social Skills Improvement System, as it includes direct teacher observation ratings of social behavior such as assertion, communication, responsibility, and self-control as well as a

problem behavior scale for internalizing and externalizing behaviors, among others (Gresham and Elliot, 2008).

The window of dynamic growth and autonomy in adolescence may offer insight into the importance of intersections between developmental social neuroscience, social-emotional learning, and technology (Giovanelli et al., 2020). Evidence suggests that how technology users interact in a virtual world is strongly associated with their behavior and personality in the real world (Bayraktar and Amca, 2012; Wohn and Wash, 2013). In a paper outlining foundational principles required to ensure learner immersion, the presence and representation of self in a virtual world was found to be critical in promoting deep levels of social engagement (Mount et al., 2009). Additional studies have supported utilizing an avatar-driven, virtual learning platform as a social training tool for children and young adults with high functioning autism spectrum disorder, specifically for social-cognitive skills such as theory of mind and affect recognition (Wainer and Ingersoll, 2011; Kandalaft et al., 2013; Maskey et al., 2014; Didehbani et al., 2016; Zhao et al., 2020). Results offered promising data to support the use of three-dimensional virtual platforms as a social training tool but may have been limited in terms of generalization, as the studies were conducted in a controlled laboratory setting as opposed to the natural context of middle school. Although modern technology can provide a robust platform to engage and motivate learners, it is also necessary to balance state-of-the-art solutions with human interaction, mentorship and strong teacher-student relationships (Kamińska et al., 2019). Implementation of a social skill training utilizing technology at the middle school level may result in an increase in student engagement and attention when the curricular content matches students' developmental interests or is delivered in a novel way, unique to student age and learning style. Moreover, when SEL programs honor an individual's desire to achieve social competencies and respect the interests, trends, and needs of adolescents, motivation can be captured along with instilling the beginnings of a mindset shift (Yeager, 2017).

Given the importance of identifying and supporting adolescents struggling socially in middle school, the purpose of this study was to 1) examine the relationship between teachers' ratings of student social skills and student baseline performance on standardized measures of social competency, 2) analyze the feasibility and preliminary effects of implementing an eight-session virtual social training with strategy-based coaching for identified adolescents in the public school setting, and 3) determine transfer effects from the targeted social skill training to the general education classroom, as reported by teacher observations 5°weeks following the training.

We hypothesized that 1) teachers are reliable identifiers of middle school students with lagging social skills; 2) the implementation of an eight-session virtual social training would be feasible within a naturalized context of public school, as evidenced by student participant improvements in measures of emotion recognition and social attribution; and 3) improvement on other related social communication skills observed by teachers in the classroom setting.

MATERIALS AND METHODS

Participants

Study participants were sixth, seventh, and eighth-grade students throughout four public middle schools in Dallas, Texas. Procedures were approved by the Institutional Review Board at the University of Texas at Dallas and the Dallas Independent School District Research Review Board. All middle school teachers who identified potential students for the study were given the opportunity to provide written informed consent upon student enrollment and take part in completing teacher rating scales. Cumulatively, 116 students were identified for potential participation across the four middle schools. Of this pool, 26 students did not enroll in the study due to frequent suspension, academic probation, transient attendance, and/or lack of parental consent, leaving 90 students and their parents or legal guardians who signed informed assent (student) and consent (parent or guardian). Of the 90 student participants, 40 were in the sixth grade, 27 were in seventh grade, and 23 were in eighth grade. The average age of the students was 12.4°years (range 11–14°years) and included 8% Caucasian, 73% Hispanic, 13.5% African-American, and 5.5% Asian or Other race. Sixty-one males and 29 females comprised the total student sample.

Procedure

All procedures were conducted at four Dallas public middle schools and the Center for BrainHealth® at the University of Texas at Dallas. Study staff was comprised of three master level clinicians and two graduate research assistants. An informational flier introducing the study was made available to all teachers at each school. Additionally, teachers were provided examples of social themes that would be covered in the virtual social training, such as initiating and maintaining conversations, understanding the quality of relationships and interactions, and recognizing and responding to peer pressure and adult authority. Teachers were asked to nominate individuals for participation in the program via a brief student identification form. Teachers reported the following description(s) of each student's social behavior in the classroom as the reason for referral: isolated or withdrawn, awkward conversational exchanges, limited group participation, rigid thinking, and/or skewed perceptions or reactions. Teachers could indicate more than one reason for referral. The most frequently reported reasons for referral were shy and withdrawn social behavior and awkward conversational exchanges (**Table 1**). For this study, adolescents between the ages of 11–14, who spoke fluent English, as defined by being able to use five-to-six word phrases and follow one-to-two step verbal directions, were eligible to participate. A letter and flyer were then sent home to the teacher-identified students to inform the parents of the availability of the study. All parent forms were proffered in English and Spanish. Interested parents were asked to contact study staff to complete informed consent procedures and provide general student demographics such as ethnicity, language spoken at home, medical history including prescribed medications and/or treatments, pre-existing psychiatric/mental illness, educational diagnosis (such as non-clinical, attention

TABLE 1 | Reason for Teacher Referral. Teachers marked which reason(s) applied for the students they reported (N = 90).

Referral reason	Number of referrals	Percentage of total sample (# of referrals/N)
Isolated or withdrawn	38	42%
Awkward conversational exchanges	43	48%
Limited group participation	25	28%
Rigid thinking	15	15%
Skewed perceptions or reactions	30	33%

deficit hyperactivity disorder, other health impairment, autism spectrum disorder, and learning disability), and a brief description of their child's social skills. Study staff coordinated with teachers to determine which class period during the school day participants could complete the virtual social training and related assessments. Students also provided input toward which class periods were preferred/non-preferred. 1˚week before the commencement of the virtual social training, student pre-test measures were administered, followed by eight, 45˚min social coaching sessions. Student post-test measures were conducted no more than 1˚week after the conclusion of the virtual social training. All student procedures were conducted within a 4–5˚week time period, depending on student availability and the school calendar. Students completed pre and post-test measures individually, and then, to establish feasibility of delivering the training within the natural context of the school setting, participants were matched with a peer that was performing at a similar competency level for the duration of the virtual social training. Other feasibility factors included accommodating for more students, delivering intervention within limited times during the school day, and meeting administrator requests. Participants who were observed by study staff to have difficulty attending within the virtual environment (n = 8) were assigned individual training sessions although no difference in the delivery of the training or coaching existed, thereafter. Participants then individually completed the virtual social training post-test. All participants, both paired and individual, completed eight sessions of the virtual social training as well as 1˚h pre-test and post-test sessions each.

Measures

The Teacher form of the Social Skills Improvement System-Rating Scale (SSIS-T; Gresham and Elliott, 2008) assessed students' social skills preceding and approximately 5˚weeks following the virtual social training. The SSIS-T is one of the aforementioned 10 assessment tools for teachers and is a norm-referenced, standardized scale that provides a broad assessment of students' social skills across seven domains using 46 items and problem behaviors across five domains using 30 items. Subscales related to social skills include data on areas such as communication and assertion, while the problem behaviors domain looks at areas such as internalizing problems, externalizing problems, and hyperactivity. All items are rated on a four-point frequency scale: Never, Seldom, Often, and Almost Always. As documented in the SSIS Rating Scales Manual (Gresham and Elliott, 2008), there is substantial evidence for the reliability and validity of the score inferences made from the SSIS-T scales and subscales. Test-retest indices for Total Social Skills were 0.82 for the teacher version with median stability indices for the Social Skills and Problem Behavior subscales in the 0.80s.

The Developmental Neuropsychological Assessment-II Affect Recognition (NEPSY-II AR; Korkman et al., 2007), a subcomponent of this social perception subtest, was used to measure participants' ability to recognize others' emotions. This subcomponent includes three task areas that require participants to select photographs where children appear to be feeling the same way. NEPSY-II AR has high reliability coefficients (rs = 0.85–0.87) and moderate test-retest coefficients (rs = 0.50 to 0.58; Brooks et al., 2010).

The Social Attribution Task (SAT) measured participants' understanding of social accuracy, attribution, and intentionality (Abell et al., 2000). In this experimental measure, adapted from the original videos of Heider and Simmel (1944), participants were asked to narrate the movements of blue and red triangles presented in six separate brief videos. In the current study, pre and post-test administrations were randomized, and two different sets of six videos were used for each participant. For the first three videos, participants were instructed to "Watch each video. At the end of each video, you will describe what you think the triangles were doing." Then, before the start of the last three videos, the participants were prompted to "Pretend the triangles are people, and tell me what they are doing." Narratives were recorded, transcribed, and double-scored by two blind raters. Using methods of (Castelli et al., 2000) each video from the SAT was given a total and intentionality score both based on a six-point Likert scale, as well as an accuracy score based on three-point Likert scale methods (Heider and Simmel, 1944). For the intentionality score, more points were awarded when the participant used mental state vocabulary such as "scared," "surprised," "trick," "bully," etc. to describe the movement of the triangles (e.g., "Parent coaxing a child to go outside" received higher points than "A triangle moving around in a box").

The Social Language Development Test (SLDT; Elementary and Adolescent Editions) Making Inferences subtest was administered to formally assess participants' ability to use contextual clues (i.e., facial expressions, gestures, and posture) to infer a pictured character's perspective. During the Making Inferences subtest of the SLDT, the student takes the perspective of someone in a photograph and tells what the person is thinking as a direct quote. The second question in each item asks the student to identify the relevant visual clues supporting the character's thought. Scoring for SLDT Making Inferences subtest includes assigning a score of one or 0 to each response, based on relevancy and quality. The SLDT has demonstrated good test-retest reliability (SLDT-Elementary κ = 0.79 SLDT-Adolescent κ = 0.82), excellent interrater reliability (SLDT-Elementary 84%, SLDT-Adolescent 85%), and good content and criterion validity (Bowers et al., 2008; Bowers et al., 2010).

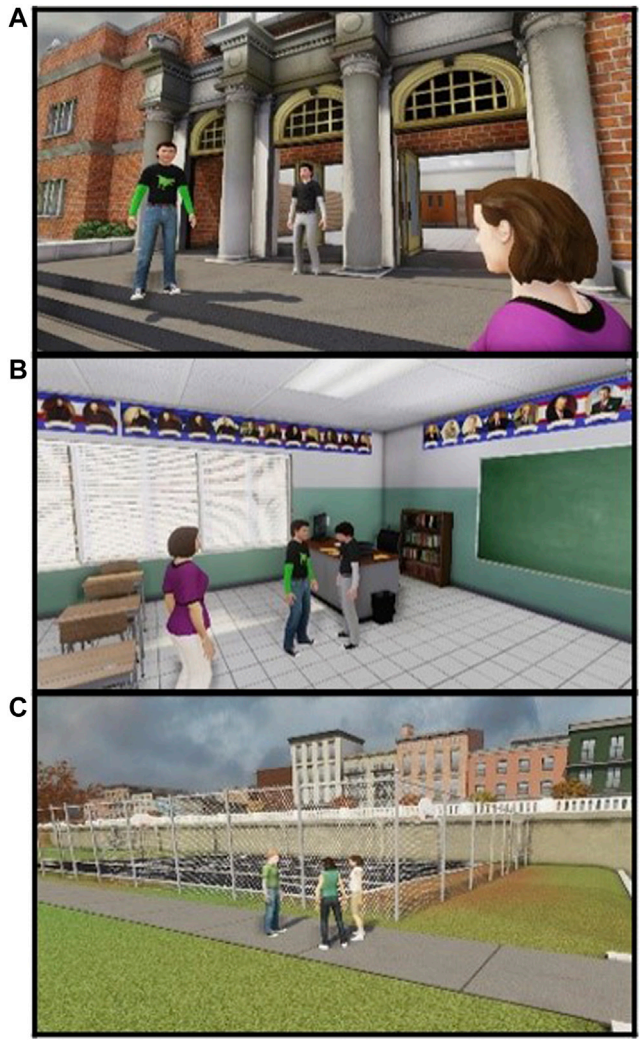

FIGURE 1 | Virtual locations **(A)** Outside school; Participant, Faux Peer, Coach **(B)** School classroom; Participant, Faux Peer, Coach **(C)** Playground and Basketball Courts; Participant, two Faux Peers.

An informal student interview was conducted upon completion of the eight-session virtual social training. Students were asked to report subjective areas of growth and provide insight into their progress. A clinician queried which elements of the virtual social training were most beneficial and applicable to students' daily lives. Lastly, a user experience form was completed by participants to share their impressions of interacting within the virtual social training environment.

Virtual Social Training Environment

Virtual Gemini™ 3.0 (VG3) was developed at The University of Texas at Dallas' Center for BrainHealth. The Center for BrainHealth's Emerging Technology Lab brought the vision of researchers and clinicians to life as a secure online multiplayer simulation. The VG3 was an immersive 3D platform built on a full source code version of *Unreal Engine* via the Unreal Development Kit. The virtual world takes the form of a city neighborhood block with access to many environments that are designed to facilitate social role-play. Participants and clinicians were represented in the virtual world by full-body avatars selected to match gender, general height, eye color, hair color, and clothing preferences. Virtual locations (**Figure 1**) included were a school, a grocery store, an apartment building, a coffee house, a bookstore, and an outdoor city central square area. Exterior features within the city square included the business fronts of a movie theater, restaurant, electronics store, and a pharmacy, all of which provided additional real-world context.

Navigating the virtual world was achieved via use of a USB-compatible console controller. Locomotion and interactions such as run, walk, jump, sit, stand and interact with props were mapped to that of conventional gaming norms. Additionally, participants were provided a gaming headset with microphone for voice communication before, during, and after the experience in the virtual world. Voice over Internet Protocol (VOIP) was handled by *Mumble*, chosen for its simple user interface and low latency. Clinicians needed the additional functionality of voice manipulation to facilitate the portrayal of many different personas in a single coaching session. For this, the study used *MorphVox*™ to manipulate pitch and tone to create simulated voices for various clinician-controlled characters as needed, regardless of age or gender. No participants exhibited difficulty utilizing the technology.

Intervention

The virtual social training was designed to include a dynamic, eight-session social coaching protocol, with established themes and strategy focus as well as coaching targets, administered within a virtual world (**Figure 2**). A team of two clinicians was assigned to each student or pair of students to fulfill two distinct clinical roles. Assigned as the "lead" coach, the first of the two clinicians provided onsite user support, in-person instruction of the social strategies, and real-time social coaching within the virtual world (**Figure 3**). The second role was filled by a confederate-clinician that interacted with participants exclusively as "faux peers" in the virtual world and was implemented from a remote location at the Center for BrainHealth. To ensure quality and consistency, a clinician scenario guide was developed to guide the "faux peer" in assuming the personas of multiple characters with unique personality traits and varying intentions over 40 total simulated social interactions (**Figure 4**). All sessions were designed to allot sufficient time for each participant or participant pair to receive 5–10 min of virtual social training strategy instruction and four virtual conversations with the "faux peers", with social coaching between each conversation. Parents and teachers were informed that the confederate-clinician would play these multiple characters, while the participants were simply told that the people they were talking to were "real people" and were instructed to "Interact with the other avatars just like you would normally act with people in the real world." Study staff were instructed to not direct the participants on what to say or do during the social interactions. After each conversation, the lead coach utilized a social coaching approach with guided discussion developed from the SIP model. All participants, regardless if paired or individual, were asked to identify if and when they were

SESSIONS	THEME & STRATEGY FOCUS	SOCIAL COACHING TARGETS
Pre Coaching-Establish Dynamic Conversational Social Competency Baseline		
#1	Establishing Social Presence; Meeting New Classmates and School Counselor	□ Sustain engagement, interest in others, recognize others' states, perspectives, motives, opinions
#2-3	Developing Conversations; Responding to Others and Expressing Interests	□ Engage in conversation, share thoughts, opinions, experience, ask questions, make social connections, and relate to others
#4	Developing Assertion; Understanding Nuances of Others' Reasoning, Decision Making and Intentions	□ Consider multiple points of view to evaluate a situation for potential problems. Affirm, negotiate, challenge, and compromise to explore many different perspectives
#5	Developing Empathy; Customizing Responses and Sharing Personal Experiences	□ Relate insights and provide relevant examples and support based on social inferences
#6	Asserting & Confronting Peers & Adults; Responding to Risky Situations	□ Determine safety, risk, and actions to take, consider best interest for self and others to make strong, assertive choices
#7	Maintaining Relationships; Transforming and Adapting Thoughts, Emotions, and Actions	□ Share related questions, ideas, experiences, and/or feelings that best fit the context of a given social situation with preferred peers
#8	Asserting with Close Peers; Balancing and Thriving in Difficult Situations	□ Recognize misguided or shortsighted ideas and intentions, respond with novel solutions while maintaining relationships
Post Coaching-Measure Dynamic Conversational Social Competency Change		

FIGURE 2 | Virtual social training session design.

FIGURE 3 | Lead social coach. Virtual apartment, participant avatar.

using the social strategies and to explain how the strategies were impacting their ability to recognize social cues and respond to others. For students receiving individual training sessions, due to having difficulty attending within the virtual environment, the lead coach used frequent verbal cues to redirect focus and engagement within the virtual world. Two-thirds of the interactions took place with peers, and one-third took place with adults. Conversations took place within the virtual world at the following virtual locations: apartment complex (15%), school (44%), and city square (41%), with more conversations taking place in academic and social environments to ensure contextual appropriateness for the adolescent years.

Analyses

To test the hypotheses that teachers are reliable identifiers of middle school students with lagging social skills, standardized

Session 4 -Theme Introduction: You're coming back to the group today and have a group project with your friends. Meet with your counselor first to understand your activities for the day, then meet with friends to work on a project. After you talk with each person you'll come back here and talk with me.

Social Coaching Target: Consider multiple points of view to evaluate a situation for potential problems. Affirm, negotiate, challenge, and compromise to explore many different perspectives

Location	Prompt given by Clinician	Clinician Scenario Guide
School Office	Today is Project Day. Mrs.Sands will fill you in on the details. She should be in the school. 	**Ms. Lauren Sands (adult female)** -Greet participant warmly. Indicate that you have a fun project that everyone will work on. Wait for response. -Indicate that the project is a group engineering/science project where the group will work together to come up with a project to do. It can be any topic but has to be a project that everyone can do. Pause and ask for questions. -Indicate the participant will work with one person at a time and have 3 different steps to do the project: (pause as you explain each step) 1st friend – come up with project topic, 2nd friend – come up with how to do it, 3rd friend – complete the project. -Talk with the participant and offer any help or guidance as needed. Let them know you'll follow-up tomorrow to see how it goes.
Interactive Coaching & Student Reflection		
School Classroom	The 1st person that you will be working on the project with is Erin. She is in the classroom already. 	**Erin (female friend)** -Greet participant and sound bossy – mention you do this every year and it's always boring. Mention that this year you want to do something you want to do – strongly suggest something around sports. Wait for response. -If the participant offers any suggestions, sound annoyed and shoot down all his/her ideas. Insist you want a project around sports. -If participant refuses then reluctantly listen to ideas but still refuse saying they are "dumb" or "boring." -If participant accepts then sound happy and work together to come up with a good project for you. (e.g., create a super ball that is aerodynamically shaped to fly faster)
Interactive Coaching & Student Reflection		
School Playground	Michael has been assigned to your group. He should be meeting up with you soon. 	**Michael (male friend)** -Greet participant in a friendly manner. See if participant tells you the situation. If not ask what you will be helping on for the project. -Indicate you are really excited about the sports topic and can think of A LOT of ways to work on the project. -Be open minded to suggestions that the participant makes but list a lot of solutions on your own (without paying too much attention to the participant's ideas). -If participant tries to offer suggestions, then go along with those to incorporate. -If participant does not offer suggestions, then encourage the participant to help. -Indicate you have to leave early and are sad you can't help with the rest of the project.
Interactive Coaching & Student Reflection		
School Hallway	Tyler is part of the project too. I think he will be going into the classroom. 	**Tyler (male friend)** -Greet participant and sound bored/disappointed. Wait for response. -See if participant tells you the situation. If not, then indicate you heard from Michael what you'll be working on. Sound upset and angry. You don't want to work on this project. -Refuse to help, even if participant tries to encourage you. -Listen the participant but come up with excuses not to help (you can do it on your own, you don't need me, this is stupid anyway, you don't have everything you need to do the project, the teacher won't know). Finally insist that your sister should do it since she was the one that came up with the idea. -Storm off as you are refusing to help (going to go tell her to do the project by herself).
Interactive Coaching & Student Reflection		

FIGURE 4 | Confederate-clinician/faux peer scenario guide- session four.

rating scales measuring social skills and problem behaviors were provided to classroom teachers for each participant. Results were then compared to baseline performance measures in the areas of emotion recognition, social inference, and social attribution to determine any association between teacher observations of social behavior and student performance. It was expected that student classroom-based social skills were 1) positively associated with one or more areas of social competence at baseline, and 2) negatively related to problem behaviors. Additionally, pre-post participant performance data and study completion rate were measured to establish the feasibility and effect of the implementation of an eight-session virtual social training within a naturalized context of public school. Lastly, to test the hypothesis that student participants would transfer skills into the classroom setting 5˚weeks following the training, a post-training rating scale was completed by teachers. Again, expected findings were that implementation of an eight-session virtual social training in a public middle school setting would yield a positive impact on classroom social skills.

Two sets of general linear mixed models were implemented to accommodate the aims of this study, testing the association of student social performance measures with teacher assessments of social behaviors and effects of the virtual social training on each of those measures. The first set modeled each of the teacher assessments as a function of the students' social competency, diagnostic category of each student (non-clinical, attention deficit hyperactivity disorder, other health impairment, autism spectrum disorder, and learning disability), time (pre- and post-training), and all pair-wise and three-way interactions of those factors. The primary test of interest was the association of the student

TABLE 2 | Association between Teacher Report and Baseline Measures of Social Competency. Tests of regression coefficients, SSIS-T sub-scale associations with NEPSY-II (left) and SLDT (right).

Association with NEPSY-II: Affect recognition					Association with SLDT: Making inferences			
SSIS–T subscales	**Coefficient**	**T-value**	**df**	***p*-value**	**Coefficient**	**T-value**	**df**	***p*-value**
Communication	0.26	2.24	88.7	0.027*	0.08	1.26	68.5	0.213
Cooperation	0.29	2.40	84.5	0.018*	0.10	1.36	73.8	0.177
Assertion	0.09	0.70	90.8	0.484	–0.02	–0.29	73.5	0.771
Responsibility	0.27	2.40	88.8	0.019*	0.06	0.95	69.8	0.343
Empathy	0.04	0.28	97.7	0.778	0.14	1.87	61.5	0.066
Engagement	0.17	1.19	96.9	0.237	0.04	0.46	62.5	0.649
Self control	0.35	2.44	95.1	0.017*	0.12	1.52	63.1	0.132
Social skills total	1.57	2.14	98.9	0.035*	0.30	0.81	62.1	0.422
SSIS–T problem behavior subscales								
Externalizing	–0.35	–2.16	72.9	0.034*	–0.31	–2.63	83.5	0.010*
Bullying	–0.02	–0.26	88.5	0.793	–0.06	–1.40	70.3	0.165
Hyperactivity	–0.24	–1.86	81.4	0.066	–0.23	–2.85	80.1	0.006*
Internalizing	–0.21	–1.56	87.5	0.123	–0.02	–0.29	69.2	0.769
Problem behavior	–0.94	–2.12	87.1	0.037*	–0.33	–1.23	77.3	0.221
Autism spectrum	–0.29	–1.26	93.6	0.212	–0.15	–1.34	68.7	0.184

**FDR = 0.10*

TABLE 3 | Student Social Skill Performance Post Training. SLDT- E and A reported in standard score, other measures reported using raw score; Neuropsychological Assessment (NEPSY-II), Social Attribution Task (SAT), Social Language Development Test Elementary and Adolescent (SLDT- E and A).

Measure	**Baseline Mean**	**Post mean**	**T**	**Df**	***p*-value**
Measures of social competency					
NEPSY-II: Affect recognition	25.59	26.91	2.89	86.0	0.005*
SAT: Total	16.40	18.12	4.56	86.0	0.000*
SAT: Intentionality	11.65	13.55	4.21	86.0	0.000*
SAT: Accuracy	6.31	7.23	2.86	86.0	0.005*
SLDT-E and A: Making inferences	82.74	91.86	6.44	71	0.000*

**FDR<0.05*

measures with the teacher assessments, but the other factors and interaction terms were included in the event they influenced the teacher ratings. Average regression coefficients for each dependent variable were converted to t-statistics, which formed the basis for inference. Application of the false discovery rate (FDR) method controlled for multiple testing. The second set modeled each student competency measure and each teacher assessment separately as a function of diagnostic category (listed above), time (pre- and post-training), and the interaction between these two factors. The primary test of interest was the mean change due to virtual social training, but included diagnostic category in the event that the effect of training depended on one or more of these clinical groups, however, no relevant interactions were found. As above, inference for mean change following training was based on t-statistics, and multiple testing was controlled by the FDR method.

For both sets of models, separate variance components for within-subject measurements (pre- and post-training measures) and for between-subject measures were estimated. This was done not only to allow multiple factors in the linear models, but also to accommodate missingness in some of the time points. This linear based ANOVA model, was reported as t-statistics instead of F-statistics. Measurements that were not paired in time were not excluded. Model parameters were estimated by maximum likelihood (ML) or restricted ML for variance components; and all models, estimates, and tests were written in the R statistical computing language (R Core Team, 2017). The FDR method was applied to each of the sets of models, and the FDR level was controlled at 0.10.

RESULT

Association Between Teacher Report and Baseline Measures of Social Competency

Table 2 presents data that examines the relationship between the teacher ratings and measures of social competency at baseline. The NEPSY-II AR subtest had a high positive association with the majority of the SSIS-T Social Skills Subscales (i.e., Communication, Cooperation, Responsibility, Self-Control) as well as the Total Social Skills raw score. There was also a high negative association with SSIS-T Problem Behavior subscale of Externalizing as well as The Total Problem Behavior score. Normed standard scores on the SLDT Making Inferences subtest had a strong negative association with the SSIS-T Externalizing and Hyperactivity subscales.

TABLE 4 | Classroom Behavior 5°Weeks Post Training. Reported in raw scores; Social Skills Improvement Rating Scale- Teacher (SSIS-T).

Measure	Baseline mean	5°Week follow-up mean	T	Df	*p*-value
Teacher rating: SSIS-T subscales					
Communication	10.97	11.95			0.021*
			2.38	50.2	
Cooperation	11.30	11.39			0.827
			0.22	49.2	
Assertion	8.47	9.76			0.004*
			2.98	50.5	
Responsibility	11.23	11.45			0.620
			0.50	51.3	
Empathy	8.30	8.39			0.873
			0.16	53.6	
Engagement	9.44	9.94			0.396
			0.85	53.2	
Self–control	11.36	11.74			0.514
			0.66	53.1	
Social skills total	70.84	75.13			0.161
			1.42	54.0	
Externalizing	6.96	7.09			0.791
			0.27	46.9	
Bullying	1.69	1.87			0.481
			0.71	50.0	
Hyperactivity	6.39	6.19			0.648
			−0.46	48.3	
Internalizing	6.67	6.57			0.828
			−0.22	50.2	
Problem behavior	22.83	21.27			0.346
			−0.95	50.2	
Autism spectrum	17.56	16.04			0.087
			−1.75	52.1	

FDR <0.05

Student Social Skill Performance Post Training

Whole group data on measures of social competency were examined for statistical significance (**Table 3**). Paired t-tests comparing pre-test and post-test differences for the total sample (N = 90) revealed significant increases on NEPSY-II AR mean raw scores. There was also significant improvement on the SAT total scores as well as intentionality and accuracy subscales (N = 90). Lastly, there was a significant improvement noted on the SLDT Making Inferences subtest (n = 72). Standard score conversions are compared due to the elementary and adolescent versions of the test having slightly different scoring procedures and raw score totals.

To further address the feasibility of the training, qualitative data was collected to evaluate each participant's perspective and experience. During the post-training exit interview, participants (N = 90) were queried as to what component of the virtual social training helped the most and why. Sixty-eight percent of participants identified a more confident mindset in regards to their own social communication skills such as relating, maintaining, adapting, and asserting thoughts and ideas. Participants most frequently reported that practicing making connections in the virtual world, either through conversations, shared explorations, world knowledge, and/or developed relationships was the most helpful aspect of the training. The second most frequently reported element was learning a strategy to help evaluate situations and incorporate reactions, feedback, and cues from others to generate novel solutions and implement strong social choices. During this post-training exit interview, no participants reported difficulty using the technology, and the overall technology user experience for this pilot group of sixth through eighth graders was positive. Feedback obtained from students was consistent in that the experience of simulating social situations in a virtual world was fun and interactive, felt "real", and allowed for repeated practice of social strategies in new and engaging ways.

Classroom Behavior Five Weeks Post Training

Teachers were asked to report on how student participants were engaging socially 5°weeks after the training (**Table 4**). Initial data analysis revealed improvement in all social skills subtest areas. Further data analyses revealed statistically significant improvement in the areas of communication and assertion (n = 52). At 5°weeks post training, student participants were reported to communicate more frequently with peers and teachers (i.e., communication) and have greater insight into when to ask for help (i.e., assertion).

DISCUSSION

The results of this pilot study show that the utilization of virtual social training for adolescents in the middle school environment

appears to be feasible. Adolescents with lagging social skills are at a disadvantage, as they tend to struggle with accurately recognizing what others think and feel, resulting in poor social communication skills and a negative social mindset. These weaknesses present in a classroom setting as decreased social participation, group work disengagement, and a limited ability to ask for help when needed. Three important contributions of this training study are discussed, followed by the study's limitations which motivate and refine future investigations. The contributions of this research relate to 1) the potential advantage of teacher identification and referral of students struggling socially in middle school; 2) utilizing a virtual environment to simulate real-life interactions with specific social coaching targets and strategies; and 3) the preliminary exploration that virtual social training may have a lasting positive impact on social confidence and behavior in the classroom.

Within the middle school setting, teachers act as key observers of student social behavior. This pilot study supports the feasibility of utilizing teacher identification of social behavior and change, consistent with previous researchers who denote that direct teacher observation of behavior provides essential, real-time information about student functioning and can allow for several potential advantages, such as being used to confirm the presence of a social problem and evaluate student response to intervention (Clemens, et al., 2012; Miller, et al., 2014). Additionally, this work expands on previous studies investigating the validity of teacher ratings of adolescents' social competency levels (Ogden, 2003). With the predominant reasons for referral in this study being shyness/withdrawal and social awkwardness, proactively working with teachers to ensure consistent and reliable identification of students struggling socially may help support quality interactions within the classroom, therefore increasing the likelihood of student confidence, engagement, and participation in classroom discussions. In the face of current societal, economic, environmental, and social challenges, the identification of lagging social skills and promotion of skill development in the educational setting is seen as more critical than ever before. SOCIAL, a socio-cognitive integration of abilities conceptual framework, provides a biopsychosocial understanding of social skill development and proposes that social competence requires cognitive and affective capacities (Beauchamp and Anderson, 2010). The current study builds upon the aforementioned model and adds to the currently limited landscape of social-emotional programming in middle school, as this specific environment demands dynamic and ever-changing social, communicative, and cognitive functions. As such, schools are being urged by political leaders and administrative policy to pay more attention to equipping students with skills such as communication, collaboration, social regulation, and problem-solving, as well as critical thinking (Schonert-Reichl et al., 2017).

Few virtual training programs have demonstrated effectiveness beyond a single study, and a great deal of uncertainty still exists regarding the ideal curriculum and process to develop social skills in a virtual environment (Howard and Gutworth, 2020). We must therefore be cautious in ascribing cause-and-effect relationships between the training and the observed improvements before and after the 5°week virtual social training. Whereas this is a significant limitation, the results offer promise as supported by the compelling observations across training engagement and teacher-reported improvement. Remotely delivered, individualized social coaching sessions with a trained clinician helped participants understand and integrate this information. Our prior work has shown that social-cognitive strategy training in a virtual environment can generalize beyond the trained domains to neural signatures underpinning social brain health, such as increased brain blood flow, with the brain changes linked to improved complex social cognition, emotional well-being, real-life functions, and social adeptness (Kandalaft et al., 2013; Didehbani et al., 2016; Yang et al., 2017). The present study offers high-quality virtual-based cognitive coaching aimed at teaching tactical social strategies previously shown to improve affect recognition and social engagement. The current paradigm extends the aforementioned approach by exploring the feasibility of training students in a traditional middle school environment with measured social behavior change in the classroom setting. This study replicates laboratory findings in terms of pre-post social performance gains and adds that the virtual social training can be administered in a typical public middle school to improve students' ability to recognize others' emotions, consider perspectives, and interpret intentions, as evidenced by a high completion rate of 80 percent.

Integral to the future of effective and engaging social skill training, technology-based, interactive platforms can be personalized to match the social competency levels and specific social contexts of the adolescent experience while simultaneously teaching and applying new skills. Investigating the value of virtual technology within applied settings within education is an important supplement to classic lab experiments (Makransky et al., 2020). These findings support that a virtual platform for participants to be empowered and self-monitor their application of social strategies may increase student engagement and motivation. Results demonstrated both improvements in quantitative and qualitative measures of social competence and students' reported level of accomplishment and ability.

The present findings have implications that go beyond the promising results of this study. More encouraging is the attainment of positive results while students are in middle school. Investigators found participants' impaired social functioning was identifiable by teachers in a classroom setting, measurable by a standardized assessment battery, and observed by clinicians within an online, virtual environment. Sixth, seventh, and eighth grade may be an opportune time to implement specialized training to improve social competencies. The application of brain science to evidence-based policymaking should address high-level cognitive capacities such as self-awareness, social understanding, and decision-making (Choudhury, 2017). Lastly, this work supports recent advances in the study of at-risk youth that indicate a positive,

strengths-based and preventative approach to working with economically disadvantaged minority youth and encourages a greater focus on identifying resilience-promoting assets within the ecology of one's school, family, and community (Marks et al., 2020).

There were several interesting factors considered from this pilot study that should influence follow-up studies of a similar nature. Analyzing data on the frequency and quality of participants' interactions and strategy use while in the virtual world could help further characterize patterns of social engagement in adolescents, assist in measuring potential response to the virtual social training, and serve as a useful feedback tool for the participants. Although data analyses did not find diagnostic category as an influential factor in the outcomes presented in this study, further exploration of students' social behavior and how related competencies change over time may lead to a more nuanced approach when classifying different types of social learners.

LIMITATIONS

There are limitations to this pilot study involving study design. In regards to teacher referrals, developing a Likert scale for teachers to rate the social behavior of all students within a class, and then refer at-risk youth may lend to a more dynamic analysis of teacher concerns prior to enrollment in the study. However, the strength of the design was that data was collected in a real classroom environment by the classroom teachers, which made it possible to quickly assess and respond to teacher concerns as well as measure the impact of the virtual training in a realistic setting. Most significantly, this study did not use a control group to isolate the effects of the training. Therefore, causation cannot be established and results must be interpreted with caution. Due to the inclusive nature of this study, it was not possible to develop an experimental design in the given setting because the teachers and administrators did not want to further disadvantage any students in an already at-risk population. To address this, future randomized controlled trials could compare an experimental group to a waitlist control group that engages in conversations with a partner in the virtual world, however, does not receive social coaching or strategies. Nonetheless, virtual social coaching may still offer promise for future interventions. Lastly, this study suffers from issues with missing data, especially concerning the low response rate from teachers (60% at 5˚weeks post-training). Although teachers reported positive social behavior change 5˚weeks after the training, using a longitudinal approach that extends to multiple populations and age groups would provide a more comprehensive look at generalization effects and social performance across time. A correlational analysis between improved social competency levels and academic achievement could also provide insight into the benefit and lasting effects of an eight-session virtual social training from a holistic social-educational perspective.

Research directions for group-based social interactions within a virtual environment also remain largely unexplored. Evidence suggests that individuals with social challenges most frequently avoid loud, crowded spaces and may benefit from a modifiable, virtual environment to improve social skills (Lau et al., 2020). To further enhance sensory immersion, it may be beneficial from an engagement standpoint to incorporate non-player characters and auditory features such as environmental ambient sound into the virtual world, thereby simulating real-life experiences of small and large group gatherings. Additionally, a platform enhancement suggested by participants was a group gaming component of the virtual experience.

CONCLUSION

Adolescent social development has critical cognitive elements that govern the processing of information from the social world and drive the attributions that are made. This work provides hope that viable solutions for adolescents struggling socially in the educational setting may eventually be obtained through the provision of evidence-based virtual social training. With advancements in naturally motivating virtual technology, real-time social coaching is a feasible intervention approach that promotes social communication and assertion.

The current study is an innovative and individualized alternative that expands previously stagnated social skill interventions. Furthermore, students demonstrate improved precision in recognizing and understanding social, conversational, and emotional nuances to best formulate and execute a prosocial response, creating a strong, confident foundation for social reasoning and resiliency.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/Supplementary Material, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the University of Texas at Dallas Institutional Review Board and Dallas Independent School District Research Review Board. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

MJ: Lead author and Senior Speech-Language Pathologist partnering with a team of clinical researchers to translate a lab-based study into real-world application. Utilizing remote technology, Maria's research is dedicated to a keen focus on social cognitive development. AT: Trained as a Speech-Language Pathologist, Aimee coaches to the whole student,

meeting youth at their current level and propelling them forward utilizing evidence-based and scientifically supported solutions. KT: A Speech-Language Pathologist, Kathleen coaches each child through their unique social experiences using personalized strength based training paired with a strategic social-cognitive approach. TA: A senior clinical researcher at the Center for BrainHealth, Tandra oversees programming that promotes social brainhealth across daily living as well as implements assessments and intervention. AT: A director of emerging technology, Aaron oversees the virtual reality social cognition lab. Utilizing virtual technology, Aaron leads a team of graphic artists, programmers, and designs platforms for clinicians to use for virtual social skill training. SC: As a cognitive neuroscientist with more than 40 funded research grants and 200 + publications, SC scientific discoveries elucidate and deploy novel approaches to advance creative and critical reasoning, strengthen healthy brain development, and expand innovative thinking.

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REVIEW
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Temperament and School Readiness – A Literature Review

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This review study was conducted to describe how temperament is related to school readiness. The basic research question was whether there is any relationship between later school success and temperament in children and, if so, what characterizes it. A systematic search of databases and journals identified 27 papers that met the two criteria: temperament and school readiness. The analytical strategy followed the PRISMA method. The research confirmed the direct relationship between temperament and school readiness. There is a statistically significant relationship between temperament and school readiness. Both positive and negative emotionality influence behavior (especially concentration), which is reflected in the approach to learning and school success.

Keywords: school readiness, temperament, self-control, preschool age, school success, effortful control

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INTRODUCTION

Temperament, as a cluster of mental attributes that are presented in the form of experiencing and reacting to stimuli with an effect on emotional expressions and behavior, has an effect on school results amongst children (Keogh, 2003). For school education, therefore, what is important is how the child is able to manage its temperament and project it into activity, perseverance, and balance in response to stimuli (McClelland and Wanless, 2012).

The aim of this review study was to identify the relationship between the temperament of the child and school readiness presented in the scientific literature and how the research activities were constructed.

The definitions of temperament are not uniform in their conception and differ with different authors. Three basic theories have been put forward in relation to temperament in human life during its historical development: physiological theories Hippocrates or Galen (Ashton, 2013), bio-ecological theories (e.g., Thomas and Chess, 1977), and behaviorally oriented theories (e.g., Thomas and Chess, 1977). In the context of temperament research, current studies indicate terms that refine temperament and its manifestations, such as executive functions, effortful control, and self-regulation. Two basic research questions were identified in the context of the objective.

1. Are there studies that describe the relationship between temperament and school readiness and subsequent success rates in children?
2. If so, how can this relationship be characterized?

THEORETICAL BACKGROUND

Temperament

Temperament is the focus of scientists' interest in psychology. Perhaps the most prevalent are theoretical approaches to temperament as defined by Buss and Plomin (1975), Thomas and Chess (1977), Rothbart and Derryberry (1981), Goldsmith and Campos (1982), and Kagan (1984).

The Kagan approach (Kagan, 1984) is constructed based on biological factors that he considered congenital and may affect behavior. Goldsmith and Campos (1982) provide a definition of temperament as an individual difference in the ability to experience and express primal emotions. Differences in temperament are observable in the intensity of behavioral expressions, facial expressions, gestures, and movements. The definition, which is constructed on the basis of nine dimensions of behavioral styles – activity level, regularity, approach withdrawal, adaptability, threshold of responsiveness, intensity of reaction, quality of mood, attention span/persistence, and distractibility – was used by Thomas and Chess (as cited in Pharis, 1978). The model that was designed by Buss and Plomin (1975) was behavior-genetics oriented. It is assumed that early manifestations of temperamental features are hereditary and adapt evolutionally in a child, as responses to its living conditions, and are also relatively stable. Three core dimensions were identified: emotionality (E), activity (A), and sociability (S). The above-mentioned authors represent the primary sources to which most later studies relate. The approach to temperament by Rothbart (Rothbart and Derryberry, 1981) defines temperament as biologically ingrained individual differences in reactivity and self-regulation in emotional, activation, and attention-based processes. Reactivity refers to levels of biological arousal caused by changes in internal and external stimulation, which are captured as dimensions of negative influence and surgency. Self-regulation applies to processes that modulate reactivity and are reflected in a temperamental dimension that requires effortful control.

Temperament is accompanied by relatively permanent individual differences in reactivity and self-control that can be influenced in the course of the child's development by maturation and experience (Rothbart and Bates, 1998). Differences in temperament are apparent from early childhood, with some children tending toward negativity and bad moods, while others have difficulties adapting to a new environment and people (Thomas et al., 1963; Putnam and Rothbart, 2006).

Children's temperament has been described as a source of multiple categories of behavioral manifestations. The result is the concept of temperament as a three-component structure, which is represented by Surgency/Extraversion, Negative Affectivity, and Effortful Control (Rothbart, 1988; Rothbart and Bates, 1998, 2006; Rothbart and Putnam, 2002). In a more detailed concept, the Surgency/Extraversion category is described as impulsive, exhibiting a high degree of activity and courage and, at the same time, a need for satisfaction.

Negative Affectivity is characterized by manifestations of sadness, frustration, and being difficult to calm down. Effortful Control is characterized by the need for control and ability to concentrate (Rothbart and Putnam, 2002). In relation to school readiness and the subsequent success of children, Negative Affectivity is characterized by the above-mentioned authors as a possible source of problems with controlling emotions and thus as a possible source of problems in children's behavior.

Executive Functions

Executive functions as a term can be described as a collective name for a complex and diverse set of mental processes, the content and scope of which are differently defined. Most often, higher-order cognitive abilities are described using this term, allowing people to use psychological and physical resources effectively in an unknown or under-structured situation. Executive functioning, cognitive functioning, and affectivity can be considered as three fundamental dimensions of human behavior. Executive functions provide "know-how" on how to handle cognitive and affective processes. There is empirical evidence suggesting a strong relationship between temperamental characteristics and executive functions (Sudikoff et al., 2015). Affrunti and Woodruff-Borden (2015) state that the expression of temperament can be influenced by executive functioning. Temperament also includes behavioral aspects, as well as attention-seeking processes, including maintaining orientation and executive control. These skills form the basis for the development of self-regulation (Rothbart and Hwang, 2002).

Effortful Control

The interaction of effortful control and emotion or stress is characterized by Zelazo et al. (2016) using the expressions "hot" effortful control and "cool" effortful control. These are based on the results of behavioral and neuroimaging research. Both types of effortful control are involved in the problem-solving function and varying degrees of motivation and emotion. For a "hot" approach, important situations involve the predominance of motivation and emotion. The "cool" approach works in affectively neutral contexts (Zelazo and Carlson, 2012).

Self-Regulation

The current theoretical basis emphasizes the importance of self-regulation in relation to school readiness. Self-regulation in a broader sense involves the ability to control emotions (Blair and Raver, 2015). Self-regulation offers an important addition to the conceptualization of school readiness because it addresses children's ability to attend to information, use it appropriately, and inhibit behavior that interferes with learning. However, like the broader concept of school readiness, theories and perspectives on self-regulation have focused on various priorities (Pan et al., 2019).

The level of reactivity is related to the characteristics of the reactions to changes in stimuli that are reflected on several levels (behavioral, autonomous, and neuroendocrine) and display different periods of observable parameters from latency and an increase and then a peak of intensity until relaxation. Self-control influences these processes and influences reactivity (Rothbart et al., 2004).

School Readiness

School readiness is understood as the state when a child enters school adequately prepared to engage in school activities and benefit from the educational situations so that he/she can experience success regarding his/her potential. Kagan (1990) speaks about readiness for learning, which is a state in which the child, thanks to his/her development, is able to learn the individual subjects. Janus (2007) describe school readiness as a level of maturity of the nervous system which allows the child to process specific "school" stimuli and develop his/her skills and knowledge without mental suffering.

Regarding mental development, school readiness is a child's state when the child's skills necessary for meeting his/her cognitive, physical, and social needs on entry to school can be employed (Mashburn and Pianta, 2006; Pianta et al., 2007; Janus and Gaskin, 2013). The developmental level of the child provides the opportunity to safely reflect the needs of schooling in a wider context in terms of cognitive, social, and emotional functions (Lemelin et al., 2007).

In relation to the above, one can also include maturity and physical health, emotional maturity, and the necessary communication skills (Kagan, 1992; Doherty, 2007).

Janus and Offord (2000) named the basic domains that are important in relation to a child's functioning at school, which can at the same time be used as areas for evaluation or in the event of a need for diagnostics of particular functions. These are physical health and well-being, including the necessary development of fine and coarse motor skills. It is also a domain that includes the social skills of responsibility and respect, approach to education, and readiness to explore new things. Attention also needs to be paid to emotional maturity, which includes pro-social behavior and the ability to function in a group. Being able to deal with anxiety and fear and the ability to manage one's behavior regarding concentration and activity are associated with emotional maturity. According to these authors, the other domains on the list are the level of language skills and the overall level of cognitive functioning in the areas of literacy, mathematical imagination, and motivation to learn. Communication skills and their adequate development as an essential factor for effective schoolwork can be emphasized.

METHODS

The research scope of the study is focused on the school readiness of children in relation to their temperament. The given age category of the children and their temperament are considered essential with regard to their readiness for, and subsequent success in, school education, as is stated by other expert studies. Vágnerová (2012) considers preschool age to be a period during which the child should be mentally and physically sufficiently mature to begin school attendance, while Al-Hendawi (2013) argues that temperament is a significant parameter of school adaptation and success. Al-Hendawi (2013) also states that the authors of expert studies view temperament from different perspectives.

The aim of the research was to determine whether there are studies that deal with the relationship between temperament, its dimensions, and school readiness.

For this review study, a design was applied that is based on the PRISMA method (Moher et al., 2015) in the context of the theory of Paré and Kitsiou (2017). Four stages of the work process were created based on this method.

Stage 1– Strategy

The study, and therefore the search for the primary source texts, focused on the period from 1 January 2000 to 29 February 2020, with the selection including articles in scientific journals in English. The search keywords were represented by the following expressions: School readiness; Temperament; Preschool age; School success; Effortful control; Self control; Mood.

The following elements were used for the search strategy: (school N1 readiness) OR (school N1 success); (school N1 readiness) OR (school N1 success) AND mood; (school N1 readiness) OR (school N1 success) AND Effortful control; (school AND readiness) OR (school AND success); (school AND readiness) OR (school AND success) AND Effortful control; (school AND readiness) OR (school AND success) AND mood; (school N/3 readiness) OR (school N/3 success) AND mood AND preschool.

This time span was chosen because the largest number of texts for further analysis was searched for in the databases during this period. The choice of a shorter time span of the margin did not offer sufficient saturation in searching.

Stage 2 – The Selection of Databases for the Search

The MEDLINE, CINAHL, ERIC, EMBASE, PsycINFO, PsycArticles, Web of Science, Google Scholar, Scopus, and Proquest databases were used for the search. The EBSCO Discovery Service was used. A total of 1092 articles were found.

Stage 3

Abstracts were analyzed for all 1092 articles. On the basis of this analysis, those articles that did not match the specified criteria were gradually eliminated. **Figure 1** shows what the procedure for the selection of suitable articles looked like.

In the last stage a detailed analysis of 142 articles was performed. In all these articles, the key categories "Temperament", "Executive functions" "Effortful control", "Self-regulation", and "School readiness" were used.

On the basis of the analysis of 142 articles, specific groups based on the topics were created. School readiness was related to different variables with an indirect relationship to temperament – ADHD (25 articles), autism (one article), illness and health problems (19 articles), different age categories (28 articles), a conflict between the parents' and teachers' expectations of preschool-age children (five articles), and the topic of preschool children and disability (one article). In addition, there was the theory of mind and executive functions (eight articles), language skills (two articles), and the environment of the family and school

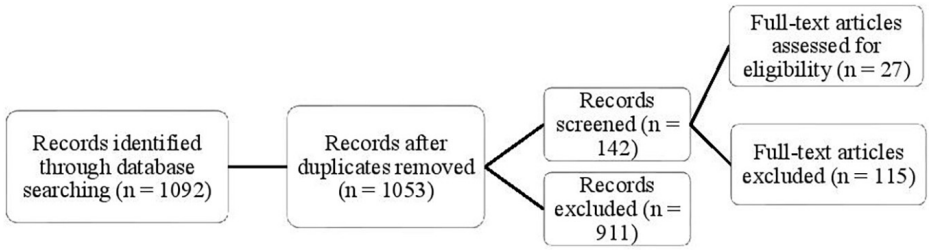

FIGURE 1 | Flowchart of Searching.

(eight articles), parents' temperament (nine articles), and teacher temperament (nine articles).

The narrow selection included 26 or 27 articles whose topics matched the requirements of the relationship between school readiness and temperament, i.e., both the essential categories – school readiness and temperament – appeared in them simultaneously. Only the 27th article (Miller and Goldsmith, 2017) is rather specific because the authors wanted to create an ideal pupil who would be successful at school.

The articles were analyzed qualitatively using a set of qualitative indicators. The indicators were determined in compliance with the research questions as the basis for the research and a more detailed description of the relationship between the child's temperament and school readiness. On the basis of these criteria, three qualitative indicators were determined: methods, target group, and research results. These indicators were then divided into the sub-groups shown in **Table 1**.

The stated qualitative indicators were determined as the basis for further examination and a more detailed description of the relationship between the child's temperament and school readiness or success in the selected articles.

RESULTS

Qualitative Indicator – Methods

The focus of the selected studies was divided into three fundamental domains: temperament (A), cognitive abilities (B), and social skills (C) (see **Table 2**). In twelve studies (Schoen and Nagle, 1994; Rudasill and Konold, 2008; Rudasill and Rimm-Kaufman, 2009; Stacks and Oshio, 2009; Zhou et al., 2010; Gartstein et al., 2016; Collings et al., 2017; Miller and Goldsmith, 2017; VanSchyndel et al., 2017; Bryce et al., 2018; Beceren and Özdemir, 2019; Johnson et al., 2019) the authors directly use the term 'temperament', while in 15 (Bramlett et al., 2000; Valiente et al., 2008, 2010; Rimm-Kaufman et al., 2009; Iyer et al., 2010; Rhoades et al., 2011; Silva, 2011; Valiente et al., 2011; Willoughby et al., 2011; Al-Hendawi and Reed, 2012; Razza et al., 2012; Morris et al., 2013; Gaias et al., 2016; Sawyer et al., 2019; Fung et al., 2020) they use the term 'regulation of emotions', which they perceive as part of temperament. In all the research focused on school readiness, however, the concept of readiness differed, and it was possible to divide it into two basic categories of social skills (Bramlett et al., 2000; Rimm-Kaufman et al., 2009; Rudasill and Rimm-Kaufman, 2009; Stacks and Oshio, 2009; Valiente et al., 2010; Zhou et al., 2010; Silva, 2011; Valiente et al., 2011; Willoughby et al., 2011; Al-Hendawi and Reed, 2012; Morris et al., 2013; Gaias et al., 2016; Gartstein et al., 2016; VanSchyndel et al., 2017; Johnson et al., 2019; Beceren and Özdemir, 2019) and cognitive skills (Schoen and Nagle, 1994; Rhoades et al., 2011; Valiente et al., 2011; Razza et al., 2012; Morris et al., 2013; Collings et al., 2017; Miller and Goldsmith, 2017; Bryce et al., 2018; Johnson et al., 2019; Sawyer et al., 2019; Rimm-Kaufman et al., 2009; Valiente et al., 2010; Zhou et al., 2010; Willoughby et al., 2011; Gaias et al., 2016; Gartstein et al., 2016; VanSchyndel et al., 2017). In the area of cognitive skills, the authors observed reading and mathematical concepts (Valiente et al., 2010; Morris et al., 2013; Gaias et al., 2016; Johnson et al., 2019), language skills (Schoen and Nagle, 1994; Rhoades et al., 2011), and in two cases both the skills (Razza et al., 2012; Sawyer et al., 2019).

To characterize temperament, different tools were used, in eleven cases the CBQ questionnaire (Rudasill and Konold, 2008; Rudasill and Rimm-Kaufman, 2009; Iyer et al., 2010; Valiente et al., 2010; Zhou et al., 2010; Silva, 2011; Valiente et al., 2011; Morris et al., 2013; Gaias et al., 2016; Miller and Goldsmith, 2017; Bryce et al., 2018), which will also be used in our case. In order to assess the level of cognitive and social skills, certified tools were mainly used, in one case (Johnson et al., 2019) a tool that the researchers developed themselves, and in two cases, observation was used (Rimm-Kaufman et al., 2009; Rudasill and Rimm-Kaufman, 2009).

The definition of temperament is then adapted for the purpose of the studies. In eight cases, the authors put an emphasis on individual differences in their definitions (Bramlett et al., 2000;

TABLE 1 | Qualitative indicators.

METHODS	TARGET GROUP	CONCLUSION
1. What was observed	1. Number	1. Confirmation of the relationship
2. Method of data collection	2. Gender	2. Risk
3. Complementary method	3. Age period	3. Protection
4. Design	4. Who responded	4. Notes
5. Definition of temperament	5. Ethnicity	
	6. Specifics	

TABLE 2 | Qualitative indicator – target group.

Art.	Number	Gender %		Age period	Who responded	Ethnicity	Specifics
		♂	♀				
1	104	Not stated		1st year of primary school	Parents and teachers	98% Caucasian, 2% minority	Not stated
2	77	54.5	45.5	5-11 years	Parents and teachers	74% Afro-Americans, 16.9% Caucasian, 6.5% Hispanics, and 2.6% other ethnicity	Specific requirements in education resulting from increased risks of adverse circumstances (economic disadvantage, developmental delay, combination of both)
3	324	52	48	4-7 years	Parents and trained professionals	74% Afro-Americans, 16.9% Caucasian, 6.5% Hispanics and 2.6% other ethnicity	87% of children included in the free lunch program
4	241	52	45	Ø 5.44	Parents	78% of Mexican/Mexican-American ethnic origin, 8% were non-Latino Caucasian, 7% identified as other, 6% of the children were African-American, and 1% were Native American	Children in the Head Start program
5	74	33.8	66.2	36-68 months	Parents	55.4% of the children Caucasian, 17.6% Afro-Americans, 20.3% mixed ethnicity, and 6.8% unclassified	Children in the Head Start program
6	10,700	Not stated		Preschool age	Teachers	39.29% Caucasian, 21.16% Afro-Americans, 33.66% Hispanics, 5.9% Asians	Children in these types of programs: "Head Start" and "pre-K" (pre-kindergarten).
7	152	40	60	Ø 72 months	Teachers	Not stated	Average economic situation
8	2595	52	48	5 years	Trained professionals	21.9% Caucasian, 52.1% Afro-Americans, 23.1% Hispanics, 2.9% other	76% of the children were born to single mothers
9	3410	51	49	0-7 years	Teachers	Australian – representative sample	Representative sample
10	341	47	53	Ø 4.5	Parents and teachers	69% Afro-Americans, 18% Multi-racial, 12% Hispanics, 1% Caucasian	Children in the Head Start program
11	1364	705	659	4.5	parents, teachers	1097 white	Representative sample
12	74	41	33	5–6 years	teachers	60.8% white, 9.5% black, 14.9% Latino, 6.8% Asian, 4.1% multiracial, 6.2% other	kindergarten children from primarily low-income families
13	214	118	96	T1 55-97m	parents, children, teachers	77%; 80%; 78% Caucasian, 12%; 12%; 11% Hispanic, 5% others	6-year longitudinal study, 2-year period for T1., T2, and T3 milestones; Family SES, and especially income as a robust predictor of achievement.

(Continued)

TABLE 2 | Continued

Art.	Number	Gender %		Age period	Who responded	Ethnicity	Specifics
		♂	♀				
	193	105	88	T2 2 years after			
	159	88	71	T3 4 years after			
14	390	212	178	6-10 years	teachers, children, peers,	38.2% Latino, 46.7% white, 15.1% other races,	Low- and middle-income families
15	264	122	142	7-12 years	parents, children, teachers	52% Mex-Am., 34% Eur-Am., 8% Afr-Am., 6% Native Am.,	Representative sample
16	819	406	413	54 months and 1st grade of school	parents, teachers	84% Caucasian, 10% Black or Afr-Am, 6% others.	Representative sample
17	172	92	80	4.70-6.24 years	teachers,	83.7% Caucasian, 13.4% Afr – Am., 2,9% others	Rural children
18	829	not stated	not stated	3-5 years	parents, teachers,	Percentage not stated: Afr- Am., Euro-Am., Hispanic and others.	Time span of 2 years; I. 2006 II. 2007. Private preschools as well as public Head Start centers participated. Free lunches for 60%.
19	926	50%	50%	3-5 years	researchers, teachers,	58% Afr-Am., 31% Caucasian, 10% Hispanic, 1% another racial group,	Head Start 50% children, 50% community childcare,
20	425	44,5%	55,5%	6.6-9.1 years	parents, teachers, children,	Chinese children	Families with low SES
	382	47,1%	52.9%	10.1-12.9 years			
21	114	57%	43%	18 months, 42 -54 months	parents, teachers,	82.4% non-Hispanic, 83.1% Caucasian	Representative sample
22	291	58%	42%	avg. 67.72 months	parents, teachers,	70% White, 14% Latino, 8% Asian, 3% Black, <1% Am- Ind.	Students attended regular education classrooms in public schools in the southwestern United States.
23	174	49%	51%	M = 6.48	teachers; children	Caucasian 60% Hispanic/Latino 29% Asian 5% African American 2% Other/mixed ethnicity 4%	Urban children
24	31	18	13	4 months longitudinally until 4 years	parents,	Caucasian 92.3%	All participants were healthy, typically developing children, no specifics regarding economic status, single parenting, specific educational support.
25	284	137	174	60 months	teachers, parents	Turkish (not stated exactly)	Representative sample
26	523	52.9%	47.1%	52.42 months	teachers, parents	Hong Kong children	Representative sample
27	29 teachers	Not stated		4 years	Teachers	Not stated	Teachers “generate” the profile of the most successful child who enters school prepared the best

Rudasill and Konold, 2008; Rudasill and Rimm-Kaufman, 2009; Valiente et al., 2010; Gartstein et al., 2016; Collings et al., 2017; Bryce et al., 2018; Johnson et al., 2019), in eleven cases they emphasized self-control (Rimm-Kaufman et al., 2009; Valiente et al., 2010, 2011; Willoughby et al., 2011; Gaias et al., 2016; Gartstein et al., 2016; Collings et al., 2017; Miller and Goldsmith, 2017; Bryce et al., 2018; Johnson et al., 2019; Sawyer et al., 2019), and in five cases they stressed the biological basis (Bramlett et al., 2000; Rudasill and Konold, 2008; Rudasill and Rimm-Kaufman, 2009; Al-Hendawi and Reed, 2012; Sawyer et al., 2019). Morris et al. (2013), Beceren and Özdemir (2019), Johnson et al. (2019), and Fung et al. (2020) stress the influence of temperament on emotions in their definition and the influence on children's social skills is emphasized in nine studies (Schoen and Nagle, 1994; Valiente et al., 2008; Stacks and Oshio, 2009; Iyer et al., 2010; Zhou et al., 2010; Rhoades et al., 2011; Silva, 2011; Razza et al., 2012; VanSchyndel et al., 2017).

Qualitative Indicator – Target Group

The numbers of respondents were representative in relation to the research that was analyzed. In longitudinal studies, there were research studies with large numbers of respondents (more than 1000) (Razza et al., 2012; Johnson et al., 2019; Sawyer et al., 2019), but also one research study involving 31 respondents (Gartstein et al., 2016). For most other research studies, the number of respondents ranged between 100 and 1000 (Schoen and Nagle, 1994; Bramlett et al., 2000; Valiente et al., 2008, 2010, 2011; Rimm-Kaufman et al., 2009; Rudasill and Rimm-Kaufman, 2009; Iyer et al., 2010; Zhou et al., 2010; Rhoades et al., 2011; Silva, 2011; Willoughby et al., 2011; Gaias et al., 2016; Collings et al., 2017; VanSchyndel et al., 2017; Bryce et al., 2018; Beceren and Özdemir, 2019; Fung et al., 2020). The exceptions consisted of some studies (Stacks and Oshio, 2009; Al-Hendawi and Reed, 2012; Morris et al., 2013) in which there were fewer than 100 respondents and one case with 1364 respondents (Rudasill and Konold, 2008). In one study (Miller and Goldsmith, 2017) the respondents were teachers whose task was to create basic categories which they could use to assess a child's school readiness.

In four cases (Bramlett et al., 2000; Silva, 2011; Miller and Goldsmith, 2017; Johnson et al., 2019) the authors of the study do not state the results regarding gender. In the studies by Schoen and Nagle (1994), Stacks and Oshio (2009), Valiente et al. (2010), and VanSchyndel et al. (2017) the gender ratio between boys and girls was 40% to 60% and in the remaining studies the ratio was around 50% in all cases.

The age span of the respondents was between 0 and 12 years of age. The age of the respondents was associated with the research aim (see **Table 2** and the glossary accompanying the table). The information about the respondents was in all cases (except in one case, Gartstein et al., 2016), obtained from the responses of teachers or trained researchers and in 14 cases (Bramlett et al., 2000; Rudasill and Konold, 2008; Valiente et al., 2008, 2010, 2011; Rudasill and Rimm-Kaufman, 2009; Zhou et al., 2010; Rhoades et al., 2011; Silva, 2011; Al-Hendawi and Reed, 2012; Collings et al., 2017; VanSchyndel et al., 2017; Beceren and Özdemir, 2019; Fung et al., 2020) also from parents. In three cases, information was also obtained from children (Iyer et al., 2010; Zhou et al., 2010; Valiente et al., 2011).

Schoen and Nagle (1994), Miller and Goldsmith (2017), and Beceren and Özdemir (2019) do not state ethnicity in their studies. Sawyer et al. (2019) state that the research was carried out on a representative sample of the Australian population, similarly to Bramlett et al. (2000), who state that 98% of their sample was Caucasian. In the case of these two studies, the aim was not to compare the influence of temperament on school success with regard to ethnicity, but primarily a description of the given relationship in a representative sample of the given population. Silva (2011) cites ethnicity, but not the percentual distribution. Rudasill and Konold (2008), Zhou et al. (2010), and Fung et al. (2020) presented mono-ethnic samples; in the first case they were Caucasians, the second study involved children from Hong Kong, and in the third article the respondents were from China. In the other studies the percentages of the ethnic groups are presented.

Schoen and Nagle (1994), Bramlett et al. (2000), Rudasill and Konold (2008), Rudasill and Rimm-Kaufman (2009), Valiente et al. (2010), Gartstein et al. (2016), Beceren and Özdemir (2019), Sawyer et al. (2019), and Fung et al. (2020) do not state any specifics in relation to their respondents or state that it was a representative sample. Miller and Goldsmith (2017) aimed their research at creating a profile of the most successful child who enters school prepared to the maximum extent. Rimm-Kaufman et al. (2009) reported that their respondents were exclusively children from villages, while in contrast Gaias et al. (2016) chose children from cities. In other cases, the authors studied children who came from a socially or economically endangered environment. They were specifically children who were born to single mothers (Razza et al., 2012), children who were included in the "Head Start" program (Stacks and Oshio, 2009; Rhoades et al., 2011; Silva, 2011; Willoughby et al., 2011; Bryce et al., 2018; Johnson et al., 2019), and children who were included in the free lunch program (Silva, 2011; Collings et al., 2017). Iyer et al. (2010), Zhou et al. (2010), Valiente et al. (2011), Al-Hendawi and Reed (2012), and Morris et al. (2013) were interested in children who displayed specific requirements for education as a result of increased risk of adverse circumstances (economic disadvantage, developmental delay, or a combination of both).

Qualitative Indicator – Conclusion

In the case of the study by Bryce et al. (2018), it was not possible to confirm a hypothetical chain process: child's positive emotionality → emotional engagement in kindergarten → behavioral expressions in kindergarten → educational results in kindergarten. In other cases, the link between temperament and school readiness or subsequent school success was confirmed.

In some cases (Rudasill and Konold, 2008; Valiente et al., 2008, 2010, 2011; Rudasill and Rimm-Kaufman, 2009; Iyer et al., 2010; Zhou et al., 2010; Rhoades et al., 2011; Silva, 2011; Al-Hendawi and Reed, 2012; Morris et al., 2013; Gaias et al., 2016; Gartstein et al., 2016; Collings et al., 2017; Miller and Goldsmith, 2017; VanSchyndel et al., 2017; Bryce et al., 2018; Beceren and Özdemir, 2019; Johnson et al., 2019; Fung et al., 2020) the authors were further interested in whether temperament can be seen as a risk or protective factor. In most cases, it was found that

higher Effortful Control has a positive relationship to greater school readiness – the success rate and lower Effortful Control can predict behavioral problems and thus problems at school (Valiente et al., 2008, 2010, 2011; Iyer et al., 2010; Zhou et al., 2010; Morris et al., 2013; Gartstein et al., 2016; VanSchyndel et al., 2017). Rudasill and Rimm-Kaufman (2009), Silva (2011), and Gaias et al. (2016) add that the value of Effortful Control can influence the teacher's relationship with the child and thus the child's school readiness and also later school success. Al-Hendawi and Reed (2012) found that negative emotionality has a significant effect on adaptivity and schoolwork and can become a predictor of inappropriate behavior. In contrast, Johnson et al. (2019) did not confirm that problems in the area of a child's temperament can be perceived as a significant predictor of prosocial behavior. There is a statistically significant relationship between temperament and school readiness. Both positive and negative emotionality influence behavior (especially concentration), which is reflected in the approach to learning and school success.

Collings et al. (2017) suggest that there was a positive effect of a previous intervention on temperament, confirmed in the individual items of school performance. Their results for the boys who participated in the intervention program were better in the areas of literacy and mathematics than was the case in boys who did not participate. Bryce et al. (2018) state that positive emotionality significantly influenced behavior in children in kindergarten. Rudasill and Konold (2008), Rhoades et al. (2011), Beceren and Özdemir (2019), and Fung et al. (2020) characterized the child's maturity in the context of how he/she is able to control his/her temperament so that it can function as a supportive factor in education. Similar conclusions were also reached by Miller and Goldsmith (2017). In their view, children who were able to regulate their emotions were able to react better in socially appropriate ways and focus their attention, which facilitates learning and provides higher chances of success in school education.

In addition, difficult temperament at an early age can lead to low parental involvement at age three. The role of difficult temperament, poor maternal involvement, and externalizing behavior may be partially responsible for the continuity that has been observed in antisocial behavior over time (Walters, 2014).

The last thing that the authors state is the more detailed characteristics of the relationship identified between temperament and school readiness or school success. Bramlett et al. (2000) admit that there might be differences between what can be termed the home and school temperaments, which can explain the differences between the parents' and children's answers. Beceren and Özdemir (2019) stress the importance to social-emotional adjustment of family involvement. Schoen and Nagle (1994), Al-Hendawi and Reed (2012), Collings et al. (2017), and Miller and Goldsmith (2017) state that here there are differences between the temperaments of boys and girls; the last two argue that boys show higher activity. Razza et al. (2012), Collings et al. (2017), and also Gartstein et al. (2016) suggest that there is a positive effect of intervention programs on school readiness. These are programs that focus on exerting control over one's temperament during preschool age. Similarly, Sawyer et al. (2019) state that if there is an increase in the ability to exert self-control at the ages of 2-3 and 6-7, this can have a positive influence on school readiness. The ability to self-regulate is considered an essential factor in school readiness by Rudasill and Konold (2008), Valiente et al. (2010), Willoughby et al. (2011), and VanSchyndel et al. (2017), and Valiente et al. (2008), Zhou et al. (2010), Valiente et al. (2011), Morris et al. (2013), and Fung et al. (2020) attribute great importance to effortful control for school readiness. Another important factor that can affect a child's school readiness is his/her relationships with peers (Iyer et al., 2010) and teachers (Rudasill and Rimm-Kaufman, 2009; Silva, 2011; Gaias et al., 2016). Rimm-Kaufman et al. (2009) state that the quality of the preschool classroom affects the child's behavior, and this can then affect school readiness. Miller and Goldsmith (2017) argue that the model of "an ideal child" was created separately for boys and girls who will be successful at school.

Summary

The analysis of literary sources showed that in the period under consideration, there are expert studies dealing with the relationship between temperament and school readiness. In total 27 articles were included in the narrowest selection, in which the authors sought and examined this relationship or perceived it as the default setting for further examination.

From selected studies it is clear that when working with the phenomenon of temperament, as a factor that can influence other phenomena from the point of view of psychology, there is a big problem with the definition of temperament. In the introduction to the rewiev study, the individual definitions and views of their authors on temperament are given. The following are terms that are used by other authors instead of temperament. **Table 3** lists the concepts of temperament as presented by the authors of selected 27 studies. In the analyzed studies, the authors used either the term temperament or the concept of regulation of emotions directly. Temperament or regulation of emotions were then characterized from different points of view using terms: self-control, individual differences, biological basis and social skills. These concepts of temperament in selected articles confirm the high degree of difference of approaches to the concept of temperament.

Out of 27 relevant studies, 26 confirmed a statistically significant relationship between temperament and school readiness; see **Table 4**. In one case (Bryce et al., 2018), the authors did not confirm the relationship between temperament and school readiness, but at the same time they stated that the results support the hypothesis about the indirect influence of positive emotional adjustment in the child on his/her behavior and afterwards on his/her school results. The results of the selected studies indicate that there are differences between boys and girls in the area of temperament, which is then reflected in the level of school readiness; see **Table 2**. We should therefore consider this fact in the child-raising/educational process. Another thing that needs to be taken into account in the educational process is the relationship between children's temperament and the temperament of teachers. This relationship can have an impact

TABLE 3 | Qualitative indicator – methods.

Art.	What was observed[a]			Design[b]	Definition of temperament
	A	B	C		
1	+	–	+	1	Individual differences in the tendency of behavior with the onset in childhood and relative stability over the further course of life (Orth and Martin, 1994).
2	+	–	+	1	The authors define temperament on the basis of several current theories from which they abstract three common constructions for temperament: 1) biological fundamentals; 2) possible identification already at an early age; 3) apparent more as a tendency in behavior.
3	+	+	–	1	Temperament is described by the authors according to studies by Eisenberg et al. (2000), Rothbart et al. (2000), Derryberry and Reed (2002), Cole et al. (2004), and Zentner and Shiner (2012) as a source of specific features of the ability to possess self-control in a child.
4	+	+	–	1	The authors define temperament as inborn individual differences in reactivity and the ability to display self-control (Rothbart et al., 2004, p. 357).
5	+	–	+	1	The authors approach temperament as part of the complex of a child's behavioral expressions with an effect on his/her social skills, which are also influenced by the level of attachment (Belsky and Fearon, 2002; Spieker et al., 2003).
6	+	+	+	1	Temperament is perceived as a multidimensional construct, which is individually different in terms of the ability to exert self-control especially in the areas of reactivity, emotions, and attention (Rothbart and Bates, 1998).
7	+	+	–	1	The authors of the study use the characteristics of temperament as a predictor of the manner or style of the social and physical interaction of the child with the environment.
8	+	+	–	1	The authors work with the assumption that temperament in childhood is one of the factors influencing the intentional attention of the child.
9	+	+	–	1	The authors of the study work with the knowledge that temperament, attention, and the ability to manage emotional expressions are identified as characteristics that have a biological basis and are relatively stable over the course of childhood (Thomas et al., 1963).
10	+	+	–	1	Understanding emotions is regarded as a crucial aspect of social awareness, which is one of the complexes of socio-emotional skills in a receptive and expressive form. One of the essential components is temperament, which, together with cognitive and other functions, influences the quality of the child's school readiness and later his/her results in education.
11	+	-	–	1	Temperament is an individual's biologically based, multidimensional (e.g., emotionality, activity level, shyness, effortful control) style of responding to the environment (Thomas and Chess, 1977).
12	+	+	+	1	Effortful control is defined as a child's ability to utilize attentional resources and to inhibit behavioral responses in order to regulate emotions and related behaviors (Rothbart and Ahadi, 1994).
13	+	+	+	1; 3	Effort control is a group of temperamentally based skills viewed as the basis of self-regulation (Rothbart and Bates, 2006). EC is the efficiency of executive attention.
14	+	–	–	1	Effortful control skills represent such competencies as could account for both children's risk of peer victimization and poor school-related outcomes.
15	+	–	–	1	Effortful control was used as an index of children's regulatory abilities: "the efficiency of executive attention—including the ability to inhibit a dominant response and/or to activate a subdominant response, to plan, and to detect errors"
16	+	–	+	3	Temperament is an individual's general style of responding to stimuli in the environment. It is a biologically based, multi-dimensional construct that begins to emerge during infancy and childhood, is molded by environmental forces, and provides the foundation for personality traits in older children, young people, and adults (Thomas and Chess, 1977; Kagan and Fox, 2006; Rothbart and Bates, 2006).
17	+	+	+	3	An important dimension of temperament is effortful control, the broad construct of self-regulation that incorporates a set of related skills involving emotion, attention, behavior, and cognition.
18	+	–	+	1	Effortful control, the regulatory aspect of temperament, has been defined as "the efficiency of executive attention, including the ability to inhibit a dominant response and/or to activate a subdominant response, to plan, and to detect errors" (Rothbart and Bates, 2006, p. 129).
19	+	+	+	1	Self-regulation as one of the major achievements of early childhood refers to the process through which children increasingly acquire the ability to regulate their own arousal, emotion, and behavior (Kopp, 1982; Shonkoff and Phillips, 2000).
20	+	+	+	1	Effortful control and anger/frustration are temperament characteristics which are associated with a wide range of adjustment outcomes in children and adolescents, including behavioral problems, social competence, and moral and conscience development (Eisenberg and Morris, 2002; Rothbart and Bates, 2006). As a multidimensional construct including various capacities such as the voluntary focusing of attention (e.g., concentrate when studying) and suppressing inappropriate responses (Derryberry and Rothbart, 1997; Rothbart and Bates, 2006).
21	+	+	+	1	Childhood temperament is hypothesized to drive social and personality development throughout the lifespan (Rothbart and Ahadi, 1994).
22	+	+	+	1	Temperament is "constitutionally based individual differences in reactivity and self-regulation, in the domains of affect, activity, and attention" (Rothbart and Bates, 2006).

(Continued)

TABLE 3 | Continued

Art.	What was observed[a]			Design[b]	Definition of temperament
	A	B	C		
23	+	+	+	1	Effortful control is a predictor of adaptive functioning across developmental domains in early schooling, defined as "the ability to inhibit a dominant response to perform a subdominant response and/or to activate a subdominant response, to plan, and to detect errors", a set of temperamentally based skills that form the basis of self-regulation.
24	+	+	+	1	Temperament is constitutionally based individual differences in reactivity and self-regulation in the domains of affect, activity, and attention (Rothbart and Bates, 2006). Structurally, temperament in childhood has been defined in terms of three major domains: Negative Emotionality, Positive Affectivity/Surgency, and Extraversion (Putnam et al., 2001; Gartstein and Rothbart, 2003).
25	+	–	+	1	Temperament is emotionally motivating and shaped by human experience and adaptive variations (Derryberry and Rothbart, 1997). Temperament as the psychological source of genetics in a person, a psychic aspect of DNA (Beceren and Özdemir, 2019).
26	+	–	–	1	Children's emotional regulation depends on their temperamental regulation or effortful control (Rothbart and Bates, 2006; Eisenberg et al., 2000).
27	+	+	–	3	The authors work with the definition of temperament as individual differences in behavioral reactivity and the ability to manage, which are directly linked to socio-emotional and communicative skills (Goldsmith and Harman, 1994).

[a] *What was observed: A = temperament, B = cognitive ability, C = social skills.*
[b] *Design: quantitative = 1, qualitative = 2, mixed = 3.*

on school readiness and success at school. Apart from the confirmation of the relationship between temperament and school readiness, the authors of the studies also dealt with the description of this relationship. The authors agree that the inability to manage one's emotions has a significant influence on one's behavior, such as the ability to concentrate or intentional attention, and afterwards one's readiness for school. If an individual is able to manage his/her emotions, he/she is able to react in a socially appropriate manner and is able to focus, and this can facilitate his/her learning, which is a prerequisite for school success.

In 14 out of the 27 cases, there were respondents from a socio-economically disadvantaged environment; see **Table 2**. The authors do not confirm the direct influence of a socio-economic disadvantage on school readiness or success but characterize the temperament of these children in relation to searching for appropriate upbringing and educational procedures. They also show the success of these procedures, which does not comply, however, with the theories of temperament, which are based on the fact that temperament is inborn and relatively stable (e.g., Orth and Martin, 1994).

In searching for specialized texts focused on the relationship of temperament and school readiness, we repeatedly encountered the concept of the relationship of temperament to cognitive functions. Specifically, temperament is part of effortful control directly related to executive attention (Rothbart et al., 2007). Frick et al. (2018) described the relationship between temperament and cognitive function in their research. Their work focuses on cognitive self-regulation as a set of constructive behaviors that influence cognitive abilities to integrate learning processes. These processes are planned and customized to support the tracking of personal goals in a changing environment. This function already develops when the child is at an early age. When the child is of school age, temperament is associated with cognitive abilities. With regard to the part of the study by Chong et al. (2019) in which they focused on preschool age, the authors report that temperament was less related to cognitive and academic outcomes after parenting and family confusion had been taken into account.

Temperament is considered a predictor of functional attention influenced by individual differences in reactivity and self-regulation in emotion and activity (Rothbart et al., 2006; similarly, Guarnera et al., 2019). Outside the topic of research, but as a critical problem area, there appears the relationship of temperament (especially its projection into the attention) and learning difficulties and the connection with the possibility of special intervention (Commodari, 2012). Gan et al. (2016) draw attention to the possible influence of the environment (rural – city) on temperament and subsequently on children's school readiness. The quality of the teacher-child relationship or direct teacher intervention can have a positive influence on the relation between emotional regulation and cognitive skills (Commodari, 2013; Guarnera et al., 2017). The relationship of individual components of temperament and cognitive function in school-age children – especially reading, writing, and mathematics – is evidenced in their study (Guarnera et al., 2017).

DISCUSSION AND POSSIBLE APPLICATION IN PRACTICE

By analyzing the selected articles, the basis for creating answers to the key questions was obtained.

1. There is a significant relation between temperament and its major dimensions and school readiness.
2. Temperament and its dimensions can affect school success in both directions, positively and negatively.

Children whose Effortful Control is the dominant feature can be assumed to possess the ability to exert control and self-regulate in the field of behavior (Olson et al., 2005).

If the level of Surgency/Extraversion is higher in the context of the child's behavior, it can be considered a risk factor that affects hyperactivity. To a lesser extent, it can be an inhibitor of the

TABLE 4 | Qualitative indicator – conclusions.

Art.	Notes
1	Possible differences between home and school temperament.
2	Boys showed a higher level of activity, impulsiveness, and emotional intensity, and a lower level of shyness. Girls showed a higher level of attempts at self-control and a higher level of social skills and adaptivity. Girls showed cooperative behavior, more partner sympathy, and a more positive attitude to school. The authors speak about possible greater tolerance for some "negative" behavior in boys than in girls.
3	The influence of gender, temperament, and the children's subsequent participation in specific programs while of preschool age on school work.
4	The results tend to support the thesis about the indirect influence of a child's positive emotional tune and behavioral expressions influenced by that and afterwards his/her results at work.
5	These results are also in compliance with the results of other studies by Martin et al. (1988) and also Howse et al. (2003).
6	Not stated.
7	All the TABC scales of assessed temperament were significantly associated with a pre-reading score. Furthermore, the study showed that the boys in the group were more active but lost concentration more easily, and in their behavior and in their reactions in the class they were more emotional.
8	The authors do not demonstrate the influence of the socio-economic background of the family, maternal warmth, or difficult expressions of temperament on school success in the sample of children. The authors emphasize the need for intervention during preschool age in children who show difficulties in controlling their temperament to foster real prevention of difficulties at the beginning of education.
9	The results show that children whose task attentiveness increases between the ages of 2 and 3 and 6 and 7 show better results in literacy and in mathematical imagination than children whose results in task attentiveness are worse in the given period. Similarly, it concerns the area of self-control of emotions. Children whose ability in emotional regulation at the ages of 2-3 and 6-7 increases show better results in literacy during school attendance.
10	The results of this study also suggest that regardless of demographic criteria, the functioning of intentional attention is one of the essential elements in the school success of a child. The results of the study support the statement of the mutual influence of emotional relationship, intentional attention, and results in education.
11	Inhibitory control and attentional focusing (i.e., effortful control) contributed to teachers' ratings of children's social competence. Children with high levels of inhibitory control and attentional focusing were rated higher on cooperation and self-control. Effortful control is denied as the ability to inhibit an inappropriate response and activate an appropriate one. Students who are highly cooperative and show high levels of self-control are doing just that.
12	Effortful control strongly correlates with school readiness and achievement among kindergarteners. The effects of effortful control were not affected (moderated) by demographic variables. No matter of children's sex and household income children with high effortful control demonstrated better school readiness, math and reading skills.
13	Effortful control was positively related to social functioning, and social functioning was positively related to achievement, even when SES, age, and sex were used as covariates (i.e., as predictors of academic achievement).
14	The emotional experience of being bullied undermines children's ability to engage effectively in classroom activities by interfering with their effortful control functioning. Peer victimization correlated negatively with effortful control at each time point, and effortful control was predictive of school engagement and academic achievement.
15	There is evidence that academic competence is associated with effortful control and children's relationships, but it is not clear if effortful control provides unique prediction of academic competence or if relationships partially mediate the effortful control and academic competence associations.
16	The relationship between child- and teacher-initiated interactions in the context of effortful control and lower levels of effortful control predicted more frequent teacher-initiated interactions. Teachers interacted more frequently with children low in effortful control to provide reminders concerning behavior and attention, and these interactions may be viewed negatively by children as restrictive in their nature.
17	Classroom quality did not moderate the relation between children's attributes and engagement in school. The classroom quality is important in relation to children's adaptive classroom behaviors but protective in other unmeasured areas, such as self-directedness or planfulness, which involve more sophisticated forms of self-regulation, such as metacognition and the development of motivational styles.
18	With increased concerns about children's school readiness there has been a focus on improving academic skills and the quality of teachers' instructional styles. Teachers should be aware that early conflictual relationships may have long-term consequences for how children feel about school and that conflict with some children may be more likely and have an impact to their school success.
29	Self-regulatory tasks were strongly correlated with child academic outcomes.
20	Children displaying temperament precursors (e.g., low effortful control) to academic problems may be identified as early as beginning school age. These children can benefit from interventions that target the cognitive, interpersonal, and motivational processes associated with low effortful control and school failure.
21	Children who are well-regulated and impulsive may have an advantage in terms of academic achievement. Matching between impulsivity and approach emotions may also be advantageous for achievement in early childhood.
22	Students who are able to regulate their emotions in the classroom have a distinct advantage over their less-regulated peers. Effortful control is likely to influence academics as children progress through school.
23	Learning about and reflecting on students' and teachers' own temperamental characteristics—can help these functions in concert; teachers may become more aware of how attributes such as effortful control shape their classroom practices and interactions with students.
24	The relation of infant temperament in the context of the emergence of basic knowledge/pre-academic skills holds promise for applications relying on temperament to screen children at risk of difficulties at school entry, and possibly to identify those most likely to benefit from interventions.
25	Social emotional adjustment by temperament and empathy; the subdimensions of temperament significantly predicted the social emotional adjustment subdimensions of family involvement, social confidence, readiness for school, and emotional adjustment.
26	There is a utility to supporting kindergarten children's readiness for school to foster their future emotional regulation and because of that to reduce potential problems.
27	In total, five clusters were created according to their connection to the characteristics of school readiness in the group of children who were observed. The evaluation showed no differences between the boys and girls. A model of "an ideal child" for boys and girls was created; they show a high level of positive approach, excitement about work, endurance, curiosity, the necessary social skills, and a tendency to cooperate. The hypothetical child showed a minimal level of negativism and disturbing reactions.

"research approach" but irrespective of the school's instructions and rules. The presence of the above options can be a source of problems in children's behavior and thus have a negative effect on school readiness outcomes (Fox et al., 2001). However, manifestations of children's behavior, as an important element of school readiness, are always the result of the relationship between temperament and its interaction with the environment. For more on this see Rothbart and Putnam (2002).

School attendance and the child's subsequent success in education can be influenced by more factors. The major factors that experts (Janus, 2007; Merrell and Tymms, 2007; Vágnerová, 2012) list include cognitive functions, motivation, experience, and the child's temperament. Temperament can influence a child's functioning during school performance and therefore to some extent either enhance or limit the child's performance. In mathematics, reading, or other school activities which require the child to calm down, concentrate on the task, and resist stimuli from the surroundings, temperament can be a very important factor (Collings et al., 2017; Ato et al., 2020). Therefore, it can have a negative influence on the performance of a child who is functioning cognitively quite well, but is unable to concentrate, calm down, and detach him- or herself from disturbing stimuli from outside. On the other hand, it can enhance a child's performance, which might be weaker from the school evaluation perspective. They can, to an adequate extent, reduce their physical activity, calm down, concentrate, and carry out a task to its end.

Al-Hendawi and Reed (2012) argue that the negative emotionality associated with a low level of ability to control expressions of temperament can be a source of problems in social situations in class. In their study, these authors point out the possibility of the overstimulation of children with stimuli from the outside, with a negative effect on their engagement in schoolwork and the quality of their results. Dependency in the teacher-child relationship has a strong correlation with school adjustment difficulties, including poorer academic performance, more negative attitudes to school, and less positive engagement with the school environment (Birch and Ladd, 1997).

In terms of temperament and its introduction into the school environment, there is one potentially conflicting area (Keogh and Prokopcová, 2007). These are situations where the child's temperament and the temperament of the teacher do not meet in a mutually satisfactory constellation, but are mismatched with each other, creating clashes and having a negative effect on their mutual functioning.

The quality of first-grade classroom environments is based on three domains: emotional support, classroom organization, and instructional support. A high-quality classroom environment may ameliorate the academic and social risks associated with having a difficult temperament (Curby et al., 2011).

Some teachers are active and react quickly, while some are slower and react upon consideration. These differences are reflected in the activities which take place in the classroom, especially in the pace of teaching and in the form of personal interactions and emotional charge. If there is a child in the group with a significantly different temperament to that of the teacher, this difference may be a source of misunderstandings and consequently of failure and demotivation in the child. The child will experience more stressful situations when entering school. Apart from the encounter with the teacher's temperament, there is also the encounter with the temperaments of the child's classmates. If it is important to deal with temperament and success at school, it is not on the basis of a construct, but on the actual situation in each classroom and the need to work effectively with these factors. In conclusion, it should be noted regarding the school or class environment that they appear explicitly in only two articles as one of the parameters linked to the temperament of children. In the first case, Al-Hendawi and Reed (2012) are inclined to the concept of the school environment in terms of the creation and functioning of social relations. They work with relationships between children and children and the teacher. In the second article, Bramlett et al. (2000) used the term 'school environment' for the social environment and focused on the area of problematic behavior, which is related to the reduced ability of the child to control his or her temperament.

The preschool period of the child is a very important period in which the basics of socio-emotional competence are laid. Their influence on future success in education and in the development of socialization is indisputable. Teachers can use specific programs – such as Head Start or their own active approach – to help children successfully develop self-regulatory behavioral control skills and thus help prepare them for school success (McBryde et al., 2004; McClelland and Wanless, 2012; Brophy-Herb et al., 2018; Booth et al., 2019). In conclusion, the authors cited above agree on temperament as an innate individual reactivity to stimuli that can affect the school success rate of children.

The analysis of the articles also showed that even if the temperament is innate, it can be affected by appropriate interventions, so that it can be used in a positive direction in school success. Methodologically, this study will be used to process a similar study that will focus on the areas of children with visual handicaps.

WEAKNESSES

The focus on texts written in English can thus be a weakness. It is possible that this topic might be covered in other languages, but the results of such studies are not presented here. The authors are aware of possible terminological differences that can occur in the texts, as was the case, for example, with the term 'temperament', for which some authors used the term 'mood'.

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PP and MP contributed to the design and implementation of the review, to the analysis of the results, and to the writing of the manuscript. All authors contributed to the article and approved the submitted version.

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Teaching Socio-Emotional Competencies Among Primary School Students: Improving Conflict Resolution and Promoting Democratic Co-existence in Schools

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Teaching socio-emotional skills among primary school students is the key to creating a climate of cooperation in classrooms and reducing disruptive or aggressive behaviors among students. The primary goal of this research is to present an educational proposal for imparting socio-emotional competencies among primary school students. We attempt to impart socio-emotional competencies based on: (1) fostering self-knowledge, self-esteem, and respect for others among students; (2) developing behaviors that allow them to perceive and express feelings and self-regulating emotions; and (3) developing assertive communication skills aimed at improving conflict resolution. This program has been designed in such a way that it is implemented throughout the academic year by organizing bi-monthly sessions of 45 min each, held until the completion of 15 sessions. The sample consists of 100 students in the third grade, with the control and experimental groups having an equal number of students (50 each). The instruments used for this research are: (a) BarOn Emotional Quotient Inventory (Youth Version [BarOn EQ-i:YV]): used for measuring emotional and social functioning; (b) the Matson Evaluation of Social Skills with Youngsters (MESSY): used for assessing social skills; and (c) Questionnaire for the Assessment of School Violence in Preschool and Primary School Questionnaire. To check the effectiveness of the educational intervention, a quasi-experimental design, along with pretest-posttest control group design, is used in accordance with the general linear model. Its effectiveness is also checked using repeated measures analysis of variance. The results show that the program is useful in preventing violent behaviors in the educational field and promoting the development of socio-emotional skills among third grade students. Finally, the applicability of the program to other educational contexts is discussed to enhance students' personal development and decrease the levels of violence found in primary school.

Keywords: primary education, socio-emotional skills, school violence, disruptive behaviors, conflict resolution

INTRODUCTION

Theoretical Framework

One of the main objectives of primary education is to train people with knowledge, skills, attitudes, and key competencies for life and personal development. In line with this and notably at the curricular level in this stage, the objective is that students are able to fully mature and achieve happiness, well-being, and maximum academic development. For these reasons, it is important that curriculum designs at this stage provide high school students with the resources and opportunities necessary for their maturation and that give meaning to their academic and personal progression.

It is important to note that the feeling of being appreciated, heard, being part of a community (in this case, educational), and perceiving that personal needs are being addressed ensures that students are better socialized and can manage stress and frustration effectively. It also ensures high levels of well-being and this has a clear impact on the entire school community.

Along these lines, it should be noted that the feeling of satisfaction in the academic environment, both for students and teachers, increases positively when the educational center adopts a learning community dynamic, achieves a positive social climate, records no case of bullying, and members establish bonds of friendship, respect, and positive relationships.

The scientific literature has shown that a child learns to function socially in a school. The peer group, which is one of the main sources of emotional support in childhood, also plays a fundamental role in the development of a student's social competence (Salmivalli et al., 1996; Fekkes et al., 2005; Sharp et al., 2006; Oliver and Candappa, 2007; Riva et al., 2007; Nickerson et al., 2008; Olweus and Limber, 2010; Adolphs, 2013; Oldenburg et al., 2016; Ortega-Ruiz et al., 2016; Santamaría and Valdés, 2017; Arseneault, 2018; Wachs et al., 2019; Pozo-Rico et al., 2020).

The problem arises when violent behaviors are found in this behavior group, which may have detrimental effects on the development, personal adjustment, and academic achievement of students (Barnett et al., 1987; Solberg and Olweus, 2003; Bauman and Del Rio, 2006; Lau and Rosenthal, 2011; Burger et al., 2015; McDougall and Vaillancourt, 2015; Van Noorden et al., 2015; Cuff et al., 2016; Slater and Sanchez-Vives, 2016; Bjereld, 2018). These violent behaviors might also seriously affect the classmate environment (Jolliffe and Farrington, 2006; Salmivalli et al., 2013; Gaffney et al., 2019; Ingram et al., 2019).

In addition, when a student is continuously exposed to such situations of violence, there is a break in the socializing functions performed by peers, thereby forming the sources of stress and school maladjustment (Aceves et al., 2010; Polanin et al., 2012; Veenstra et al., 2014; Brendgen and Troop-Gordon, 2015; Yablon, 2017).

It is possible to identify three types of violent behaviors among peer groups (Coie et al., 1991):

- Reactive violent behavior: occurs in response to the provocation or aggression of the other.
- Instrumental violent behavior: aimed at obtaining an object or a social position.
- Bullying: harassment or mistreatment between equals; the aggression is committed without prior provocation and is directed at a person.

In addition, aggression or violent behaviors (Olweus, 2005) can be classified into the following. (A) Covert aggression: hostility is not directly displayed, but rather, there is irony, jealousy, hatred, yelling, or snorting. (B) Instrumental aggression: this is used as a means to achieve something, rather than causing harm to the victim. It is possible to also differentiate hostile aggression, which is caused by anger and is aimed toward causing pain to someone. (C) Reactive aggression: it occurs as revenge for a previous act. (D) Intimidating aggression: a victim is attacked without prior provocation.

Classmates play a significant role in developing social competence. They are one of the main sources of emotional support in a school and contribute substantially in the formation of our identity (Greene, 2006; Olweus and Limber, 2010; Mulryan-Kyne, 2014; Pincham, 2015; Young-Jones et al., 2015; Gonzalez and Ramirez, 2017; Gilar-Corbi et al., 2020; Saitua-Iribar et al., 2020; Santaolalla et al., 2020; Tyumaseva et al., 2020; Wei et al., 2020). However, when a student is continuously exposed to situations of violence in a school environment, there is a break in the socializing functions provided by peers. In such a situation, they become sources of stress and school maladjustment, leading to school and emotional maladjustment of those who perform and suffer from these violent behaviors (Kochenderfer-Ladd and Skinner, 2002; Bauer et al., 2007; Craig et al., 2009; Ttofi and Farrington, 2011; Chester et al., 2015; Moore et al., 2017; Limber et al., 2018; Gaffney et al., 2019; Jantzer et al., 2019; Smith et al., 2019; Murray and Cousens, 2020; Penalva-Velez et al., 2020).

For these reasons, the research on school violence has increased in the recent decade, constituting a key challenge for schools around the world (Spink, 2005; Court, 2006; Vives, 2014; Becerra et al., 2015; Abu-Nimer and Nasser, 2017; Akyuz et al., 2017; Giavrimis, 2020; Gonzalez et al., 2020; Jurges et al., 2020; Martinez et al., 2020; Ngabirano et al., 2020; Roulston and Cook, 2020; Valero-Valenzuela et al., 2020; Viejo et al., 2020; Wynn et al., 2020).

This school violence includes various types of transgressive behaviors, such as minor criminal acts or more serious behaviors like physical and verbal aggression against teachers and classmates. For this reason, an early and effective educational intervention is very important (Meraviglia et al., 2003; Martin et al., 2005; Mura et al., 2010; Del Rey et al., 2012; Naidoo et al., 2016; Ortega-Ruiz et al., 2016; Yubero et al., 2018; Falla and Ortega-Ruiz, 2019; Vives-Cases et al., 2019; Curtis et al., 2020; Madrid et al., 2020; Peters et al., 2020).

As a result, school violence has negative consequences on all the students involved, while the most damaging effects reverberate on the victim. All the students involved in situations of school violence are at a high risk of suffering from social interaction problems or emotional disorders in the future. The consequences of these on the victim as well as on the aggressor and the observer are pernicious. This is especially so for the victim, who usually suffers from the most negative consequences.

They tend to cause school failure and difficulties, high levels of anxiety, dissatisfaction, phobia of going to school, insecurity, negative self-concept, insomnia, eating disorders, depression, aggressive behaviors, and even suicidal attempts (Donoghue et al., 2014; Reuland and Mikami, 2014; Kub and Feldman, 2015; Modin et al., 2015; Duque and Teixido, 2016; Juvonen et al., 2016; Lucia, 2016; Pecjak and Pirc, 2017; Thornberg et al., 2017; Vveinhardt et al., 2017; Juan et al., 2018; Williford and Zinn, 2018; Yang et al., 2018; Garmendia Larranaga et al., 2019; Moyano et al., 2019; Velki, 2019; Li et al., 2020; Nunez-Fadda et al., 2020).

Negative self-concept and low self-esteem will continue to exist in children who have been the victims of school violence until their adult life. They will subsequently favor abuses in their workplaces, family circles, or social spaces (Ma, 2002; del Barrio et al., 2008, 2011; Kartal, 2008; Kartal and Bilgin, 2009; Totura et al., 2009; Pittet et al., 2010; Lopez et al., 2012; Mehta et al., 2013; Twemlow and Sacco, 2013; Cerezo et al., 2015; Duggins et al., 2016; Thornberg et al., 2018; Esposito et al., 2019).

The scientific literature also brings out the negative repercussions of violent behaviors for the aggressor, who learns to achieve his/her objectives improperly. The aggressor tends to reproduce his/her actions through more serious behaviors later in life. In addition, the aggressor tends to be convinced that the rules should not be respected and that the display of aggressive behavior guarantees social popularity (Graham et al., 2006; Gutierrez et al., 2012; Blitz and Lee, 2015; Donoghue and Raia-Hawrylak, 2016; Gonzalez, 2017; Beserra et al., 2019; Angel, 2020; Mendez et al., 2020).

Students who observe violent behaviors in educational settings, even if they do not pick sides in instances of bullying, also manifest negative consequences, such as progressive inhibition while witnessing the pain of others, little empathy and solidarity, feelings of guilt, and isolation, in the future (del Barrio et al., 2008; Simegova, 2009; Lopez et al., 2012; Estevez et al., 2019; Garces-Prettel et al., 2020; Perales et al., 2020).

To summarize, all these aggressive behaviors in the context of schools hinder the normal development of teaching and negatively affect the school environment. As a result, there is a need for novel intervention proposals that are easily transferable to the reality of the classroom and can be adapted to the demands of the 21st century. One such proposal is presented in the current study.

Goals, Contents, and Characteristics of the Program for Imparting Socio-Emotional Competencies

The general goal is to promote a social climate of coexistence in the classroom, starting from the promotion of socio-emotional competence among primary education students to ensure that it fosters a healthier relationship among students and enables them to resolve conflicts more peacefully.

The specific goals of the program are detailed below:

- Encourage self-knowledge, self-esteem, and respect for others in students.
- Develop in them behaviors that enable them to perceive and express their feelings and self-regulating emotions.
- Develop their assertive communication skills with the aim of improving conflict resolution.

Basing on these goals, the following contents have been included:

- Content block 1: personal knowledge, self-esteem, empathy, and group cohesion (includes lessons 1–7).
- Content block 2: emotions, emotional regulation, and relaxation (includes lessons 8–11).
- Content block 3: assertiveness, communication, and conflict resolution (includes lessons 12–15).

Note that the training programme adopted two methodologically and conceptually different skills. On the one hand, the skills specifically aimed at vulnerable and at risk of social exclusion schoolchildren (e.g., self-esteem and assertiveness). On the other hand, the skills specially aimed at perpetrators of violence (e.g., self-control, emotional regulation and empathetic behaviors. However, both types of skills have been worked together across the programme, thus strengthening the final goal, that is, conflict resolution and promoting democratic co-existence in schools.

The order of lessons 1–15 is based on a progression from the simplest approach to each of the competencies inherent in training to the acquisition of the most complex ones. Thus, the programme has been designed in such a way that it is implemented throughout the academic year, with bi-monthly sessions of 45 min each held until the completion of the proposed 15 sessions.

The program is deemed to remain flexible in all situations. The sessions can be conducted at any time deemed appropriate, respecting the criteria set forth by teachers. There may be occasions wherein the sessions already worked out can be resumed whenever deemed necessary, or the proposed sessions can be advanced to be carried out at the end of the program in accordance to the occasions that arise within the group.

As a guide, the sessions scheduled for an academic year are provided in **Table 1**.

Finally, the characteristics of the program made it necessary that, before starting the program, it is essential that all the primary education teachers, especially those assigned to conduct classroom sessions, have familiarized themselves with the program and have made this known to the families of students and the entire school community.

For this reason, right at the beginning of the course, primary education teachers receive training from the school's educational guidance team to facilitate the implementation of the program and mobilize necessary resources for its implementation.

Likewise, it is important to explain to the families of students what the program comprises of and offer them guidance on how they could contribute to the reinforcement and consolidation of the skills among students. For this, it would be important to take the advice of the educational guidance team of the school. This would give the teachers the opportunity to meet the families at the beginning

TABLE 1 | Goals of the program to impart socio-emotional competencies.

Lesson	Goal	Lesson's head title
1	Self-knowledge and self-esteem	"THAT'S HOW I AM"
2	Self-knowledge and self-esteem	"THAT'S HOW WE ARE"
3	Self-knowledge and self-esteem	"STRENGTHS"
4	Self-knowledge and self-esteem	"PERSONAL ACHIEVEMENTS"
5	Self-knowledge and self-esteem	"MY LUGGAGE FOR LIFE"
6	Self-knowledge and self-esteem	"I AM IMPORTANT"
7	Self-knowledge and self-esteem	"WE ARE IMPORTANT"
8	Emotions and emotional regulation	"MY EMOTIONS AND THOSE OF OTHERS"
9	Emotions and emotional regulation	"I EXPRESS EMOTIONS"
10	Emotions and emotional regulation	"I MANAGE MY EMOTIONS"
11	Emotions and emotional regulation	"I RELAX"
12	Assertiveness, communication, and conflict resolution	"I AM ASSERTIVE"
13	Assertiveness, communication, and conflict resolution	"WE COMMUNICATE"
14	Assertiveness, communication, and conflict resolution	"WE COMMUNICATE"
15	Assertiveness, communication, and conflict resolution	"WE SOLVE CONFLICTS"

of the course and provide them with the resources that are necessary.

This program is not limited to a series of sessions carried out by an isolated teacher in the classroom. The entire educational team is involved in generalizing these learning's during any time of the school day.

Facilitating the generalization of learning is the key that every teacher can take advantage of in occasions that arise spontaneously in the daily life of students. Further, any connection they find in their subjects with what they have worked on the program that week will help them strengthen their remembrance of the lessons learned.

As a result, while it is the teacher who is selected to carry out the proposed sessions with the students, the rest of the teaching team is also involved to ensure the reinforcement and monitoring of the skills acquired.

The contents worked on lesson by lesson will be worked out periodically with the students. In addition, a visual support that helps in remembering the skills is acquired. To do this, a mural with images related to the sessions carried out is created, placing the activities worked on by students on the class board.

MATERIALS AND METHODS

Participants

Two primary schools participated in this research. Both schools have two groups of students for each academic year. Both schools are located in areas with well-off socio-cultural levels. A total of 100 students participated in this study, with 50 students randomly assigned to the experimental condition and the other 50 students assigned as part of the control group. All these students are in the 3rd grade, with the control and experimental groups consisting of similar number of boys and girls (48% male students and 52% female students). The students belonged to 8–9 years age range.

Instruments

The following criteria were considered while selecting the measurement instruments:

- The conceptual adjustment of the instruments, depending on the variables to be analyzed.
- The reliability and validity of the instruments' psychometric indicators.
- The viability of instruments' application.
- The justification of their adequacy as

Based on these criteria, the following instruments were selected.

School Violence in Preschool and Primary School Questionnaire

This questionnaire obtains precise information on different relevant variables such as the type of violence, the places where it occurs, and the frequency of violent behavior (Albaladejo-Blázquez et al., 2013). The questionnaire consists of 30 short and easy-to-understand items. A Likert-type scale with four response options has been used. Given that the questionnaire includes items that assess the frequency with which different situations have been experienced, carried out, or witnessed, the responses to each of the items are: never, few times, many times, and always.

The questionnaire includes four main sections. In the first three sections, we find the assessment of the presence of situations of violence at school from the perspective of the spectator, victim, or the aggressor. The fourth section assesses as to how the subjects react to situations of violence. The factors measured in this study are the following: witnessed violence, lived violence, involving violence, and "what you see"/"what you say." The psychometric characteristics of this instrument are adequate and show high internal consistency (Cronbach's alpha = 0.86) in the three scales that compose it (violence observed, lived, and carried out). More specifically, the factor "witnessed violence" showed high reliability, with its Cronbach's alpha index being 0.80. In addition, similar reliability was found for the

factors "lived school violence" and "realized school violence," whose Cronbach's alpha indices were 0.71 and 0.79, respectively (Albaladejo-Blázquez et al., 2013).

Matson Evaluation of Social Skills With Youngsters

This measure evaluates the degree of adequacy of individuals' social behavior (Matson et al., 1983). The Spanish version of the measure is used in this study (Trianes et al., 2002). The scale makes it possible to evaluate the specific social skills involved in adaptive and non-adaptive social behaviors, considering the students' relationship with their peers and adults. The instrument can be applied to individuals of 4–18 years of age. The instrument has versions of self-report and external evaluation (parents and teachers). The self-report version used in this study has 62 items. The original version has five factors: Aggressiveness/Antisocial Behavior, Appropriate Social Skills, Friendship, Overconfidence/Jealousy/Pride, and Loneliness/Social Anxiety. The Spanish version had the following factors: Aggressiveness/Antisocial Behavior (AAB), Social Skills/Assertiveness (SSA), Conceit/Haughtiness (CH), Loneliness/Social Anxiety (LSA), and MESSY Total Scale. A Likert-type rating scale comprising of 1 ("not at all") to 5 ("very much") ratings was used. Recent studies show that the scale has strong psychometric properties, including internal consistency and convergent and divergent validity (Matson et al., 2010). These adequate psychometric properties have also been found in the Spanish version (Méndez et al., 2002).

Emotional Quotient Inventory Short EQ-i YV (S)

The Emotional Quotient Inventory is an inventory that covers multiple emotional and social competencies, including an estimate of emotional intelligence as well as a social and affective profile (Bar-On, 1997). The Youth Version (BarOn EQ-i:YV) used in this study assesses the emotional and social functioning of youths aged 7–18, providing an estimate of their underlying emotional and social intelligence (Bar-On and Parker, 2000). It includes 51 items, which are rated on a five-point Likert scale. It evaluates the following general factors of EI: intrapersonal intelligence, interpersonal intelligence, adaptation, and stress management. By adding these dimensions, a general score for Emotional Intelligence is obtained. Higher scores indicate better functioning to meet the demands and challenges of everyday life, while lower scores indicate a greater probability for having emotional, social, and/or behavioral problems. The Spanish version has been used in this study (López-Zafra et al., 2014). All the scales have adequate contrasted validity and the internal consistency of their subscales is between 0.65 and 0.86 (Bar-On, 2004).

Therefore, and in accordance with the scientific literature, MESSY and EQ-i YV has been selected as a robust psychometric approach to evaluate the effectiveness of the programme. In addition, and related with MESSY, Matson et al. (2010) study provides support for the adequate psychometric properties in terms of the construction and validation of this questionnaire. This finding also validates the Spanish version of this instrument (Méndez et al., 2002). Moreover, and related with EQ-i YV, López-Zafra et al. (2014) demonstrated the adequate psychometric properties in terms of the validity of the Spanish version of this questionnaire.

In the same way, the "School Violence in Preschool and Primary School Questionnaire" has been selected because it is an instrument developed in the Spanish education context and is useful for obtaining precise information on different relevant variables such as the type of violence, the places where it occurs, and the frequency of violent behavior. In addition, Albaladejo-Blázquez et al. (2013) showed the adequate psychometric properties in terms of the construction and validation of this questionnaire.

This justifies the adequacy of the choice of instruments such as acute scales to achieve a conceptual adjustment between the instruments and key variables training across the programme, the psychometric indicators for each scale, and the viability for the implementation of this in a sample of young students (8–9 years age range).

In conclusion, based on these criteria, the related instruments have been selected as they are considered appropriate (psychometric consistency and sufficient validity), viable (adequate for the sample and their cultural, education level, and age characteristics) and pertinent for the adjustment of the training on the programme (conflict resolution and promoting democratic co-existence in schools).

Procedure

The entire school community was fully informed of the details of the study (including the goals, the responsible teacher team, and the confidentiality of the student's answers across all the measure instruments). Prior to participation, written informed consent was obtained. Following this, the participants were randomly assigned to one of the two research conditions: experimental group (where the training on socio-emotional competencies is carried out) or control group (without special training). The experimental group consisted of students who participated in the training programme. The programme was designed to improve their socio-emotional competencies and, in turn, facilitate conflict resolution and promote democratic and peaceful co-existence in schools. The control group consisted of primary school students who did not participate in the programme or receive any other intervention during this period. Finally, the measurement instruments were completed by students before and after the training programme in all research conditions. In order to facilitate the completion of the three questionnaires in such young students, a couple of sessions (of 50 min each) were used, respecting the relevant breaks at all times to avoid students' exhaustion.

Experimental Design and Data Analysis

A quasi-experimental design "with control group" has been adopted, measuring the variables with the instruments mentioned above following the intervention in both groups (control vs. experimental). Thus, to verify the effectiveness of the training programme implemented, the general linear model (GLM) was implemented. Using this procedure, a multivariate analysis of variance (MANOVA) and a univariate analysis of variance (ANOVA) of repeated measures (factors: group

and time) was performed. Tests of within-subjects interaction effects (time × group) were carried out. Finally, the graphs of interactions have been presented to illustrate the differences obtained for both the groups in pretest and posttest settings. SPSS version 22.0 (IBM Corporation, Armonk, NY, United States) has been used for all statistical analyses.

RESULTS

Firstly, we proceeded to check if the experimental and control groups presented significant differences in the variables considered in our study. For this, a means comparison analysis was carried out for independent samples. On the one hand, and regarding sociodemographic variables, no differences were found between the pre-test and post-test scores between male and female students on any variable. Furthermore, when gender is included as a covariate in the General Linear Model analysis, it is not significant. Therefore, the following statistical analyses were performed by eliminating the gender covariate. On the other hand, the results of student's *t*-test show that there were no significant differences in any of the measured variables between the two groups (experimental vs. control) in pretest, with the exception of the variables "involving violence" and "what you say" (found in the School Violence in Preschool and Primary School Questionnaire), and the Social Skills/Assertiveness (SSA) factor (found in the Matson Evaluation of Social Skills with Youngsters).

Secondly, the M-Box test result indicates the homogeneity of the variance-covariance matrices for the following variables involved in the MESSY: Aggressiveness/Antisocial Behavior (AAB) ($F = 0.940$, $p = 0.420$). This is also applicable for the variables involved on MESSY's Total Scale ($F = 0.261$, $p = 0.854$). Similarly, the following variables were involved in the Emotional Quotient Inventory Short EQ-i YV: intrapersonal intelligence ($F = 0.432$, $p = 0.430$) and stress management ($F = 1.025$, $p = 0.380$). However, the result does not indicate such homogeneity for the following variables involved in the School Violence in Preschool and Primary School Questionnaire: witnessed violence ($F = 15.198$, $p = 0.000$) and lived violence ($F = 9.984$, $p = 0.000$). Further, the following variables were involved in the MESSY: Conceit/Haughtiness (CH) ($F = 10.910$, $p = 0.000$) and Loneliness/Social Anxiety (LSA) ($F = 5.335$, $p = 0.001$). Similarly, the following variables were involved in the Emotional Quotient Inventory Short EQ-i YV: interpersonal intelligence ($F = 3.356$, $p = 0.018$), adaptation ($F = 4.384$, $p = 0.004$), and EQi Total Score ($F = 0.3.356$, $p = 0.005$). In any case, it should be remembered that a violation of this assumption has minimum effect if the groups are approximately equal in size (Hair et al., 1999).

Next, the resulting values of intra-subject and inter-subject effects have been presented in **Table 2** to show that the effect of the interaction between the time of evaluation (pretest and posttest) and the implementation of the educational intervention is significant ($p = < 0.05$) for the students involved in the experimental condition in comparison to the control group for the factors found in the School Violence in Preschool and Primary School Questionnaire (witnessed violence, lived violence, involving violence, and "what you see"/"what you say"); for the factors found in the MESSY (Aggressiveness/Antisocial Behavior (AAB), Social Skills/Assertiveness (SSA), Conceit/Haughtiness (CH), Loneliness/Social Anxiety (LSA), and MESSY Total Scale) and all the factors (intrapersonal intelligence, interpersonal intelligence, adaptation and stress management) found in the Emotional Quotient Inventory Short EQ-i YV. So, in all this mentioned factors, the results of the test show that the effect of the interaction between the time of pre-test and post-test assessment and the implementation of the program is significant.

Finally, three important figures have been presented. **Figure 1** presents the interaction graphs that illustrate the directions of the significant differences found in the levels of school violence post the educational intervention (measures with School Violence in Preschool and Primary School Questionnaire). **Figure 2** presents the interaction graphs that illustrate the directions of the differences in MESSY Total Score as a representation of the significant differences found in the set of factors of MESSY (Aggressiveness/Antisocial Behavior (AAB), Social Skills/Assertiveness (SSA), Conceit/Haughtiness (CH) and Loneliness/Social Anxiety (LSA). **Figure 3** presents the interaction graphs that illustrate the directions of the differences in Total Score EQ-i as a representation of the significant differences found in the set of factors of EI (intrapersonal intelligence, interpersonal intelligence, adaptation and stress management, measures with Emotional Quotient Inventory Short EQ-i YV). Thus, all the factors mentioned showed significant improvements post the intervention for the students involved in the experimental condition.

DISCUSSION

One of the basic needs of the individual is to feel that he is accepted and appreciated for who he is, to feel that he has an important role within his community, to establish bonds of loyalty, commitment, ethics, and cooperation; as well as obtaining help in times of need, whether on a personal level or as a recipient to overcome the requirements of an academic subject.

For these reasons, it is very important that the curricular designs in the Primary Education stage include teaching strategies, whether based on the master class or mobilized through virtual learning environments, that encourage students to work in unison, develop social skills to handle social situations in the classroom, and appropriately manage social experiences in which an understanding, identification, expression and adequate regulation of own and other emotions is required.

This research is therefore committed to teaching Emotional Intelligence and Social Skills due to their crucial role in the successful prevention of conflicts and in promoting a positive classroom climate and social synergies among Primary Education students.

In recent decades, there has been a rise in the evidences found on the importance of scholar school violence prevention (Gazquez et al., 2007; Loan et al., 2018; Modin et al., 2018;

TABLE 2 | Results of intrasubjet/intersubject univariate ANOVA.

Area examined	Source	Type III	df	*F*	Sig.	Partial η^2	Ob. power
School violence							
(school violence in preschool and primary school questionnaire)							
Witnessed violence	Intra	87.49	1.00	21.13	0.00	0.18	1.00
	Intra*Inter	124.45	1.00	30.06	0.00	0.23	1.00
	Error intra	405.73	98.00				
	Inter	31616.33	1.00	2195.03	0.00	0.96	1.00
	Condition	507.45	1.00	35.23	0.00	0.26	1.00
	Error inter	1411.55	98.00				
Lived violence	Intra	0.11	1.00	0.03	0.87	0.00	0.05
	Intra*Inter	106.61	1.00	24.98	0.00	0.20	1.00
	Error intra	418.31	98.00				
	Inter	74352.45	1.00	2864.40	0.00	0.97	1.00
	Condition	240.67	1.00	9.27	0.00	0.09	0.85
	Error inter	2543.83	98.00				
Involving violence	Intra	1.35	1.00	3.32	0.07	0.03	0.44
	Intra*Inter	8.79	1.00	21.60	0.00	0.18	1.00
	Error intra	39.90	98.00				
	Inter	28512.77	1.00	2770.42	0.00	0.97	1.00
	Condition	39.05	1.00	3.79	0.05	0.04	0.49
	Error inter	1008.60	98.00				
"what you see"	Intra	6.86	1.00	9.58	0.00	0.09	0.87
	Intra*Inter	20.90	1.00	29.18	0.00	0.23	1.00
	Error intra	70.19	98.00				
	Inter	29599.48	1.00	2529.21	0.00	0.96	1.00
	Condition	8.48	1.00	0.72	0.40	0.01	0.13
	Error inter	1146.90	98.00				
"what you say"	Intra	0.01	1.00	0.04	0.83	0.00	0.06
	Intra*Inter	7.61	1.00	37.50	0.00	0.28	1.00
	Error intra	19.89	98.00				
	Inter	1380.89	1.00	1226.20	0.00	0.93	1.00
	Condition	3.01	1.00	2.67	0.11	0.03	0.37
	Error inter	110.36	98.00				
Social skills							
[matson evaluation of social skills with youngsters (MESSY)]							
AAB	Intra	559.73	1.00	235.09	0.00	0.71	1.00
	Intra*Inter	205.53	1.00	86.32	0.00	0.47	1.00
	Error intra	233.33	98.00				
	Inter	355112.36	1.00	1544.65	0.00	0.94	1.00
	Condition	18.88	1.00	0.08	0.78	0.00	0.06
	Error inter	22530.01	98.00				
SSA	Intra	73.96	1.00	55.52	0.00	0.36	1.00
	Intra*Inter	47.18	1.00	35.42	0.00	0.27	1.00
	Error intra	130.54	98.00				
	Inter	2230959.75	1.00	5933.20	0.00	0.98	1.00
	Condition	3271.25	1.00	8.70	0.00	0.08	0.83
	Error inter	36849.25	98.00				
CH	Intra	0.13	1.00	1.59	0.21	0.02	0.24
	Intra*Inter	0.05	1.00	0.64	0.42	0.01	0.12
	Error intra	8.32	98.00				
	Inter	19918.80	1.00	446.68	0.00	0.82	1.00

(Continued)

TABLE 2 | Continued

Area examined	Source	Type III	df	*F*	Sig.	Partial η^2	Ob. power
	Condition	0.40	1.00	0.01	0.92	0.00	0.05
	Error inter	4370.09	98.00				
LSA	Intra	4.12	1.00	5.55	0.02	0.05	0.65
	Intra*Inter	6.92	1.00	9.32	0.00	0.09	0.86
	Error intra	72.77	98.00				
	Inter	48931.18	1.00	3314.58	0.00	0.97	1.00
	Condition	11.98	1.00	0.81	0.37	0.01	0.14
	Error inter	1446.72	98.00				
MESSY total scale	Intra	936.06	1.00	232.05	0.00	0.70	1.00
	Intra*Inter	579.34	1.00	143.62	0.00	0.59	1.00
	Error intra	395.32	98.00				
	Inter	2076317.17	1.00	2563.90	0.00	0.96	1.00
	Condition	4307.89	1.00	5.32	0.02	0.05	0.63
	Error inter	79363.21	98.00				
Emotional intelligence scores (emotional quotient inventory)							
Intrapersonal intelligence	Intra	27.66	1.00	79.11	0.00	0.45	1.00
	Intra*Inter	41.74	1.00	119.38	0.00	0.55	1.00
	Error intra	34.26	98.00				
	Inter	42660.69	1.00	1907.20	0.00	0.95	1.00
	Condition	19.41	1.00	0.87	0.35	0.01	0.15
	Error inter	2192.09	98.00				
Interpersonal intelligence	Intra	8.801	1	17.539	0.000	0.152	0.986
	Intra*Inter	49.301	1	98.245	0.000	0.501	1.000
	Error intra	49.179	98				
	Inter	59312.746	1	3070.190	0.000	0.969	1.000
	Condition	185.526	1	9.603	0.003	0.089	0.866
	Error inter	1893.254	98				
Stress management	Intra	26.79	1.00	21.05	0.00	0.18	1.00
	Intra*Inter	44.59	1.00	35.04	0.00	0.26	1.00
	Error intra	124.71	98.00				
	Inter	54854.25	1.00	4630.07	0.00	0.98	1.00
	Condition	31.81	1.00	2.69	0.10	0.03	0.37
	Error inter	1161.04	98.00				
Adaptation	Intra	17.11	1.00	58.06	0.00	0.37	1.00
	Intra*Inter	15.89	1.00	53.92	0.00	0.35	1.00
	Error intra	28.89	98.00				
	Inter	47267.65	1.00	2513.65	0.00	0.96	1.00
	Condition	6.75	1.00	0.36	0.55	0.00	0.09
	Error inter	1842.83	98.00				
EQ-I total	Intra	5.36	1.00	42.52	0.00	0.30	1.00
	Intra*Inter	16.35	1.00	129.56	0.00	0.57	1.00
	Error intra	12.36	98.00				
	Inter	50817.31	1.00	10022.38	0.00	0.99	1.00
	Condition	27.74	1.00	5.47	0.02	0.05	0.64
	Error inter	496.90	98.00				

Nation et al., 2020; Xu et al., 2020), the relevance of training Youngsters' Social Skills (Donohue, 2005; Matson et al., 2007; Wang et al., 2011; Youngstrom et al., 2017) and the convenience of instruction for EI competency among the students of primary school (Petrides et al., 2006, 2016; Nelis et al., 2009, 2011; Durlak et al., 2011).

However, while the evidence for the importance of these variables has been highly studied, more front-line applied

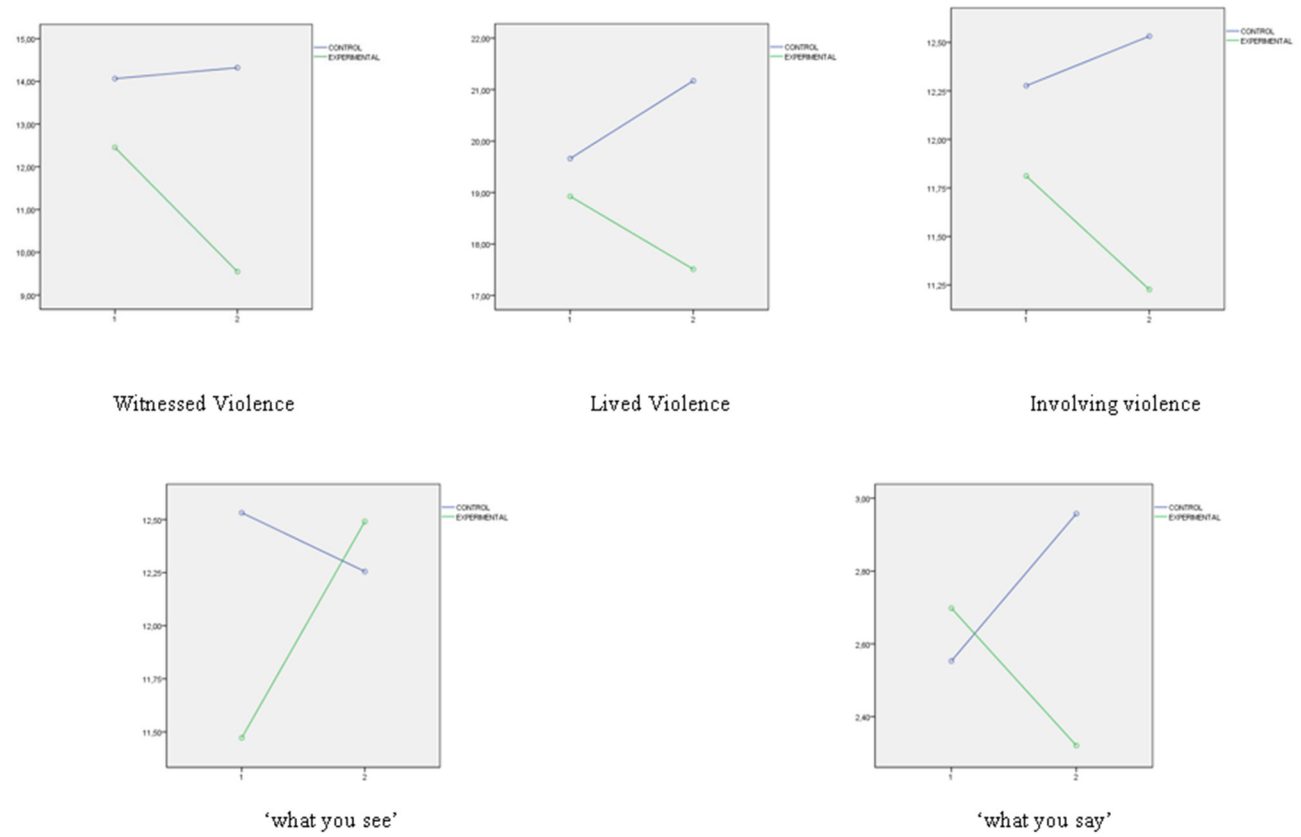

FIGURE 1 | School violence after the educational intervention measure with school violence in preschool and primary school questionnaire.

researches are needed to improve these factors' (prevention of school violence and promotion of socio-emotional skills) importance in the school context in the early academic years (Pozo-Rico and Sandoval, 2020). In the light of the results obtained, the program proposed in this research has been useful for the prevention of violent behaviors in the educational field, promoting the development of social and emotional skills among the students enrolled in the 3rd year of primary education.

On this way, the effectiveness of educational training has been proved for witnessed violence, lived violence, involving violence, and "what you see"/"what you say" found in School Violence in Preschool and Primary School Questionnaire. For the factors Aggressiveness/Antisocial Behavior (AAB), Social Skills/Assertiveness (SSA), Conceit/Haughtiness (CH), Loneliness/Social Anxiety (LSA), and MESSY Total Scale found in the MESSY and all factors (intrapersonal intelligence, interpersonal intelligence, adaptation and stress management) found in Emotional Quotient Inventory Short EQ-i YV. However, higher intervention effect sizes could have been obtained with a larger sample of students. In any case, all this mentioned factors, the results of the test show that the effect of the interaction between the time of pre-test and post-test assessment and the implementation of the program is significant.

Note that the type of activity the control group had instead of the treatment group is the regular academic classroom in the context of the normative and standard curriculum. The experimental group consisted of students who participated in the training programme. The programme was designed to improve their socio-emotional competencies and, in turn, facilitate conflict resolution and promote democratic and peaceful co-existence in schools. The control group consisted of primary school students who did not participate in the programme or receive any other special co-existence intervention during this period, but continued with the regular academic classroom instead. Hence, the convenient regular academic activity related with the standard curriculum in the control group could not have detrimentally affected involved groups of children. In neither case this control students group has been unobserved in view of the fact that they have the regular classes based on the academic curriculum all the school time.

This study therefore presents an opportunity to impart socio-emotional competencies among primary school students to improve conflict resolution and promote democratic and peaceful co-existence in schools. In addition, an enriched version of educational training is highly applicable to other educational contexts to enhance students' personal development and decrease the levels of violence found in primary education.

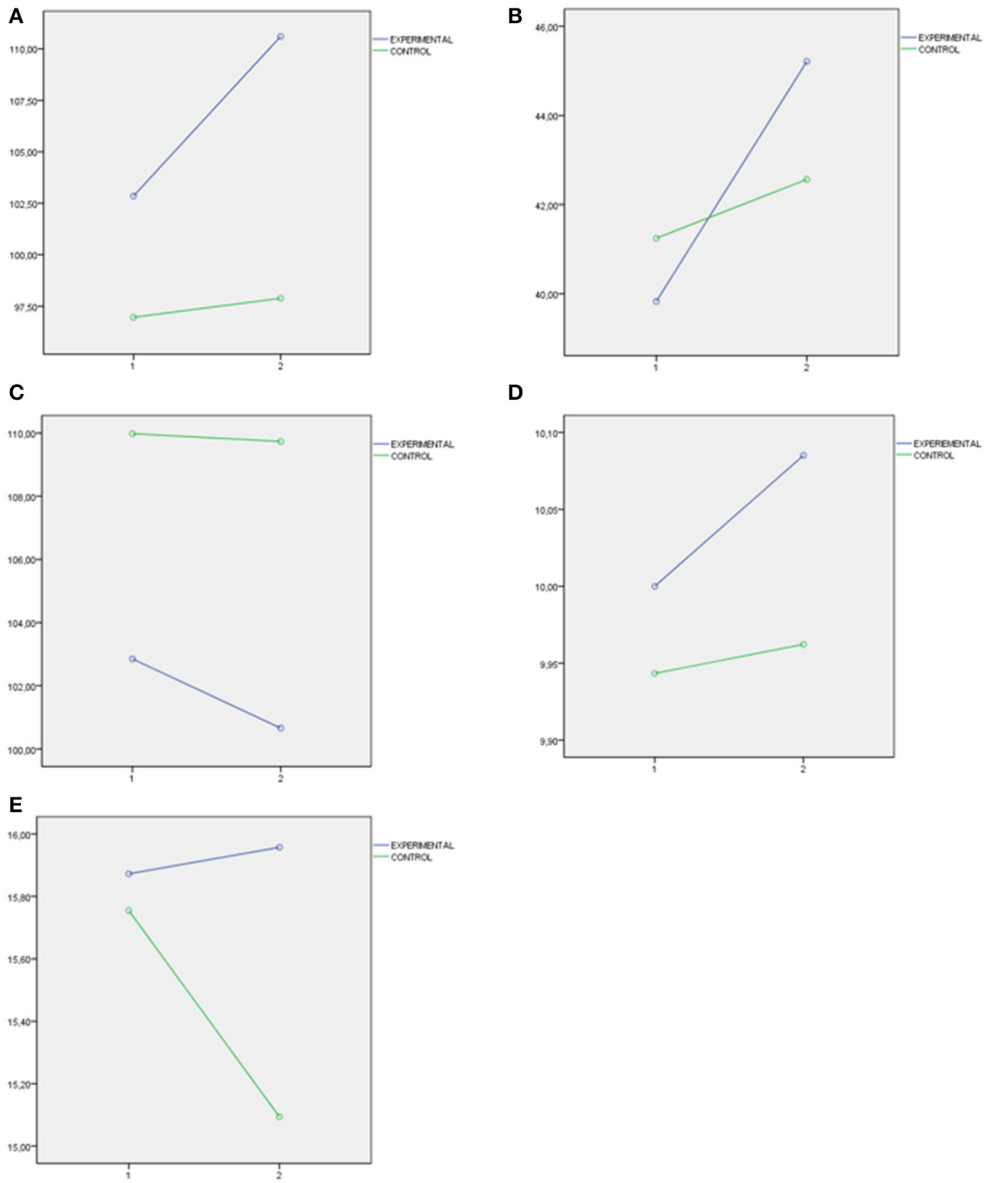

FIGURE 2 | (A) MESSY Total Scale as a representation of the significant difference obtained in the set of factor of EI measure with youngsters' social skills measure with Matson Evaluation of Social Skills. **(B)** Aggressiveness/antisocial behavior MESSY. **(C)** Social skills/assertiveness MESSY. **(D)** Conceit/haughtiness MESSY. **(E)** Loneliness/social anxiety MESSY.

CONCLUSION

To summarize, the study theoretically implies that there should be a promotion of socio-emotional skills and prevention of school violence among primary education students *via* committed and effective educational programs, such as the one shown in this research. The study's practical implications are based on the fact that the proposed program is a simple and an easily applicable intervention which any teacher—who is trained to teach its contents—can put into practice in his/her classroom.

However, there is a need for future research to address the research gaps of this study along seven fundamental lines: (1) replicate the study with a larger sample size to ensure that the research is carried out with the groups of each comparable experimental condition and ensure that there are no significant differences between any of the variables studied; (2) include more training regarding the violence committed and haughtiness (related to social skills) in the student training program to facilitate significant differences between the factors; (3) expand the evaluation of the prevention of school violence and the promotion of social skills among teachers and families (for the instruments used in this study allow it), as well as introduce a new instrument for the evaluation of emotional intelligence valued by the two key educational agents (teachers and families);

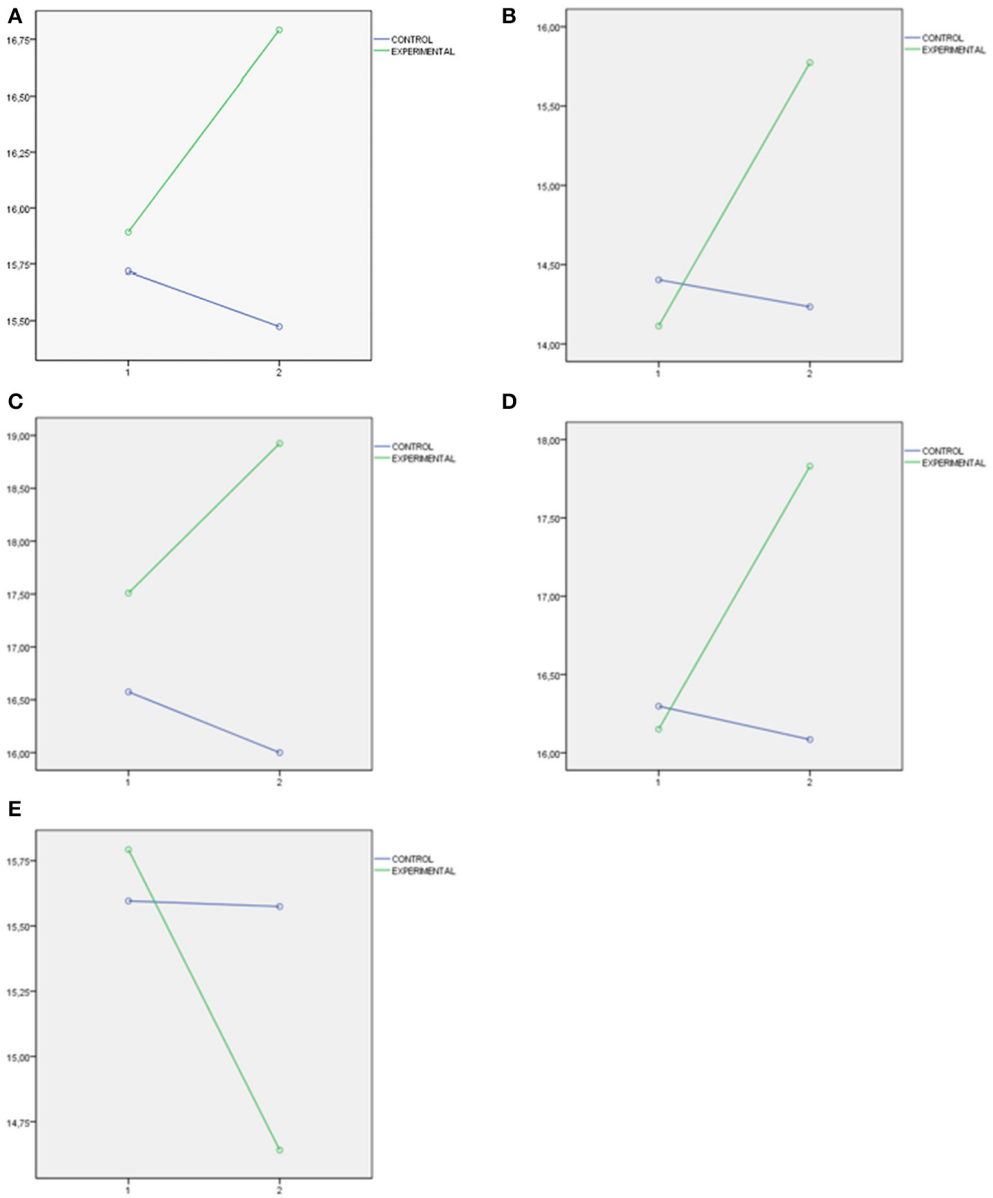

FIGURE 3 | (A) Total score EQ-i as a representation of the significant differences obtained in the set of factor of EI measure with Emotional Quotient Inventory Short EQ-i YV. **(B)** Intrapersonal intelligence EQ-i. **(C)** Intrepersonal intelligence EQ-i. **(D)** Stress management EQ-i. **(E)** Adaptation EQ-i.

(4) conduct a long-term educational follow-up to evaluate if the positive results of the intervention are maintained over time; (5) it would be interesting to apply the program to the different stages of all the courses and adapt it for different ages, thereby obtaining better results at the school level; (6) it would be convenient to design a training program for teachers and families who complete the action with students; (7) include a greater number of variables in future research to enable the evaluation of the other beneficial aspects of the program and its impact on key issues, such as academic performance and well-being of students (and the entire educational community); and (8) New instruments must be added to cover all the content of the programme in a more exhaustive way. These new lines of research to prevent school violence and promote socio-emotional skills among students are evidenced as attractive and committed to facilitating quality teaching and facing the new educational challenges of the 21st century.

In conclusion, violence is extremely common in modern society. It is present in families, schools, and the media. Promoting co-existence in classrooms has become a priority objective that does not always achieve the desired effects.

Numerous studies focus their efforts on generating proposals that provide solutions to problems related to violence against others, and also against oneself. The scientific literature presented

a multitude of programmes aimed at eradicating violence or bullying in the classroom, eliminating gender-based violence, and developing an endless number of projects that seek to appease a series of problems that often have a common origin: deficiencies in students' socio-emotional skills. In this way, meta-studies of Durlak (2015a), Durlak (2015b), and Taylor et al. (2017) are especially relevant because they provide evidence of the importance and consequences of EI and social skills improvement (as obtained in the current study) to derive a positive impact on the wider research and policy context more concerned with democratic co-existence in schools.

In this way, through the training proposed herein, this research generates a socio-affective environment in which students can achieve full personal and social development. In addition, a large part of the development of a child's personality takes place during primary school, the educational environment in which the most important social interactions will take place.

For this reason, studies on violence in childhood should focus on the educational context so that, together with the participation of families, a climate that favors co-existence can be achieved. We can affirm that by promoting the socio-emotional skills of our students, we have managed to prevent the appearance of violent behaviors in the classroom. So, the way educational systems are organized to incorporate these types of programmes is key to guaranteeing the same results as obtained in our research and reducing instances of school violence.

Therefore, the results clearly indicate it is possible to achieve an improvement in social skills and the management of emotions in the improvement of conflict resolution and the promotion of democratic coexistence in schools. This has great practical implications for achieving the state of well-being and quality education to which we aspire in the educational field.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ref. UA2015-07-06. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

MS-V, TP-R, and RG-C: conceptualization. JC: methodology. RG-C: software and data curation. TP-R and RG-C: validation. JC and RG-C: formal analysis. RG-C, TP-R, JC, and MS-V: writing—original draft preparation. RG-C, TP-R, and JC: writing—review and editing. All authors have read the manuscript and have agreed to have a published version of the manuscript.

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Age-Specific Life Skills Education in School: A Systematic Review

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Strengthening life skills is a popular approach for prevention and health promotion in schools. It aims to empower students to deal effectively with the demands of everyday life by improving self-regulation, making informed decisions, and building supportive social relationships. By addressing various health-related topics such as friendship, sexuality, violence, or substance use, life skills education has the potential not only to teach students how to act responsively regarding their health and well-being, but also to build a comprehensive understanding of the biological, psychological, and social factors influencing their individual development. However, little is known about whether the contents of life skills programs differ depending on student age, either in terms of the set of skills promoted or the influencing factors on health that are the focus. This systematic review addressed this gap by analyzing evaluated school-based life skills programs regarding age-specific targeted life skills, underlying theoretical frameworks, and effectiveness. The analysis, following the PRISMA guidelines, was based on longitudinal evaluation studies published between 2007 and 2020, which were retrieved from six electronic databases, and referred to eighteen programs. Results showed that programs were mostly implemented in adolescence and that the targeted life skills shifted from a more behavioral-affective focus in childhood to a broader set of life skills targeted in adolescence which emphasized social and sociocultural influencing factors on health. Little evidence was available on the effectiveness of the programs on life skills development. Ultimately, life skills education promotes health-related self-regulation, especially in adolescence. However, further research is needed to clarify how to achieve sustainable effects in the development of life skills, both in childhood and adolescence.

Keywords: life skills, school-based programs, development, childhood, adolescence, health promotion, prevention

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INTRODUCTION

During their school years, children and young people have to deal with many academic and other everyday demands. Life skills (also called transferable skills, soft skills, socio-emotional skills, or 21st century skills) are assumed to help students to cope with these demands on their own and to make an important contribution to well-being and healthy development for themselves and others. Life skills are characterized by a wide range of emotional, psychosocial, and cognitive skills to improve self-regulation, make informed decisions, and build supportive social relationships (WHO, 1994; WHO, 2003; UNICEF, 2012; UNICEF, 2019). In recent years, life skills education (LSE) has gained importance at school (Munsi and Guha, 2014; OECD, 2019a, OECD, 2019b; UNICEF, 2019). However, the crucial question is to decide which life skills should be promoted at school (Foxcroft

TABLE 1 | Classification of life skills into three main categories.

Communication and interpersonal skills	Decision-making and critical thinking skills	Coping and self-management skills
Interpersonal communication skills	Decision-making/problem-solving skills	Skills for increasing personal confidence and abilities to assume control, take responsibility, make a difference, or bring about change
Negotiation/refusal skills	Critical thinking skills	
Empathy building	Creative thinking skills	
Cooperation and teamwork		Skills for managing feelings
Advocacy skills		Skills for managing stress

Source: WHO (1994, p. 2); WHO (2003, p. 9).

and Tsertsvadze, 2012; Smithers et al., 2018; Nasheeda et al., 2019)—and at what age (Avan and Kirkwood, 2010; Immordino-Yang et al., 2019)—to achieve the most sustainable effects on biological, psychological, and social factors that influence health and well-being (Flay et al., 2009; Sameroff 2010).

Our review starts with a definition of LSE, followed by theoretical considerations of life skills development, which take into account biological, psychological, and social influences on health and well-being as well as on health-related behavior.

Life Skills Education

LSE includes a set of interrelated skills that should empower children and adolescents to lead a healthy, successful life and assume social responsibility (WHO, 1994, WHO, 2003; Buehler, 2016; OECD, 2019a, OECD, 2019b; UNICEF, 2019). According to the World Health Organization (WHO, 2003; WHO, 1994), LSE includes the promotion of three categories of life skills: 1) communication and interpersonal skills, 2) decision-making and critical thinking skills, and 3) coping and self-management skills (see **Table 1**). Peters et al. (2009) have defined LSE as a cognitive-behavioral approach that generally links issues such as exposure to social influences and social norms with the promotion of cognitive, affective, and social skills.

LSE is based on interactive and participatory teaching and learning methods (WHO, 2003; Pellegrino et al., 2012; Nasheeda et al., 2019) and addresses real-life situations to apply and train essential skills. These situations often relate to problematic health-related attitudes and behaviors such as substance use, consumption of high-calorie foods, violence, risky sexual behavior, or physical inactivity. By addressing these issues, LSE aims to enable healthy choices, thereby preventing chronic diseases and adverse social consequences in the long term (Resnick et al., 2012; Sancassiani et al., 2015; MacArthur et al., 2018; Singla et al., 2020). Beyond this problem-focused approach, LSE also targets physical and mental health by promoting physical, psychological, and social well-being (UNICEF, 2012; Sancassiani et al., 2015; O'Connor et al., 2018; Singla et al., 2020).

Nevertheless, the implementation of LSE varies by geographic and cultural context (Munsi and Guha, 2014; Nasheeda et al., 2019). In Western countries, LSE programs tend to focus on refusal and resistance skills, attitude change, personal decision-making, and self-efficacy to reduce risk behavior and promote positive behaviors (Peters et al., 2009; Faggiano et al., 2014; Nasheeda et al., 2019). Similar approaches can be found in developing and emerging economies, but here, program contents appear to be broader, including more general communication skills (Nasheeda et al., 2019) and social aspects such as the status of women, children's rights, and democracy (Munsi and Guha, 2014). These programs focus on the much wider objectives of the global initiatives of Education For all (WHO, 2003) or Every Child Learns (UNICEF, 2019). Such differences in LSE approaches reflect the socio-political priorities and problem areas in different societies (Avan and Kirkwood, 2010; Munsi and Guha, 2014; Nasheeda et al., 2019).

Most LSE programs focus on students in adolescence (UNICEF, 2019). This is not surprising, as many new developmental tasks emerge in this age (Buehler, 2016), and new health-related issues such as sexuality and substance use become highly relevant (MacArthur et al., 2018), reflecting the major biological, psychological, and social changes that occur during these years (Sameroff, 2010; Immordino-Yang et al., 2019). Adolescents are particularly at risk of initiating unhealthy behaviors and continuing them into early adulthood. This, in turn, increases the risk for chronic non-communicable diseases, such as heart diseases, diabetes, and obesity (MacArthur et al., 2018; Immordino-Yang et al., 2019), and can lead to long-term social problems such as underachievement and unemployment (Hall et al., 2016; MacArthur et al., 2018). However, with this focus on adolescence, the question remains open as to the role of the earlier years of childhood in the development and promotion of life skills.

Promoting Life Skills: A Developmental Perspective

Developmental theories aim to explain the biological, psychological as well as social changes of individuals in their contexts (Sameroff, 2010; Immordino-Yang et al., 2019). Development emerges in nonlinear and complex interactions and feedback loops between the biological and psychological realms within the individual, as well as the opportunities, conditions, and constraints provided by their social environments (Bronfenbrenner and Morris, 2006; Flay et al., 2009; Sameroff, 2010; Zelazo, 2013). Biological processes comprise dimensions such as neurophysiology, neuroendocrinology, proteomics, genomics, and epigenomics. Psychological processes include cognitive, emotional, and motivational dimensions of intelligence, mental health, social competence, and identity, among others (Sameroff, 2010). The social ecology of an individual comprises the settings of families, peers, and neighborhoods, as well as institutions such as schools and health services (Bronfenbrenner and Morris, 2006; Sameroff,

2010), which all fall under overarching geopolitical (Sameroff, 2010) and sociocultural conditions (Flay et al., 2009). Thus, impulses for development come both from changes within the child (i.e., nature) as well as changes in the social contexts (i.e., nurture; Sameroff, 2010).

The development of cognitive and psychosocial skills starts from infancy and continues throughout life (Sameroff, 2010; Burrus and Brenneman, 2016). Different age phases represent differently sensitive periods to develop specific skills (Zelazo, 2013; Immordino-Yang et al., 2019). The periods of infancy and early childhood, for example, are important for the development of sensory, motor, language, and spatial skills. The development of these skills is accompanied by the development toward goal-directed actions, such as regarding communication, emotional expression, or movement. Through imitation, active play, and participation in daily social activities, children perceive patterns of cause and effect, gain agency and a sense of self, and acquire modes of social interactions and conversations (Immordino-Yang et al., 2019). Building on these physical, cognitive, and social-emotional achievements of early childhood, symbolic learning develops in middle childhood, which enables more formal representations of and thinking about structures, patterns, and processes in the inner and outer world (Sameroff, 2010; Immordino-Yang et al., 2019). The development of these skills coincides with entry into school in most cultures (Sameroff, 2010). Formal education promotes the formalization of ideas, for example in spoken and written language and mathematics (Immordino-Yang et al., 2019), and the internalization and reproduction of the society's ways of being reasonable, cooperative, and responsible (Sameroff, 2010). During early adolescence, a fundamental period of epigenetically triggered social, emotional, and cognitive growth and plasticity emerges, with increased sensitivity to social cues, for example in terms of rewards or rejection. This shift alters emotional reactivity as well as emotional regulation abilities, but it also enables long-term planning and abstract thinking (Immordino-Yang et al., 2019).

This development of skills could also be described by shifts in regulation systems of well-being from external regulation to self-regulation (Sameroff, 2010). In infancy and early childhood, regulation is primarily determined by biological needs to eat, drink, and keep warm, which is gradually complemented by controlling behavior in social and psychological contexts. This regulation is predominantly carried out by parents or other persons providing care, who thereby have the most salient influence on children's behavior and social-cognitive functioning, including stress reactivity and social and emotional well-being (Elder and Shanahan, 2006; Sameroff, 2010; Zelazo, 2013; MacArthur et al., 2018; Immordino-Yang et al., 2019). Although parental influence remains important during middle and late childhood as well as adolescence (Singla et al., 2020), children's connection with the environment is dynamic, and contacts at school or in the neighborhood gain importance, enabling new relationships with peers as well as with adults. In addition, as children grow older, they gain skills to self-regulate and thereby become more able and independent to regulate themselves, their lives and their well-being. This transition aligns with societies' expectations for greater self-regulation (Sameroff, 2010), and educational systems answer these demands by providing increasing opportunities and support for further cognitive, emotional, and social learning at school (Immordino-Yang et al., 2019)—such as with LSE.

According to Flay et al. (2009), the predominant developmental role of the social environment derives from its influence in shaping concrete behavioral intentions and behaviors. Parents, family members, peers, and other significant persons are role models of behavior (Bandura, 1999; Bandura, 2001). They offer or limit an individual's opportunities to act and to gain experiences (Jessor, 2016). In these social bonds, individuals develop social normative beliefs (Flay et al., 2009). Beyond that, overarching sociocultural factors such as class membership, socio-economic status, or the extent of social disorganization shape individuals' knowledge and values, thereby also influencing their attitudes toward various behaviors (Flay et al., 2009). At the same time, these abilities as well as the development of self-efficacy are also determined by biological and intrapersonal factors that are relatively stable and difficult to change (Flay et al., 2009; Sameroff, 2010).

The development of life skills may thus be differently related to age and to various health-related influencing factors. Life skills in the two areas of "communication and interpersonal skills" and "coping and self-management skills" (see **Table 1**) may be strongly influenced by personal and biological factors (Flay et al., 2009). In early years of childhood, however, caregivers already significantly contribute to the development of these social and emotional skills, depending on their responsiveness to the child's needs (Immordino-Yang et al., 2019) and their abilities to regulate the child's emotional reactions, external activities, and social interactions (Sameroff, 2010). The third area of "decision-making and critical thinking skills" may be more closely connected to the further cognitive development of symbolic and abstract thinking (Immordino-Yang et al., 2019). This development enables not only the acquisition of knowledge about and critical reflection on health-related issues, but also a more conscious, structured, and reflective access to the other two areas of communication and interpersonal skills and of coping and self-management skills. Formal education thus has the potential to contribute to life skills promotion. By providing safe and supported opportunities to explore and reflect emotional and social experiences, as well as the interests, preferences, beliefs, values, social identities, and attitudes behind them (Flay et al., 2009; Immordino-Yang et al., 2019), as well as by offering role models who act responsibly regarding their own health and the health of others (Silbereisen and Weichold, 2007), schools could significantly support the acquisition of self-efficacy and agency (Bandura, 1999; Bandura, 2001; Immordino-Yang et al., 2019).

To investigate the life skills that are promoted at school, this review addresses the following questions:

1. What are the contents of evaluated school-based life skills programs during compulsory schooling, in terms of promoted life skills and addressed biological, psychological, and social factors that influence health and well-being?
2. Are the program contents tailored to the age of the students?

3. Are the programs effective in terms of promoting life skills, compared to control groups which do not receive life skills education?

METHODS

Search Procedures and Inclusion Criteria

We followed the PRISMA checklist (Moher et al., 2015) to conduct this systematic review. The review was based on peer reviewed and publicly available longitudinal evaluation studies on universal school-based LSE programs. We searched six electronic databases for original research, including ERIC, PsycINFO, PSYNDEX (all *via* OVID); PubMed; CINAHL (*via* EBSCO); and Cochrane Library. The search was conducted between June and September 2020 and the publication years were limited from 2007 to 2020, including only articles written in English and excluding published dissertations, book chapters, grey literature, or other kinds of research reports. The age of the targeted population was limited to 6–16 years, comprising the years of compulsory school attendance. The search terms and strategy were as follows: life skill; AND school OR kindergarten OR college OR child OR adolescen OR youth OR young people OR teen OR pupil OR student; AND intervention OR prevention OR health promotion OR health education OR program OR curriculum. The term "life skills" was allowed to occur in the whole text of the articles and, thus, was not restricted as content of the title, abstract, or keywords. This strategy was chosen to not exclude studies on other approaches which overlap with the life skills approach. However, to ensure that the identified studies referred to approaches similar to the life skills approach, the authors of such studies should mention the association with it in the text. The other search terms had to be present in the title, abstract, or key words to already narrow down the search results as clearly as possible to the targeted population and programs.

The literature search yielded 1,262 records. This sample was adjusted for publication year and duplicates, thereby excluding qualitative research, study protocols, and registration forms for clinical trials, as well as separating systematic reviews and meta-analyses from original research. This step resulted in 827 original research articles published between 2007 and 2020. Additional inclusion and exclusion criteria for the sampled studies were established in line with the purpose of this review (see **Table 2**). The scope of the study was literature focusing on school-based LSE programs conducted by teachers during compulsory schooling. Life skills development needs opportunities for extensive and deliberate practice as well as for transfer into everyday contexts where social and emotional problems need to be solved. In the school context, teachers play an important role in providing continuous and professional support and guidance for the development of students' transferable skills (Pellegrino et al., 2012). Moreover, for this review, LSE addressing health-related aspects, such as physical or mental health and well-being, and health-related behavior were focused. LSE programs were further included if they focused on at least three of the skills mentioned in the life skills classification from the WHO (1994, WHO, 2003; see **Table 1**). This criterion was set to reflect the claim of comprehensive skills development that underpins this approach. Thus, brief interventions of only one or two sessions, or programs based only on an informational approach were excluded because they are not judged as appropriate means to build skills. The LSE program may or may not be part of a comprehensive approach that includes other components, such as parent or community interventions, thus considering not only the school, but also other important social settings of children and adolescents. As the focus of the current review was on the content and age orientation of the programs, no further a priori restrictions were placed on program design, such as minimum length or intensity, implementation as part of the school curriculum or as a separate intervention, on teacher training and coaching, or on geographic localization. However, to ensure that good quality programs were examined and to analyze whether they affected the development of children and youth, the evaluation design of the studies had to be (quasi-) experimental, with a longitudinal perspective on student development. The study design had to include pretest measurements prior to the implementation of the program. For programs with a single intervention phase a time interval of at least 6 months between completion of the program and follow-up measurements was required. Programs that implemented booster sessions in the following school year were included if they at least conducted post-test measurements after this second phase. This may correspond to a longitudinal measurement over approximately 1.5 years. Finally, results on effectiveness with respect to program objectives had to be available.

Figure 1 shows the further screening procedure and the article extraction process. We screened titles and abstracts to extract original research that met these established inclusion criteria. 490 records were identified that did not meet the criterion of (quasi-) experimental design. In addition, 265 articles were excluded mainly because they did not target students in compulsory schooling aged 6–16 years, or they did not refer to school-based programs conducted by teachers. Some other original research did not include a follow-up measurement, or the follow-up was not scheduled at least 6 months after the completion of the intervention of the first year. After this screening, 72 articles remained for assessing eligibility by checking the full text. Another 22 studies were excluded because they were not teacher-led or did not meet the set criteria regarding the study design (n = 8). Finally, eleven studies could not be included mainly because they were not written in English, or they focused on less than tree life skills. Altogether, the final number of identified studies was 31. Further examination of the 31 studies revealed that around half of them (n = 16) originated from five research projects targeting the same sample. There were, however, studies referring to the same LSE program but originating from different research projects, and some studies included more than one LSE program. Altogether, the 31 studies included in this review derived from 20 research projects comprising 18 different school-based LSE or similar programs.

TABLE 2 | Inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
1. Original research published between 2007 and 2020 in a peer-reviewed journal, written in English	Published dissertations, book chapters, grey literature, and reports; publication year before 2007; publication language other than English
2. Programs that focused on life skills promotion or similar content, implemented in a universal approach at regular schools, with students aged 6–16 years; the life skills program could be part of a comprehensive approach containing other components such as parent or community intervention	Programs implemented in schools for special education, with groups selected by special criteria (selective or indicative approach), or with clinical individuals or groups; programs conducted after school or conducted in a non-school environment; main part of program conducted with students younger than 6, or older than 16 years
3. Programs that focused on at least three skills included in the WHO (2003) life skills classification	Key content of the program was not clear or not relevant for the research question
4. Programs conducted mainly by teachers	Programs conducted by other professionals, volunteers, or peers
5. Context of LSE: Physical or mental health and well-being, health-related behavior	Programs solely targeting academic variables, e.g., learning, achievement success, transition to university or vocation; programs mainly focusing on social/societal aspects such as human rights, democracy
6. Evaluation design included a control group, with pretest measurements as well as a follow-up ≥6 months after completion of the program, and/or a program with one phase in a first school year and booster sessions in a second year, with post-test after completion of this second phase; information on effectiveness over this time interval was reported	No control group, shorter time interval for follow-up or post-test, respectively; no specified research design; qualitative research; no reported information on effectiveness

Coding Scheme

We conducted content analysis to identify key words and phrases relevant to answering the research questions (Mayring and Fenzl, 2019; Miles et al., 2020). A coding scheme was developed to categorize the characteristics of the identified programs; the coding categories and sub-categories are shown in **Table 3**. Studies referring to the same research project were first analyzed and coded separately, and information was then aggregated per research project for reporting in the results section.

Targeted Population

This category included participants' grade level and age at beginning of the program, as well as the geographical location of program implementation. In addition, the sample sizes of the experimental and control groups were compiled.

Objectives of the Program

All listed objectives of the programs were recorded, thereby differentiating life skills objectives and further health-related objectives. The health-related objectives could relate to biological, psychological, and social influencing factors on health and well-being, such as substance use, eating behavior, or violence.

Theoretical Framework

This information was collected to provide a general map of the theoretical frameworks of LSE programs. The aim here was to further specify the influencing factors on health and health-related behavior on which the sampled LSE programs focused.

Program Contents

The main interest concerning the programs lay in a categorization of the targeted life skills. According to WHO (1994) and WHO (2003), three main categories could be differentiated (see **Table 1**). First were "communication and interpersonal skills" allowing the creation of supportive social relationships; this category subsumed behavior that is directed at others such as: interpersonal communication skills, negotiation and refusal skills, assertive skills, empathy building, cooperation and teamwork skills, and skills to motivate others to behave in a certain way. Second were "decision-making and critical thinking skills" that enable individuals to make informed decisions and choose healthy lifestyles; this category comprised information gathering skills; analysis of attitudes, social norms, beliefs, and motives that affect thinking and behavior, including myths and misconceptions transported by media and advertisement; identification and analysis of situations that push certain behaviors; problem-solving skills, with a focus on identifying and evaluating different behavioral solutions concerning a topic; and decision-making with regard to own behavior, such as avoiding certain situations. If the program included the acquisition of knowledge, it was assumed that this took place in an active and interactive form such as active seeking and/or critical examination of information, thereby justifying coding within this category. Third were "coping and self-management skills" for self-regulation; this category focused on intrapersonal motivational, emotional, and evaluative processes of self-regulation, such as increasing personal confidence, self-efficacy, and self-awareness; promoting self-monitoring skills, including the intrapersonal element of peer resistance skills (i.e., staying with a certain decision); skills for managing feelings, negative thoughts, and stress, including means of relaxation or other behavioral techniques; help seeking; and understanding psychological states, such as identifying and understanding own emotions and relating them to thoughts and thinking styles.

The second category recorded further program components within or outside the school, such as school policy, family, or community interventions that exceeded the sending of information letters and/or assigning homework. It was therefore documented whether the classroom-based program was implemented within a broader context.

A third category included the duration of the classroom-based program component.

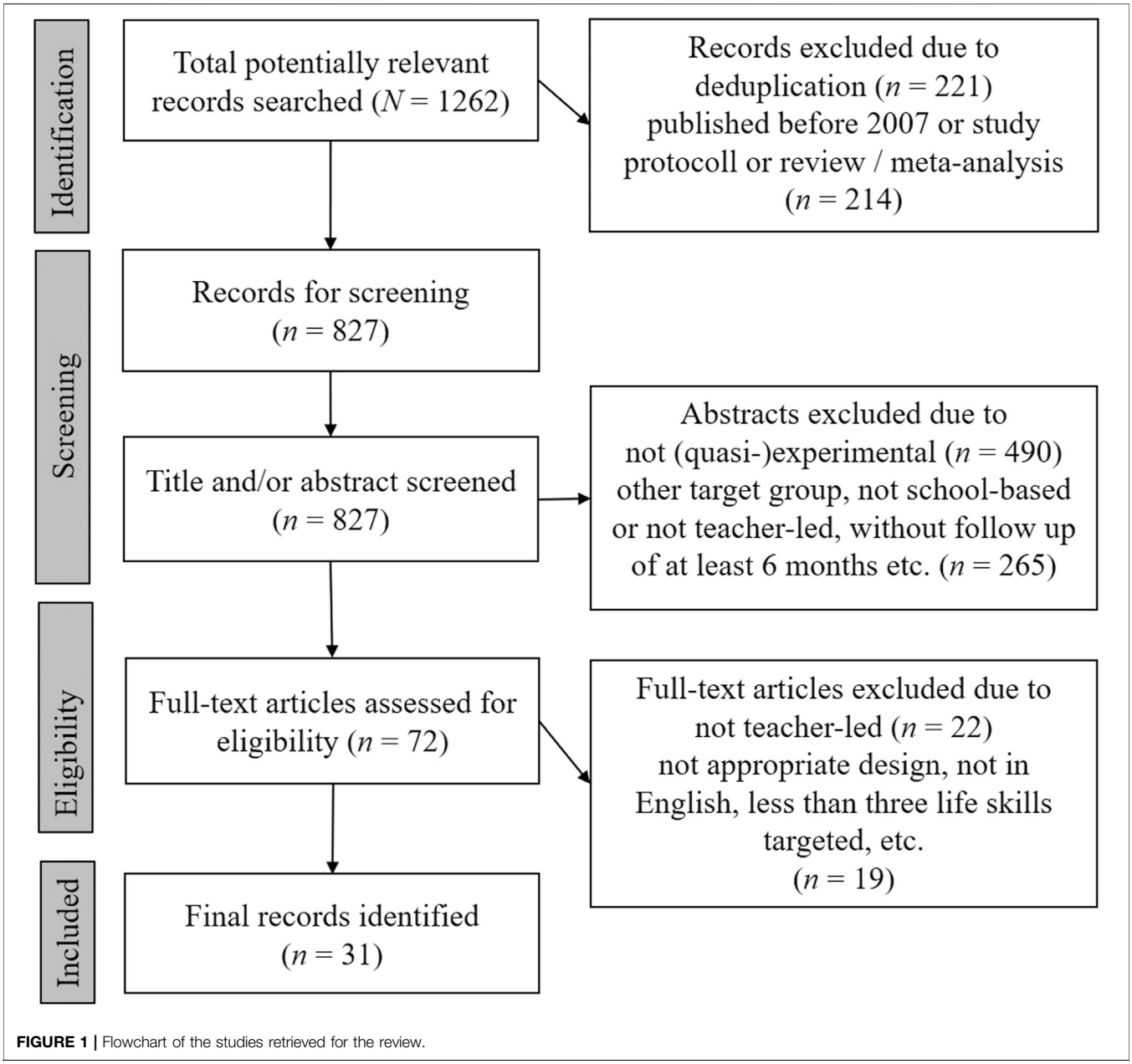

FIGURE 1 | Flowchart of the studies retrieved for the review.

Findings on Effectiveness

Statements of the longitudinal effects on life skills development and further health-related objectives were analyzed. The coding was based on a procedure shown in Peters et al. (2009) and Fenwick-Smith et al. (2018). If the experimental group, compared to the control group, showed significantly more favorable values or changes, this finding was coded with a (+); if the experimental group, compared to the control group, showed significantly less favorable values or changes, this finding was coded with a (−). If the experimental and control group did not differ concerning the targeted health issue(s) or life skills development, therefore showing a zero effect for the program, this finding was coded with a (0). This review did not include a meta-analytical evaluation of the results of effectiveness for two reasons: first, only a relatively small number of findings on effectiveness could be found, and second, the survey methods used in the identified studies were very different which makes it difficult the compare the effects.

RESULTS

Tables 4–6 summarize the identified program contents, sorted by three grade levels to reflect the age of the students (Grades 1–4, 5–6, and 7–9). For each age stage, the targeted life skills and information on the program effectiveness related to life skills development (if available) were listed, as well as the theoretical

TABLE 3 | Coding scheme for identified studies.

Categories	Sub-coding categories or description
Targeted population	1. Grades/age of students at beginning of the program 2. Geographical location 3. Sample sizes of the experimental and control groups
Objectives of the program	Description of the life skills and further health-related objectives targeted by the program
Theoretical framework	Theoretical background for the conceptualization of the program
Program contents	1. Targeted life skills ordered by three main areas: a. Communication and interpersonal skills to build supportive social relationships b. Decision-making and critical thinking skills to make informed decisions c. Coping and self-management skills for self-regulation 2. Further program components within and beyond school 3. Duration of the classroom-based program component
Effectiveness	Statements of effectiveness with respect to the targeted life skills and further health-related issues: (+) significantly more favorable values or changes in the experimental group than the control group (–) significantly less favorable values or changes in the experimental group than the control group (0) zero effect of the program

TABLE 4 | Summarized program contents and effectiveness (+/–/0) on life skills development and further health-related objectives, aggregated across programs for Grades 2–4.

Life skills (with effectiveness)			Theoretical frameworks → influencing factors on health and well-being	Further health-related objectives (with effectiveness)
Communication/ interpersonal skills	**Critical thinking/decision making skills**	**Coping/self-management skills**		
Relationships; rules; *social competence*: Positive social behavior / prosocial behavior (0), social-cognitive skills (0)	Problem-solving	Self-esteem	Cognitive-behavioral; risk/resilience factors	*Externalizing behavior*
		Identifying/connecting/ challenging thoughts-feelings-behavior: attribution (0)	→	Aggression (+)
		Relaxation/distraction	Psychological	Non-aggressive externalizing behavior (0)
		Pleasurable events	Social (Biological)	Impulsivity, ADHD/ hyperactivity (+/0) *Internalizing disorders* Depression, anxiety (0) Emotional difficulties/total difficulties score (+/0) Conduct/peer problems (0)

Italic: contents that were program objectives. (+) significantly more favorable values or changes in the experimental groups than the control groups; (–) significantly less favorable values or changes in the experimental groups than the control group; (0) zero effect of the programs.

frameworks underlying the programs. The influencing factors on health that were the focus of the programs were marked. Intrapersonal, social-interpersonal, and sociocultural influences were distinguished according to the theory of triadic influences by Flay et al. (2009). Following Sameroff (2010), intrapersonal influences were additionally divided into biological and psychological aspects. Finally, the effectiveness of the programs on further health-related objectives were collected (detailed information organized by research projects is provided as **Supplementary Table S7**).

The analyses showed that only 2 of the 18 school-based programs started in the first 4 years of elementary school. The other 16 programs began with the transition to adolescence—that is, in Grades 5–6 or Grades 7–9. An age-specific accentuation of the targeted life skills could be found, which related to an age-specific thematization of biological, psychological, and social influencing factors on health, as well as, in part, to differences dependent on targeted health topics. In the two programs conducted in Grade 2 and 4 (Malti et al., 2011; Rooney et al., 2013a; Rooney et al., 2013b) mainly intrapersonal psychological factors were addressed concerning internalizing and externalizing symptoms. They highlighted the skills to link emotions with self-related cognitions and their impact on self-regulation and coping behavior. Rooney et al. (2013a) and Rooney et al. (2013b) additionally included relaxation strategies and thus also focused on bio-physiological influencing factors at a behavioral level. Regarding externalizing behavior, Malti et al. (2011) also incorporated interpersonal factors by addressing social relationships, focusing on rule understanding, and on skills referring to positive social behavior. In adolescents' programs,

TABLE 5 | Summarized Program Contents and Effectiveness (+/–/0) on Life Skills Development and Further Health-Related Objectives, aggregated Across Programs for Grades 5–6.

Life skills (with effectiveness)			Theoretical frameworks → influencing factors on health and well-being	Further health-related objectives (with effectiveness)
Communication/ interpersonal skills	**Critical thinking/ decision making skills**	**Coping/self-management skills**		
Substance-specific skills: Assertiveness (+/0/–), *refusal* (+/0)	(Social) problem solving (0), decision making (avoiding, 0), critical thinking	*Resistance self-efficacy* (+/0)	Social influence, problem behavior, social learning, self-efficacy/behavior change, cognitive-behavioral/-affective, triadic influence, develop-mental tasks, health promotion, risk/ protective factors, planned behavior, health belief, positive youth development, acculturation	*Diverse substance use*
General social skills: Communication (+/0), negotiation, prosocial skills (0), empathy, collaboration/behavior in groups (0); peer/family relationships, social support; autonomy/tolerance (+)	Attitudes (+/0), values, *normative beliefs* (+/0), stereotypes, pressure, *social influence*	Identifying and linking feelings, thoughts, and behaviors; attributions, decatastrophizing, looking for evidence	→	Incidence/initiation (+/0), intention (+/0/–)
	Knowledge about substances (+/0), outcome expectancies	Coping with stress/negative emotions/anxiety	Social	Prevalence (+/0), frequency (+/0)
	Knowledge about advertising	*Self-management* *Self-esteem* (0), self-awareness Pleasant event scheduling	Sociocultural Psychological Biological	*School bonding (+/0)* *Subjective health* Quality of life (0), subscales (+/0/-), well-being (+/0) Strengths and difficulties (0), distress (+/0) *Internalizing problems* Depression/anxiety (+/0) *Suicidality* Suicidal ideation (+)

See ***Table 4***

a general emphasis on social and sociocultural influencing factors on health and well-being was evident. This focus brought to the fore the health-related role of social relationships (i.e., peers and families) in terms of rewards and rejection, as well as of social norms and beliefs (e.g., regarding physical appearance, peer behavior). These interpersonal and sociocultural influences were addressed by a broad set of life skills, mainly by thinking critically about these issues, supporting decision-making for a healthy lifestyle, promoting generic social skills as well as refusal and assertive skills, and strengthening coping and self-management skills such as resistance to harmful social influences, and skills to recognize the connection between thoughts, feelings, and behavior. This comprehensive approach has been adopted not only with respect to the prevention of substance use (e.g., Resnicow et al., 2008; Velasco et al., 2017), but also in relation to the prevention of internalizing symptoms such as depression (Wahl et al., 2014) and suicidal behavior (Roberts et al., 2011; Roberts et al., 2018). Biological factors influencing health were targeted in adolescence mainly by knowledge transfer, as well as by critical thinking about beliefs regarding the health topic, such as the neurophysiological effects of substance use or the physiological effects of dieting. For instance, to prevent eating disorders as well as internalizing symptoms, Warschburger and Zitzmann (2018) addressed myths about eating and dieting, but also the role of media, the impact of teasing and the importance of the self-concept.

Although the promotion of life skills was a primary content of the programs, their development was only partially examined in the studies. For instance, Malti et al. (2011) evaluated the development of social skills with comprehensive teachers,' parents,' and students,' ratings—however, with the result of zero effects for the program. Otherwise, they did not examine the development of intrapersonal skills which were also targeted within their elementary school program. The most findings on effectiveness with respect to life skills promotion were available for the programs conducted in Grades 5 and 6, with follow-up measurements 6 months up to 2 years after completion of the programs. Significant positive as well as zero effects were reported regarding interpersonal skills such as communication, assertiveness, refusal, or behavior in groups (e.g., Giannotta and Weichold, 2016; Menrath et al., 2012; Velasco et al., 2017). Referring to critical thinking and decision-making skills, positive and zero effects were found regarding the knowledge base, e.g., on biochemical effects of substances—keeping in mind that this knowledge was sometimes also imparted in control groups, due to current national curricula—as well as regarding reflection on normative beliefs and attitudes (e.g., Johnson et al., 2009;

TABLE 6 | Summarized program contents and effectiveness (+/–/0) on life skills development and further health-related objectives, aggregated across programs for Grades 7–9.

Life skills (with effectiveness)			Theoretical frameworks → influencing factors on health and well-being	Further health-related objectives (with effectiveness)
Communication/ interpersonal skills	**Critical thinking/decision making skills**	**Coping/self-management skills**		
Substance-specific skills: Assertiveness, *refusal* (0)	Problem solving, conflict resolution; plan of action/ decision making/healthy choices in free time	*Resistance self-efficacy*	Social influence, social learning, problem behavior, attitude-social influence-self efficacy, planned behavior, cognitive-behavioral, multi-directional influences/developmental systems, developmental psychology, social information processing, social competence, tripartite influence model of body image and eating disturbance; risk factors	*Diverse substance use*
General social skills: Boy–girl relationships (+ at young adult age), peer group/support, communication, negotiation, prosocial skills	*Knowledge* about substances (+), condom use (+), eating and dieting, motives/ consequences of teasing	*Self-management*	→	Incidence/initiation (+/0; + up to young adult age)
Anti-teasing classroom climate (0)	*Norms, beliefs* (0 perceived harms of substances), attitudes toward substance use (0) and eating/dieting (+), values, social pressure, social influence, media	Self-awareness, self-image, positive self-talk, self-concept, (pillars of) self-esteem, acceptance of own strengths/ weaknesses	Social	Prevalence (+/0)
	Reflecting media techniques/ artificial beauties: Media pressure/perfectionism (+), social comparison (+)	Concept of attractivity: Diversity, multidimensionality, effects of positive feedback	Sociocultural	Frequency (+/0, also till young adult age)
	Knowledge, beliefs etc. about diverse topics: Sexuality, mental health, gender, violence	Identifying, understanding, challenging of (negative) cognitions–emotions–behaviors linkages	Psychological	Cessation (0)
		Facing changes and problems; coping with anxiety/anger/ (appearance-related) stress and peer pressure	Biological	Associated harms (+/0)
		Seeking help with adults/talking to parents (0)		*Sexuality* Intercourse (0) Condom use/self-efficacy in use (+) *Antisocial behavior* Antisocial influence network/ orientation (+) *Depression, internalization* Depression symptoms (+/0, + at young adult age) Internalization (0) Relationship problems (+) *Eating disorders* Bulimic, drive for thinness, body dissatisfaction (0) *School bonding*

See ***Table 4***

Clark et al., 2010; Isensee et al., 2014; Midford et al., 2018). Problem-solving and decision-making/avoidance skills, however, were not affected by the programs (Giannotta and Weichold, 2016; Velasco et al., 2017). Progress in coping and self-management skills has been little examined. Positive but mainly zero effects were reported regarding intrapersonal resistance skills (Clark et al., 2010; Isensee et al., 2014; Giannotta and Weichold, 2016), whereas self-esteem (Giannotta and Weichold, 2016), or the intention to seek adults' help in face of troubles (Midford et al., 2018) were not impacted by the programs. Finally, referring to programs at Grade 7 to 9, findings on effectiveness on the development of

life skills were mostly missing in the studies (e.g., Vartiainen et al., 2007; or Spoth and colleagues, e.g., in; Spoth et al., 2011).

The results also showed that the objectives of the programs regarding health issues varied depending on student age. The two programs starting in the first years of elementary school (Malti et al., 2011; Rooney et al., 2013a; Rooney et al., 2013b) aimed to prevent and reduce problematic externalizing behaviors (aggression, hyperactivity) and/or internalizing symptoms (depression, anxiety). Three of the 16 programs implemented with adolescents also focused on preventing internalizing disorders (Roberts et al., 2011; Wahl et al., 2014; Roberts et al., 2018), with one of these programs also addressing the prevention of eating disorders (Warschburger and Zitzmann, 2018). However, as a majority, 14 of the 16 programs targeting adolescents focused on substance use prevention, with some of them combining this issue with promoting mental health and well-being (e.g., Menrath et al., 2012; Velasco et al., 2017), or other health-related issues that become salient during adolescence, such as school bonding (e.g., Giannotta and Weichold, 2016), leisure activities (Smith et al., 2008), suicidality (e.g., Roberts et al., 2018), or sexual behavior and sexually transmitted illnesses (Smith et al., 2008). Concerning program effectiveness for these health issues, in the sum, the evaluation findings were mostly inconsistent, i.e., with significant positive as well as zero effects. However, the large-scale study of Spoth and colleagues found positive long-term effects into young adulthood not only with respect to substance use (e.g., Spoth et al., 2017) but also on depressive symptoms and relationship problems (Trudeau et al., 2016). Within the comprehensive body of evaluation results, very few negative effects were found (see Tables 7a–7t in **Supplementary Material** for more details).

The programs varied widely regarding duration and incorporation into a broader health promotion approach (see Tables 7a–7t in **Supplementary Material** for more details). In 6 of the 18 programs, the school-based curriculum was delivered within a single school year. Five of these six programs were scheduled for 9–15 weekly sessions; only one program targeting students in Grade 2 spanned the entire school year. Otherwise, 10 of the 18 programs for adolescents laid a foundation with 5–15 sessions in the first program year and proceeded, mostly with fewer weekly sessions, into the following school year. Five of them also encompassed a third school year. Eight programs were embedded in a broader approach; these mostly comprised a program component for parents and, in some cases, also for other peers, and/or for other school- or community-directed issues.

DISCUSSION

Summary

LSE assumes that people can change the way they face the circumstances in their inner and outer world, and how they proactively and reactively deal with them. LSE mainly builds on children's and adolescents' increasing cognitive abilities to think critically about the biological, psychological, and social influencing factors on health, to make decisions consciously concerning a healthy lifestyle, to self-regulate, and to regulate social relationships. LSE thereby inherently illustrates the developmental perspective of manifold nonlinear and complex interactions between individuals and their social environment (Sameroff, 2010; Zelazo, 2013; Immordino-Yang et al., 2019).

Growing evidence has shown that the three areas of communication and interpersonal skills, critical thinking and decision-making skills, and coping and self-management skills may be accessible for alteration by formal education (Durlak et al., 2011; Burrus and Brenneman, 2016; Immordino-Yang et al., 2019). The purpose of this systematic literature review was to examine 1) which life skills and influencing factors on health and well-being were targeted in evaluated school-based LSE programs, 2) the extent to which the program contents were tailored to the age of the students, and 3) whether the programs were effective in promoting life skills. The analyses were based on 18 different LSE programs.

The analyses showed that the targeted life skills shifted from a more behavioral-affective focus in childhood to a broader set of life skills targeted in adolescence, which accentuated a social-cognitive approach. The reflection on socially shared norms, attitudes, beliefs, and behaviors, as well as on the quality of social relationships, was thus emphasized, combined with decision-making for a healthy lifestyle, and cognitive-behavioral resistance to harmful influences. In addition, programs in adolescence, compared with those in childhood, focused on promoting generic social skills, such as communication skills, or assertiveness. Following Sameroff (2010), this shift of content comparing childhood and adolescents' programs could be interpreted as a shift from mostly other-regulated toward more self-regulated approaches to health promotion. In childhood, significant others intervene in the child's internal and external regulation. In adolescence, students are asked to analyze critically these environmental influences and to take responsibility for their own regulation processes. The social-cognitive LSE approach thereby has the potential to support this self-regulation of internal experiences and external behavior.

According to Mertens et al. (2020), building insights that help to achieve self-understanding and adjust attitudes is associated with positive effects on intrapersonal and interpersonal domains, such on resilience, self-regulation, and social competence. Thus, the emphasis of life skills approaches to critical thinking and reflection on biological, psychological, and social mechanism provides a powerful and structured access to interpersonal and intrapersonal regulation. In addition, as stated by Avan and Kirkwood (2010), the emphasis on social influences in public health approaches is not surprising, given the opportunity to address issues of social inequality or childcare practices. The importance of addressing the social influencing factors on health and well-being is confirmed by other reviews. Regarding substance abuse, sexual behavior, and dietary programs with students aged 12–18 years, Peters et al. (2009) reported the strongest effects when programs addressed social influences—especially social norms—and cognitive-behavioral skills. Singla et al. (2020) found that addressing parent–child interactions and evaluating interpersonal relationships, together with promoting stress management, showed the strongest effects on mental health topics (decreased posttraumatic stress disorders and anxiety, among others) with students aged

10–19 years in low- and middle-income countries. However, the impact of the promotion of the various life skills on health topics may be domain specific. Mertens et al. (2020), for instance, stated in their meta-analysis regarding secondary school students that the promotion of assertiveness was associated with weaker effects on internalizing problems, and aggression. In their analysis programs targeting substance use were excluded—but these programs frequently implemented this social component, as our analysis showed. Thus, differential effects dependent on the targeted health topic must be further investigated.

Regarding program effects on the development of life skills, only a subset of the studies provided results. This is consistent with the observation that the promotion of life skills was mentioned only partially as an explicit program objective. The available study results showed that the programs tended to have an impact on interpersonal and communication skills, such as assertiveness, and on health-related knowledge, normative beliefs, and health-related attitudes. However, the identified programs had no significant impact on problem-solving and decision-making skills or coping and self-management skills. Within these findings, a larger part referred to knowledge, beliefs, and attitudes—presumably for methodological reasons of collecting the data. The other components were less reported regarding the effectivity of their promotion; especially the area of coping and self-management, but also (social) problem-solving was underrepresented. Moreover, the promotion of problem solving was poorly implemented in the programs. This may be a shortcoming in terms of the impact of life skills programs, as problem-solving skills were found to be an important component of relationship building (Mertens et al., 2020).

Most programs were directed at early or mid-adolescence; only 2 of the 18 programs started in the first 4 years of elementary school. The programs for adolescents mainly focused on substance use and to a much lesser extent, on internalizing symptoms, suicidality, diet, and sexuality. This result is in line with the findings from Peters et al. (2009), who showed that substance use was a main topic of LSE programs, while sexuality was less often targeted. In contrast, while Peters et al. (2009) did not find any LSE programs targeting dietary habits, we could refer to one such program, showing that LSE is also implemented within the topic of eating disorders and could have an impact on related social issues (media pressure, social comparison). The programs partially had effects on externalizing behavior (aggression, hyperactivity, antisocial behavior), externally controllable behavior (substance use, condom use), emotional regulation, suicidal ideation, and depression, but no effects were found regarding anxiety or eating disorders.

The duration of the programs varied from 5 to 15 weekly sessions in the first year of implementation, and usually fewer sessions in the following one or two school years, if any were provided at all. Some of the programs were embedded in a broader health promotion approach, which could also target parents or school politics, for example. In this context, long-term effects can be expected from approaches that span several development phases, addressing the respective development issues and including other important settings for the child and adolescent (Peters et al., 2009; MacArthur et al., 2018; Singla et al., 2020).

Limitations

Although geographic localization was not an exclusion criterion in this review, mainly programs implemented in Western countries (United States, Europe, Australia) remained for analysis, which limits the generalizability to other cultural contexts. Only two programs from South Africa (Resnicow et al., 2008; Smith et al., 2008) met the inclusion criteria of a longitudinal (quasi-) experimental study design with a follow-up measurement at least six months after program completion or a program duration which extended into a second school year and included posttest measurements. As already mentioned by Nasheeda et al. (2019), evaluation studies originating from developing and emerging economies were often limited to reporting short-term outcomes without any follow-up to test effectiveness. In addition, as Resnicow et al. (2008) mentioned in their South African study included in this review, the transfer and adaptation of programs from one culture into another need to be done carefully, accompanied by extended research, pretesting and evaluation, to get knowledge if the program contents and strategies are appropriate for this other culture. Developing and emerging economies, thus, are underrepresented in this review although they are of particular interest at global level in terms of building "enabling environments" and strengthening national school systems that establish the development of transferable skills (UNICEF, 2019).

A second limitation is that only a subset of the studies evaluated the program effectiveness in promoting life skills. The reported effects should thus be interpreted with caution. Results mainly referred to knowledge acquisition, as well as to changes in beliefs and attitudes toward the specific topic due to critical thinking, and, to a lesser extent, to interpersonal skills such as refusal skills or assertiveness. With respect to coping and self-management, few results on effectiveness were available. In addition, the effectiveness was mainly evaluated by students' self-reports. Thus, the results regarding the development of life skills might primarily reflect the students' cognitive representation of their own skills and experiences, and the degree to which these representations reflect actual skills performance is questionable. However, some studies additionally relied on external perspectives from parents and teachers; these findings showed effects that were roughly consistent with the children's self-reports (Malti et al., 2011; Roberts et al., 2011; Menrath et al., 2012; Rooney et al., 2013a; Rooney et al., 2013b; Roberts et al., 2018).

Additionally, as with program effectiveness on further health objectives, only a few negative effects were reported. This raises the presumption of publication bias. As other reviews have shown, however, having a theoretical framework is an important element of designing high-quality and effective prevention and health promotion programs (Peters et al., 2009; Foxcroft and Tsertsvadze, 2012; MacArthur et al., 2018). All programs extracted for our review—except one—provided such information on theoretical frameworks, indicating that the included programs overwhelmingly met this criterion. In addition, a high quality of implementation influences effectiveness (Durlak and DuPre, 2008). Some of the included evaluation studies provided information about the quality of implementation that would allow further assessment of program quality.

Conclusions

LSE promotes health-related self-regulation, informed decision-making, and the building of supportive relationships, mainly in adolescence. The skill of critical thinking, which is closely connected to the cognitive development of symbolic and abstract thinking, is an important agent to access these issues. Formal education can thus contribute to life skills promotion if exploration of and reflection on emotional and social experiences is embedded in a safe environment (Immordino-Yang et al., 2019) with ongoing opportunities to practice (Pellegrino et al., 2012).

However, there is still a lack of research regarding the question of to what extent and at what age life skills are accessible to change (UNICEF, 2019). Further research needs to clarify the role of LSE in the early years of elementary school and how sustainable effects on life skills development could be achieved—having in mind a content, instructional, and structural perspective (Mertens et al., 2020). Human behavior is caused by a complex network of interrelated influencing factors (Flay et al., 2009), with this interrelation assumed to be dynamic over developmental stages (Sameroff, 2010). To examine even a part of these bio-psycho-social interactions longitudinally, well-designed studies are needed. To identify potential factors that contribute to programs being effective, as well as those that could lead to negative or zero effects, these studies also need to focus on the development of life skills and not only on changes in health and well-being or health-related behaviors (Flay et al., 2009; Jones and Parker, 2014; MacArthur et al., 2018; Smithers et al., 2018; Nasheeda et al., 2019). Furthermore, it is important to examine the extent to which program contents can be adopted given diversity characteristics such as gender, race/ethnicity, or disability status (Rowe and Trickett, 2018), and how sensitive the programs are to the diverse needs and experiences of young people (Peters et al., 2009).

The life skills suggested by the WHO (1994) and WHO (2003) are strongly interrelated, and efforts are necessary to clarify their content as well as their categorization. For example, decision-making for health-related behavior is strongly correlated with action control, which itself could be classified as a sub-aspect of self-management. In line with that, efforts are necessary to clarify the conceptual overlap with other approaches such as the OECD framework of social-emotional, and cognitive skills (OECD 2019a; OECD 2019b), the Social and Emotional Learning approach (Durlak et al., 2011; Oberle et al., 2016; Osher et al., 2016; Immordino-Yang et al., 2019) or resilience-enhancing approaches (Fenwick-Smith et al., 2018) and to bring together these research programs. For instance, (Abrahams et al., 2019, based on Primi et al., 2016) proposed an integrative set of five social-emotional skills domains derived from the research on the Big Five personality traits. These five domains overlap with the tree main categories suggested by the WHO: Self-management and Negative-Emotion Regulation match the WHO category of coping and self-management skills; Engaging with others and Amity refer to aspects considered in the WHO category of communication and interpersonal skills; Open-mindedness targets aspects of intrinsically motivated creativity and invention that relate to some aspects of the WHO category of decision-making and critical thinking skills; however, regarding this latter category the WHO additionally anchors the promotion of skills that deal with the analysis and reflection of attitudes and values, social norms, beliefs, and motives that influence behavior—thus emphasizing meta-cognitive skills, which are also mentioned by the OECD framework (OECD, 2019a; OECD, 2019b). In sum, to facilitate the embedding of LSE into national curricula, these joint efforts of identification, clarification, and categorization of a manageable group of core skills are crucial, as well as tailoring its promotion to the students' age (UNICEF, 2019)—without neglecting that different life skills may have differential impact depending on the health issue being targeted (Mertens et al., 2020). In this context, there is a need to develop tools to assess life skills development beyond students' self-reports (Abrahams et al., 2019). This will also help to clarify the effectiveness of life skills programs which may be, according to Sancassiani et al. (2015), in some part controversial due to methodological problems in reliably and validly assessing life skills and other health-related issues. The extent to which the included studies in this review relied on reliable and valid measurement instruments also requires further investigation. To carry out a meta-analytical evaluation of the effectiveness of life skills promotion, these various methodological issues have to be considered.

Finally, there is the question of the extent to which teachers can continuously implement LSE in their classrooms with a reasonable amount of effort. As various reviews have shown, the training of program facilitators, such as teachers, and their coaching during implementation is essential for the effectiveness of LSE (Peters et al., 2009; MacArthur et al., 2018; see also the original research of (Roberts et al., 2011 and Roberts et al., 2018), reviewed here, for effects on training only vs. training and coaching during implementation). Efforts are needed to prepare teachers professionally for the sustainable implementation of key aspects of life skills promotion.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusion of this article will be made available by the authors, without undue reservation.

AUTHOR CONTRIBUTIONS

EK and RK conceptualized the study. EK conducted the literature research and study extraction, the latter partially supported by an assistant. EK conducted the data coding under continuous consultation with RK. EK wrote the first draft of the manuscript. EK and RK edited the manuscript.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2021.660878/full#supplementary-material

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CONCEPTUAL ANALYSIS
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Social, Emotional, and Behavioral Skills: An Integrative Model of the Skills Associated With Success During Adolescence and Across the Life Span

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Social, emotional, and behavioral (SEB) skills encompass a wide range of competencies related to how individuals build and maintain relationships, understand and manage emotions, pursue goals, and learn from experience. Despite near-consensus on the importance of SEB skills for success in life, there are numerous frameworks that simultaneously converge and diverge in how they define and measure SEB skills. In this article, we discuss our integrative model encompassing five broad skill domains: Self-Management, Innovation, Social Engagement, Cooperation, and Emotional Resilience Skills (Soto et al., 2021a). Our model defines SEB skills as *skills* (i.e., what someone is capable of doing) and not *traits* (i.e., what someone tends to do). Using this definition and model as a foundation, we argue for the importance of investigating SEB skill development during adolescence, a period where SEB skills may be both particularly amenable to change and particularly predictive of life outcomes. In particular, we highlight how SEB skills allow adolescents to take advantage of the new opportunities afforded to them as they make major cognitive and social transitions.

Keywords: social, emotional, and behavioral skills, socioemotional skills, adolescence, social and emotional learning (SEL), big five

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INTRODUCTION

A person's successful development is multicausal. No one factor, whether at the biological, psychological, social, or historical levels, guarantees a person's positive development. Nevertheless, researchers have long sought to identify the individual characteristics that can alter a person's chances for positive development. In recent years, this search has led scholars across the social sciences to investigate the nature, structure, assessment, and correlates of a broad range of personal qualities, sometimes termed noncognitive skills, character strengths, socioemotional competencies, or *social, emotional, and behavioral (SEB) skills* (Soto et al., 2021b). These constructs hold promise as potential predictors of positive development. Many studies have demonstrated their associations with positive development, and there is some evidence suggesting their malleability (Duckworth et al., 2007; Durlak et al., 2011; Heckman and Kautz, 2012; Kautz et al., 2014; Nagaoka et al., 2015; National Research Council, 2012; OECD, 2015; Taylor et al., 2017).

But beneath this promise, fundamental issues of conceptualization and measurement remain. There is no consensus as to what these personal qualities are and what they are not. There is also no consensus taxonomy of personal qualities, nor is there a consensus of these qualities' developmental characteristics. We believe that the field's ability to best understand and promote positive development requires placing some "stakes in the ground" that begin to delineate a shared path forward.

We aim to build toward consensus in this field by providing our responses to four key questions. *First*, how should the personal qualities that predict positive development be conceptualized? We argue that these qualities are best understood as skills and not traits. We define SEB skills as a person's capacities to maintain social relationships, regulate emotions, and manage goal- and learning-directed behaviors (Soto et al., 2021a). *Second*, how can the wide range of SEB skills be taxonomized? We argue the behaviors included in the Big Five personality domains provide a comprehensive foundation for a skills-based taxonomy that is both conceptually and empirically justifiable. *Third*, how should SEB skills be measured? We argue that self- and observer-reported skills inventories are optimal. *Fourth*, is there a period of the life span that holds particular promise for SEB skills research and interventions? We argue for adolescence as a focal period for SEB skills research.

HOW SHOULD THE PERSONAL QUALITIES THAT PREDICT POSITIVE DEVELOPMENT BE DEFINED AND CONCEPTUALIZED?

At present, most reviews in this broad literature begin similarly: by listing the historical evolution and the contemporary abundance of terms used to describe the field (e.g., soft skills, social and emotional skills, character strengths) (National Research Council, 2012; Duckworth and Yeager, 2015; Berg et al., 2017; Abrahams et al., 2019). A grasp of the field's history does provide valuable context. But we encourage readers to look past the differences in existing and historical *terms* for the personal qualities associated with success in life, and instead focus on the similarities and differences in the way most of these terms are conceptualized. Regarding similarities, Duckworth and Yeager (2015) noted that the various terms in this literature tend to share five core features: These personal qualities are conceptualized to be 1) beneficial to a person and their social partners; 2) expressed most clearly in relevant situations; 3) distinct from measured intelligence; 4) somewhat stable over time; but also 5) malleable, or potentially responsive to interventions (Duckworth and Yeager, 2015).

These similarities seem a reasonable starting point from which to build consensus. However, this "big tent" includes an extremely broad range of personal qualities that can include beliefs, attitudes, values, motivations, personality traits, and skills. From our vantage, this inclusivity actually stifles opportunities to come to conceptual or measurement consensus. Thus, as a first stake in the ground, we recently suggested shifting the field's focal length from a broad and inclusive set of personal qualities to, more narrowly, SEB skills, which we defined as *capacities to maintain social relationships, regulate emotions, and manage goal- and learning-directed behaviors* (Soto et al., 2021b).

Our conceptualization adds two important distinctions to Duckworth and Yeager's core features. First, SEB skills are not traits, or a person's "average" or "typical" behavior in a domain. We intentionally define SEB skills as capacities, or how someone *is capable of behaving* when the situation calls for it (Paulhus and Martin, 1987; Wallace, 1966, Wallace, 1967)[1]. This distinction recalls early work in personality and applied psychology that distinguished between typical and maximal performance of behavior (Sackett et al., 1988; Turner, 1978). In making this distinction, we are not arguing that traits do not relate with people's relationships, emotions, goals, and learning; they certainly do. Nor do we argue that skills should replace traits as predictors of positive development. Instead, we propose that traits and skills may predict different aspects of positive development or predict positive development in different ways. A second added component of our definition is that it delineates the broad categories of capacities that can be considered SEB skills. In our conceptualization, SEB skills encompass a diverse set of behaviors that include, for example, how people socially interact and collaborate, how they manage and modulate their emotions, and how they work toward accomplishing shorter-term tasks and longer-term goals.

Why introduce a new term in "social, emotional, and behavioral skills" when others already proliferate? Researchers, practitioners, policymakers, and the general public will ultimately decide which term best captures this domain. However, we believe that the term SEB skills provides some benefit in that it integrates two bodies of research that have developed concurrently across the last several decades. Acknowledging the work of developmental psychologists and educational researchers, SEB skills incorporates the "social and emotional" terminology common in those fields. Similarly, the "behavioral" component SEB skills acknowledges the work of personality and motivational psychologists, as well as economists, who have suggested that a constellation of skills or actions related to self-regulation, self-control, and conscientiousness are malleable and play a critical role in predicting positive life outcomes (Almlund et al., 2011; Heckman and Kautz, 2012; Kautz et al., 2014; Scorza et al., 2016). Finally, we intentionally chose the word "skill" both to emphasize that these attributes are malleable, trainable capacities (rather than fixed traits) and because it is colloquial and accessible to researchers, practitioners, and the general public.

[1]We note here that others in the field sometimes use the term "capacity" to refer to what we term traits (e.g., see Keizer et al., 2019 for a useful perspective on self-reliance).

TABLE 1 | Aligning prominent taxonomies of competencies, character strengths, and skills.

BESSI domains	Social engagement Skills	Cooperation Skills	Self-management Skills	Emotional Resilience skills	Innovation Skills
21st century competencies	Interpersonal competencies		Intrapersonal competencies		Cognitive competencies
Five Cs of positive youth development	Connection	Caring	Competence Character*	Confidence	
CASEL core competencies	Relationship skills	Social awareness	Self-management Responsible decision-making*	Self-awareness	
OECD framework	Engagement with others	Collaboration	Task performance	Emotion regulation	Open-mindedness

21st century competencies (National Research Council, 2012). Five Cs of positive youth development (Lerner et al., 2005). CASEL core competencies (Collaborative for Academic, Social, and Emotional Learning, 2020). OECD framework (Chernyshenko, et al., 2018).

**We provisionally assign character and responsible decision-making to combine aspects of Cooperation and Self-Management Skill.*

HOW CAN THE WIDE RANGE OF POSSIBLE SOCIAL, EMOTIONAL, AND BEHAVIORAL SKILLS BE TAXONOMIZED?

Just as there are many terms for constructs related to SEB skills, there are also many (at least 136; Berg et al., 2017) different frameworks or taxonomies for organizing specific personal attributes within broader domains. Prominent frameworks for constructs that are conceptually-adjacent to SEB skills include, for example, the National Research Council's 21st Century competencies, CASEL's Framework for Social and Emotional Learning, the OECD's Framework for Social and Emotional Skills, and the Lerner and Lerner's Five Cs Model of Positive Youth Development[2]. These prominent taxonomies of SEB skills are compared and contrasted (relative to our proposed taxonomy, described later) in **Table 1**.

The similarities across models in **Table 1** provide some footholds toward taxonomic consensus. For one, in balancing the needs to capture a broad range of skills while also remaining intuitive and parsimonious, attribute taxonomies tend to include three to five domains. Moreover, the included domains overlap considerably across taxonomies in their psychological content. Among three-domain models, the 21st century competencies taxonomy and the character strengths taxonomy provide an illustrative example. Both models include three skill domains, labeled as "intrapersonal," "interpersonal," and "cognitive" or "intellectual" capacities or strengths. Prominent five-domain taxonomies are also often characterized by considerable overlap. For example, the CASEL taxonomy differentiates interpersonal capacities into two domains: those for setting and pursuing goals (self-management competencies), and those for understanding one's attitudes, values, and emotions (self-awareness competencies). Similarly, the Five Cs taxonomy breaks down intrapersonal capacities into those used to achieve goals in life domains important to youth, like school, work, and athletics (competence skills), and those youth use to support their emotions, motivation, and values (confidence skills).

But there are also important differences across taxonomies. Some of these issues are conceptual: existing taxonomies sometimes focus on one type of personal quality (e.g., the OECD taxonomy is comprised of only traits), whereas others include multiple types like skills, traits, attitudes, values, and more. Other differences are structural: some frameworks are composed of superordinate attribute domains alone (e.g., the 5Cs model). Among those taxonomies that do include subordinate attributes or "facets," there is variation in these attributes' number and content.

Using the Big Five Personality Domains to Taxonomize Social, Emotional, and Behavioral Skills

If there are already over one hundred taxonomies for SEB skills and related concepts, then why introduce another? We have two motivations. First, we believe that a consensus taxonomy should be *comprehensive*, accounting for the wide range of skills associated with success. Second, a consensus taxonomy should be *evidence-based*, deriving from an expansive body of research that informs its structure and guides future research. Work in each of the existing frameworks has made meaningful contributions, but in our view, none fully satisfies both conditions.

We have proposed that SEB skills can be organized in terms of five broad domains informed by the Big Five personality traits (Soto et al., 2021a), an organizational framework that we believe satisfies both conditions stipulated above. Relevant to the requirement of comprehensiveness, the Big Five provide a wide-ranging conceptual and empirical framework for studying human behavior. Behaviors associated with Conscientiousness and Openness to Experience relate to educational and occupational attainment (Heckman and Kautz, 2012; Noftle and Robins, 2007; Wilmot and Ones, 2019). Behaviors relevant to the Extraversion and Agreeableness domains are associated with a wide range of interpersonal behaviors (DeYoung et al., 2013; McCrae and Costa, 1989). Similarly, Extraversion and Emotional Stability capture key characteristics of a person's emotional life (i.e., positive and negative affect; Diener et al., 2003).

[2]For those interested in comparing the various frameworks in detail, we suggest the useful "Explore SEL" web resource by Stephanie Jones and the EASEL lab (easel.gse.harvard.edu).

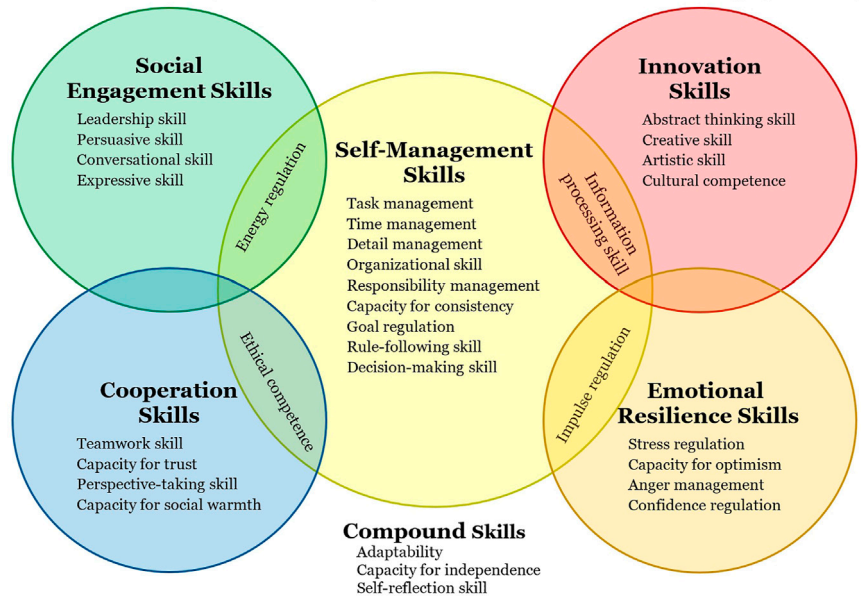

FIGURE 1 | A proposed domain-level taxonomy of SEB skills.

The Big Five also provide a sufficient evidence base. Research spanning early childhood through old age (Allemand et al., 2008; Roberts and Mroczek, 2008; Shiner and DeYoung, 2013; Soto and Tackett, 2015) has demonstrated that the Big Five constitute a useful taxonomy for summarizing people's characteristic thoughts, feelings, and behaviors across a wide range of global cultural contexts (Saucier and Goldberg, 2001; Schmitt et al., 2007; De Raad et al., 2010). We therefore argue that work on SEB skills can usefully adapt this taxonomy by replacing a trait-based conceptualization with one that is skills-based, while using the same behavioral referents. We further propose that this taxonomy's research base can stimulate a vibrant set of research questions and hypotheses regarding how skills and traits are similar or different in terms of their structure, assessment, development, and outcomes.

In general, we hypothesize that skills and traits sharing the same behavioral referents are positively correlated, due to these common referents as well as the developmental interplay of experience, skill, and disposition. For example, consider leadership. Many adolescents may lack meaningful leadership experience. Nonetheless, if given the proper training, their capacity or skill to lead would be enhanced, even if their proclivity for leadership were lacking. Once armed with the capacity to lead and then given the opportunity to lead as they age, people first relying on their skill could then develop the habitual propensity toward effective leadership, manifest in traits such as assertiveness combined with thoughtful consideration. Conversely, it may be that someone who is dispositionally well-suited for leadership (e.g., high extraversion and agreeableness) chooses or selects leadership experiences that leads to skill development. Despite these strong links, traits and skill can still be differentiated from each other. Consider a person in a leadership position who struggles to actually lead their team (high trait, low skill) or the usually-introverted person who, in a moment of crisis, emerges from their typical support role to lead their team (low trait, high skill).

To begin addressing the developmental interplay of skills and traits, as well as other critical questions, we have developed a conceptual and assessment framework of 32 specific SEB skills arrayed across five domains, and examined these skills' points of convergence and divergence with alternative models of strengths, competencies, and traits (Soto et al., 2021a; Soto et al., 2021b). Conceptually, the five domains of SEB skills we propose include:

1 Social Engagement Skills: capacities used to actively engage with other people (cf. Extraversion);
2 Cooperation Skills: capacities used to maintain positive social relationships (cf. Agreeableness);
3 Self-Management Skills: capacities used to effectively pursue goals and complete tasks (cf. Conscientiousness);
4 Emotional Resilience Skills: capacities used to regulate emotions and moods (cf. Emotional Stability vs. Neuroticism);
5 Innovation Skills: capacities used to engage with novel ideas and experiences (cf. Openness to Experience).

Table 1 compares our domain-level taxonomy to other prominent taxonomies. **Figure 1** provides a visual depiction of our proposed taxonomy, including the individual skill facets. The five SEB skills domains we propose are not rigid, exclusive categories. Our system includes interstitial and compound skills at the intersection of two or more broad domains. We also do not assume at this juncture that our list of 32 facets is complete, and expect that future research will reveal more skills and some reorganization of the overall structure.

HOW SHOULD SOCIAL, EMOTIONAL, AND BEHAVIORAL SKILLS BE MEASURED?

To this point, we have argued that SEB skills represent a promising focal point for conceptualizing the personal qualities associated with success. We have also argued that SEB skills can be organized in terms of five broad domains that resemble the Big Five in terms of their social, emotional, and behavioral referents, but are defined as sets of functional capacities rather than traits. We now consider issues of measurement.

At present, a common approach to measuring these attributes is to use the questionnaire format of a personality inventory. These measures commonly use adjectives, phrases, or statements describing behavioral tendencies (e.g., "I got my work done right away instead of waiting until the last minute"). Participants rate how well each item describes their own tendencies, often using a Likert-type format (e.g., Primi et al., 2016; Park et al., 2017). There are advantages to this approach. Personality inventories can be reliable and valid indicators of thoughts, feelings, motivations, and behaviors (Wilt and Revelle, 2015). Many participants in Western contexts have encountered such measures before and administering the items is cost-effective (Mehl et al., 2006; Vazire, 2006; John and Soto, 2007).

However, items based in this approach are not ideally suited for our capacities-based conceptualization of SEB skills: they assess a person's traits more so than their skills (Paulhus and Martin, 1987; Wallace, 1966, Wallace, 1967). Said differently, a trait approach would measure a person's "mean" level of a particular SEB skill, rather than their "maximal" level or capacity.

We believe that one promising way to efficiently assess capacities are to use skill inventories: questionnaire measures in which each item represents a specific social, emotional, or behavioral skill, and respondents rate their own capacity (or the capacity of a target individual, for observer-reports) to perform that skill when called upon to do so (Wallace, 1966, Wallace, 1967)[3]. Other researchers in this domain have adopted a similar approach. For example, researchers and educators developed preliminary skill-inventory scales to measure the CASEL competencies of relationship skills, social awareness, self-awareness, self-management, and responsible decision-making (Davidson et al., 2018). Thus, consistent with others, we argue that skill inventories represent a conceptually consistent, reliable, valid, and efficient means to assess SEB skills.

To put this argument into practice and build on the conceptual model illustrated in **Table 1** and **Figure 1**, our research team and an international group of colleagues has developed a broadband skills inventory based on our proposed five-domain model of SEB skills: the Behavioral, Emotional, and Social Skills Inventory (BESSI; Soto et al., 2021a). Across a series of seven samples of self-reports and observer-reports (N = 6,309), we find that the BESSI provides reliable and valid assessment of SEB skill domains and facets. Across these samples, reliability estimates averaged approximately 0.95 for the BESSI's five major skill domains, and 0.85 for its 32 more-specific skill facets. The BESSI's measurement structure was adequately modeled by a combination of 5 domain-level and 32 facet-level factors (CFI and TLI ≥0.93, RMSEA and SRMR ≤0.04). The BESSI skill domains and facets converged meaningfully with existing measures of character and developmental strengths, as well as social and emotional learning competencies, while also providing incremental validity beyond the Big Five personality traits (Mean ΔR^2 = 0.10). Moreover, in a longitudinal study of high school students, they concurrently and prospectively predicted a range of consequential outcomes including academic achievement and engagement, occupational interests, social relationships, and well-being.

IS THERE A DEVELOPMENTAL PERIOD THAT HOLDS PARTICULAR PROMISE FOR SOCIAL, EMOTIONAL, AND BEHAVIORAL SKILLS RESEARCH AND INTERVENTIONS?

Having proposed our definition and taxonomy for SEB skills and proposed an optimal way to measure these skills, we turn to our last question: Is there a period of the life span that holds particular promise for SEB skills research and interventions? We argue that adolescence ought to be the focal period of SEB skills research. Our rationale is based in decades of psychological science research indicating that adolescence is a period of marked transitions across multiple domains, and that in order to successfully navigate those transitions, youth must use a wide range of complex, newly developing skills.

Developmental Characteristics of Adolescence That Social, Emotional, And Behavioral Skills Development and Importance

Adolescence begins with the onset of puberty—the biological transition to physical maturity. Puberty has been described as a cascade of neurobiological effects that influence growth, metabolic changes, and sexual maturation (Dahl et al., 2018). Beyond puberty's influence on physical development, changes in structure and function in the brain during puberty spur the cognitive advances that differentiate adolescent cognition from child cognition. For example, significant synaptic pruning and more focused activation in the prefrontal cortex enhance adolescents' self-management and executive functioning capabilities (Blakemore and Choudhury, 2006; Blakemore,

[3]We note that other approaches to measuring skills are also plausible, such as using situational judgement tests or behavioral tasks. Each approach has strengths and drawbacks. Skills inventories adopt a familiar format for participants, they are cost-effective to administer, and in the case of our early research, seem to have acceptable psychometric characteristics.

[2]For those interested in comparing the various frameworks in detail, we suggest the useful "Explore SEL" web resource by Stephanie Jones and the EASEL lab (easel.gse.harvard.edu).

TABLE 2 | SEB skills in relation to new adolescent developmental abilities and opportunities.

SEB skill	SEB skill definition	Developmental ability	Developmental opportunity
Perspective-taking	Capacity to understand other people's thoughts and feelings	Greater awareness of others emotional states	Intimate interpersonal relationships
Abstract thinking	Capacity to engage with abstract ideas	Advances in moral and prosocial reasoning	Civic engagement
Impulse control	Capacity to intentionally inhibit impulses	Enhanced planning and self-regulation capabilities	Development and maintenance of healthy habits
Goal regulation	Capacity to set clear and ambitious goals for oneself	Increases in future orientation and self-regulation capabilities	Achievement in education and in career

2012). Additional changes in the "social brain" allow adolescents to become more aware of social cues, more sensitive to others' emotional states, and more cognizant of their own social standing (Blakemore and Choudhury, 2006; Pfeifer and Blakemore, 2012; Pfeifer et al., 2013).

Though the transition to physical maturity is a hallmark of adolescence, it is not the only transition that adolescents make. The end of adolescence is also marked by the transition to adult social roles, responsibilities, and status. Key developmental tasks of adolescence include completing education, choosing a career, finding a romantic partner, developing healthy habits, establishing close friendships, and getting involved in one's community. We will review these cognitive and social transitions to demonstrate how many SEB skills are both newly *possible* and newly *critical* for adolescents, relative to younger children.

Table 2 provides a guide for our review, highlighting four example SEB skills, their developmental underpinnings within the cognitive transitions of adolescence, and accompanying developmental opportunities during adolescent social transitions. This table does not encompass every relationship between developmental changes, SEB skills, and developmental opportunities. Successful development is multicausal, so while we only list one example SEB skill as relevant to each developmental task, adolescents likely utilize a constellation of SEB skills. Further, the four skills we highlight here have a clear origin within the cognitive transitions of adolescence, making these skills "possible," as well as clear social implications, making them "critical."

Cognitive Transitions

The cognitive advances of adolescence are rooted in the neurobiological changes of puberty. Significant work within the field of developmental neuroscience has connected changes in structure and function of the brain and connectivity between regions of the brain to the more complex and abstract thinking capabilities, self-management capabilities, and relational thinking capabilities of adolescent cognition. In this section, we will briefly review the newly prominent adolescent cognitive capabilities that correspond to the emergence of the following SEB skills: 1) perspective-taking skill, 2) abstract thinking skill, 3) impulse regulation, and 4) goal regulation.

We define perspective-taking skill as *the capacity to understand other people's thoughts and feelings,* and numerous findings over the past decade underscore that perspective-taking capacities increase and gain importance during adolescence. For example, adolescents are better able to recognize subtle changes in others' facial expressions compared to children (Garcia and Scherf, 2015; Kragel et al., 2015), and adolescents are more cognizant of others' mental states (Masten et al., 2009; Pfeifer and Blakemore, 2012). Further, as adolescents grow older, others-oriented reasoning becomes more prominent (Crone, 2013), highlighting that adolescents incorporate the thoughts and feelings of others in their decision-making processes.

Also relevant to adolescents' decision-making processes is abstract thinking skill, *the capacity to engage with abstract ideas*. Compared to children, adolescents can critically engage with abstract topics such as politics and religion, and think in relativistic terms (Kuhn, 2009; Smetana and Villalobos, 2009). These advances in cognition lead to more complex moral reasoning skills. While children tend to justify moral decisions in terms of rewards and punishments, adolescents began to view moral decisions in terms of societal conventions or abstract principles such as equity or the sanctity of human life (Eisenberg et al., 2009; Kohlberg, 1987).

Finally, impulse regulation, *the capacity to intentionally inhibit impulses*, and goal regulation, *the capacity to set clear and ambitious goals for oneself*, have a robust body of work linking these self-management capacities to structural and functional changes in the prefrontal cortex during adolescence (Casey et al., 2008). Impulse regulation demonstrates linear growth across adolescence with older adolescents better able to resist temptations than younger adolescents (Duckworth and Steinberg, 2015). Further, adolescents are able to think about what is possible, not just what is real, and think about the long-term consequences of their decisions (Nurmi, 2004; Beck and Riggs, 2014). Advances in planning and self-management, in addition to increases in future orientation, permit the setting and striving for goals (Napolitano et al., 2011a). In the next section, we highlight how these specific skills gain importance as adolescents face new developmental opportunities and challenges.

Social Transitions

Adolescence ends with the complete transition to adult social roles—a boundary difficult to pinpoint as it is subject to variability across domains, cultures, and historical periods (e.g., an American 18 year old serving in the armed forces but forbidden from purchasing alcohol). The emergence of a wide range of SEB skills help adolescents to successfully transition to adult status, roles, and responsibilities. In this section, we feature perspective-taking skill, abstract thinking skill, impulse regulation, and goal regulation in relation to four key

developmental opportunities and challenges that exemplify the transition to adult roles: 1) establishing intimate relationships, 2) engaging with the larger community, 3) developing and maintaining healthy habits, and 4) planning for post-secondary education and a career.

Establishing Intimate Relationships

Interpersonal relationships, particularly with peers, are central to the adolescents' lives. These relationships satisfy multiple roles within the context of adolescent development including serving as socializing agents, as emotional and social support, and as establishing the context of the social hierarchy (Ryan and Shin, 2018). The quality of relationships with peers, parents, and important others is related to immediate benefits in the lives of adolescents such as better grades, psychosocial adjustment, and social skills and long-term benefits as they set the stage for future friendships and romantic partnerships (Connolly et al., 2000; Glick and Rose, 2011; Arnold et al., 2017; Ryan and Shin, 2018).

We argue that use of perspective-taking skill during adolescence leads to more intimate and fulfilling relationships with friends and family. For example, imagine a conflict between two best friends in which one friend posted an unflattering picture of the other on social media. Even if the "poster" didn't think that the picture is a bad picture of their friend, they could use their perspective-taking skill to see the situation from their best friend's point of view, accept their friend's request to take down the picture, and reconcile with their friend. This skill use could therefore help resolve the conflict and preserve the friendship.

Engaging With the Larger Community

As adolescents develop intimate relationships with others, they also develop a more sophisticated understanding of their relationship with people in their community and society at large. The use of abstract thinking skill in tandem with advances in moral and prosocial reasoning enables adolescents to think critically and deeply about their role within the larger community. While advances in moral and prosocial reasoning do not always lead to increases in moral or prosocial behaviors (Eisenberg et al., 2009; Wray-Lake et al., 2016), abstract thinking skill may help promote civic engagement in adolescence via the integration of abstract values, such as altruism and civic responsibility into their attitudes and identity.

Supporting these possible links between civic engagement, abstract thinking skill, attitude, and identity, cross-cultural research on youth civic engagement has found associations between normative beliefs about good citizenship and intentions to vote and volunteer (Metzger and Smetana, 2010). Other studies have indicated that volunteers tend to be more altruistic than non-volunteers (Eisenberg et al., 2009) and that having a helping identity mediates the relationship between demographic characteristics, personality, and volunteering (Matsuba et al., 2007). Abstract thinking skill may be especially important when adolescents are faced with information that contradicts their worldview. For example, an adolescent who is apathetic about their obligatory service learning project in school may change their opinion on service when they learn more about issues facing their community. Thinking deeply about what they learned during their service learning project and the question of whether they live in a fair and just society may foster a greater desire to participate in future civic engagement to improve their community.

Developing and Maintaining Healthy Habits

Civic engagement becomes a developmental opportunity during adolescence not only because of advances in cognition and abstract thinking skill, but also because adolescents have more autonomy to direct their behavior. Many scholars have focused their attention on self-management capacities, particularly in youth, because adolescents increasingly make their own decisions. For example, adolescents must leverage their impulse regulation skills when they have to make a choice between doing homework while resisting the urge to check social media or choosing a nutritious snack over junk food.

Indeed, a developmental challenge of adolescence is to establish and maintain healthy habits such as eating a balanced diet, exercising regularly, getting enough sleep, and avoiding smoking. These health behaviors are not only related to short-term benefits for adolescents, but also influence the course of adult habits (Hallal et al., 2006). Impulse regulation may be especially important for adolescents who are beginning a transition to healthier habits. For instance, an adolescent who spends the majority of their time doing sedentary activities may decide to begin exercising to boost their confidence. As they begin a workout regime, they may feel very tempted to skip a few workouts because they recently got a new video game. However, with maximum effort, they keep to their exercise routine. Honing a skill related to resisting and avoiding temptations may be particularly important for adolescents with high sensitivity to rewards and sensation-seeking (Casey et al., 2008; Duckworth and Steinberg, 2015).

Planning for Post-Secondary Education and a Future Career

For many adolescents, the most salient task is achievement, and significant research has investigated how an adolescent's personal qualities (Komarraju and Nadler, 2013; Poropat, 2009), relationships (Ryan and Shin, 2018), civic engagement (Ballard et al., 2019), and health behaviors (Bradley and Green, 2013) relate to educational attainment and socioeconomic status in adulthood. As adolescents approach the transition from school to the workforce, they begin to define themselves and direct their own development through their goals (Napolitano et al., 2011b; Nurmi, 2004; Salmela-Aro, 2009). For example, several studies have linked adolescents' educational and career aspirations and expectations to their educational and vocational outcomes (Brumley, et al., 2019; Lent et al., 2000; Salmela-Aro, 2009). Aspirations and expectations serve as a first step toward a goal but do not ensure goal attainment. Goal regulation might be particularly important in the face of setbacks. An American adolescent who aspires to attend a competitive university may question their capabilities when they receive a lower-than-expected score on a college entrance exam. However, drawing on their goal regulation capabilities, they make a study plan to better prepare for the next test date.

The Importance of Adolescence Vs. Early Childhood for Social, Emotional, and Behavioral Skills

We have highlighted the potential importance of adolescence for the malleability and real-world implications of SEB skills. An alternative view could assert early childhood's importance for the development of SEB skills. From this perspective (termed a "gradualist" approach, see Lewis, 1998), one could argue that the SEB skills necessary for successful development during adolescence are built upon foundational skills that emerge during early childhood (e.g., executive functions, Diamond, 2013). Therefore, interventions should focus on promoting the development of these foundational skills early in life. For example, economists have used a "return on investment" framework to argue for the benefits of skill interventions for young children (e.g., Heckman and Kautz, 2012 [4]). A notable empirical example of such work involves the Perry Preschool Program, which provided evidence that a high-quality preschool altered disadvantaged 3–4 year old's personality traits, positively impacting future outcomes like standardized test scores (Heckman et al., 2010a; Heckman et al., 2010b).

We do not dispute or discount the results of these studies. The sustained effects of early-childhood interventions on the antecedents of some SEB skills may indeed "cascade" into adolescence. Nor are we suggesting that early-childhood education is unimportant, or that early experiences do not impact later functioning and development. However, we believe that carefully-timed interventions for adolescents that target the precise SEB skills needed to meet a critical challenge may, in some cases, be more effective than interventions with young children targeting the foundational developmental antecedents of those same skills. As a concrete example, 18 year-olds' scores on standardized tests may be improved more by an intervention promoting their studying-related SEB skills in the months prior to the test than by a longer-term intervention on their executive functions in preschool, thirteen years prior. We therefore believe that a program of research comparing the effects of SEB skills interventions during adolescence and early childhood, both in terms of return-on-investment and developmental benefits, is a critical frontier of this burgeoning field.

CONCLUSION

We argued that social, emotional, and behavioral (SEB) skills are best conceptualized as *skills*, what a person is capable of doing when the situation calls for it, and not *traits*, what a person tends to do across situations. We also presented a comprehensive and evidence-based taxonomy of SEB skills—the Behavioral, Emotional, and Social Skills Inventory (BESSI)— which organizes 32 SEB skills within a five-domain framework. To measure the 32 SEB skills within the BESSI framework, we advanced self- and observer-reported skills inventories as optimal for capturing maximum levels of skill utilization. Finally, we argued that future SEB skill research should focus on adolescence, a developmental period characterized by biological, cognitive, and social transitions that make the development SEB skills possible and makes the utilization of these SEB skills critical.

AUTHOR CONTRIBUTIONS

All authors contributed to the concepts and theories presented in this work. CN planned the manuscript. CN and MS provided a first draft and finalized the manuscript. CS, BR, and HY provided key edits and revisions to the manuscript.

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SYSTEMATIC REVIEW
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Impacts of Social and Emotional Learning Interventions for Teachers on Teachers' Outcomes: A Systematic Review With Meta-Analysis

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Teaching is among the most emotionally demanding jobs, impacting teachers' personal lives and job performance. Since teaching-specific stressors are mainly socio-emotional related, social and emotional learning (SEL) interventions targeting teachers have increased rapidly in recent years. This study conducted a systematic review with meta-analysis of 43 empirical studies which evaluated the efficacy of school-based SEL interventions involving 3,004 in-service preK-12 teachers. The initial systematic review showed that these interventions were very heterogeneous and the research on their efficacy assessed widely distinct outcome variables. Concerning the meta-analysis, results showed statistically significant small to medium effect sizes favoring the experimental group, with SEL interventions impacting teachers' social and emotional competence [$g = 0.59$, 95% CI (0.29, 0.90)], well-being [$g = 0.35$, 95% CI (0.16, 0.54)], and psychological distress [$g = -0.34$, 95% CI (-0.57, -0.10)]. Meta-regressions did not reveal significant values of the explanatory variables, and publication bias was found for social and emotional competence and well-being domains. Findings add to growing empirical evidence regarding the impact of these interventions and contribute to the development of guidelines for the design of effective SEL interventions for teachers.

Keywords: intervention, meta-analysis, professional development, social and emotional learning, systematic review, teachers

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INTRODUCTION

Over the last decade, education and mental health have been referred to as social, political and scientific priority issues requiring attention, and schools have been acknowledged as the primary context in which equity in young people's access to quality learning and developmental opportunities may be enhanced (UNESCO, 2018). Thus, teachers are expected to actively respond to both students' academic and social and emotional needs (e.g., Jennings and Greenberg, 2009). However, teachers' initial training focuses mainly on the academic domain, while they lack explicit training as regards the Social and Emotional Competence (SEC) domain. This absence of training is mainly in terms of intra-personal competences such as being able to identify and adequately manage their emotions and behaviors, and to monitor their own progress toward achieving goals

[for an extensive review on how SEC development is integrated in teacher preparation programs across the USA see Schonert-Reichl et al. (2017)], which appears to influence not only their own well-being but also students' achievement and behavior (Crain et al., 2017; Schonert-Reichl, 2017).

Not surprisingly, teaching has been described as an emotionally demanding job linked to frequent episodes of work-related stress and burnout (Jennings and Greenberg, 2009; Marques-Pinto and Alvarez, 2016). Hence, the teaching profession presents particular risks as far as teachers' occupational health is concerned, affecting not only their mental health and well-being but also classroom management and instructional practices which, in turn, affect students' engagement and academic achievement (e.g., Jennings and Greenberg, 2009; Durlak et al., 2015; Schonert-Reichl, 2017).

Therefore, efforts have been made to identify and enhance protective factors that may act as a buffer against occupational stress and burnout caused by the challenges of teaching (Durlak et al., 2015). In this scenario, the promotion of social and emotional competencies has emerged in the literature as one of the main protective factors from which teachers can particularly benefit since they are crucial to classroom management and classroom climate, two key features of teaching efficacy, leading to an increase in teachers' job performance (Jennings and Greenberg, 2009).

As a result, Social and Emotional Learning (SEL) interventions seeking to directly promote teachers' SEC have increased over the last decade (Jennings et al., 2017; Schonert-Reichl, 2017). Nonetheless, these interventions are, to date, highly distinct regarding their approach, content, format and dosage (Wigelsworth et al., 2016). Furthermore, research on their efficacy is scarce and has tended to focus more on an assessment of diverse outcome domains, thus, limiting the comparison and overview of these interventions (Jennings et al., 2017) and the establishment of guidelines for the development of effective SEL interventions for teachers. In fact, most of the literature on SEL interventions within educational contexts has emphasized student- and classroom-level outcomes (Domitrovich et al., 2016; Greenberg and Abenavoli, 2017). Only recently have evidence-based studies on how SEL interventions targeting teachers' impact on teacher-level outcomes begun to emerge steadily on a worldwide scale, pointing to promising results (e.g., Harris et al., 2016; Carvalho, et al., 2017; Castillo-Gualda et al., 2017; Jennings et al., 2017).

Nonetheless, the professional development of teachers has gained momentum over the last decades, and several guidelines highlighting the role of variables, such as the dosage of intervention, cross-session training, and the specific nature of the contents addressed in the development of effective interventions for teachers in general, have emerged (Gulamhussein, 2013). Additionally, the literature has also given prominence to several consensual standards for identifying the best empirically supported interventions, such as the use of experimental designs with participants' random assignment to treatment groups, the use of follow-up measures, and independent research trials (Biglan et al., 2003) and the control of biases (Higgins et al., 2011). However, the suitability and relevance of these guiding references have yet to be studied when specifically applied to SEL interventions for teachers.

A Brief History of the SEL Rationale

Twenty-five years ago, with the forthcoming twenty-first century, an expansion of sociopolitical norms on academic success and quality education to include non-academic skills was seen (Osher et al., 2016). Thus, schools became flooded with a myriad of interventions aiming to prepare children and youths to face future challenges (Durlak et al., 2015). These interventions, mostly based on the Positive Youth Development movement were, however, developed in a splintered and uncoordinated manner (Elias et al., 1997). Nonetheless, despite targeting different and apparently non-related behaviors (e.g., career education, sex education, violence prevention, health education, and nutrition education), these interventions shared a common basis established within a set of cross-cutting social, emotional, and behavioral skills (Greenberg et al., 2003). Hence, in 1997, Elias et al. first introduced and defined the SEL rationale with a view to creating a regulatory board for the centralization and standardization of intervention and evaluation policies and practices seeking to promote the optimal development of children and youths. In this scenario, the SEL rationale emerged with the purpose of establishing a common framework to systematize, guide and assess student-targeting interventions which were proliferating within schools at the end of the twentieth century, in order to optimize their contributions (Durlak et al., 2015). Thus, the SEL rationale results from a need to operationalize constructs and it is not presented as a theoretical framework for the practice, therefore it has been referred to as atheoretical (Tolan et al., 2016).

Nevertheless, the original authors identified some theoretical frameworks as primarily informant sources to which practitioners and researchers should resort for the design and implementation of their intervention programs (Durlak et al., 2015). However, when consulting these sources, the goal of developing competences in youths that promote their optimal adaptation to life challenges (Elias et al., 1997) should always be at the forefront. The following theoretical frameworks have been recommended to help program developers and researchers create and evaluate SEL interventions: systems theories, theories on emotional intelligence, social development and social skills training, and theories related to development, learning, and behavior change (Durlak et al., 2015; Osher et al., 2016; Tolan et al., 2016). When designing or evaluating an intervention, these theoretical frameworks should be taken into consideration to inform: (1) what to change (i.e., what specific contents should be included within the program; e.g., Emotional intelligence theory); (2) how to change (i.e., specific strategies through which the program should promote the change; e.g., Social cognitive theory, Social information-processing theory); (3) where / with whom to change (i.e., in what context and / or with whom; e.g., Ecological systems theory; Durlak et al., 2015; Tolan et al., 2016). Hence, the SEL rationale, in essence, results from multiple and isolated lines of empirical research which have been driven from different theoretical frameworks that have not always clear and distinct boundaries (Tolan et al., 2016).

Nowadays, SEL is defined as the process by which individuals acquire and apply core skills in five interrelated areas i.e., self and social-awareness, self-management, relationship skills, and responsible decision making, referred to as SEC (Durlak et al., 2015). Despite its practice-centered origin, two theoretical frameworks mostly inspired the conceptualization and operationalization of the SEL areas. On the one hand, the Emotional intelligence theory (Salovey and Mayer, 1990) inspired the development of the emotional-related areas. On the other hand, the social skills training movement, based on Bandura's social learning theory (Bandura, 1969), appears to have inspired the development of the self-regulation and interpersonal relationship areas (Marques-Pinto and Raimundo, 2016). Understandably, the SEL rationale shares with other coexisting frameworks the purpose of promoting optimal development (e.g., the Social Competence rationale) and the same underlying conceptualizations of social and emotional functioning, thus making the clear distinction between SEC and other categories of psychological functioning a challenge (Tolan et al., 2016). However, the SEL rationale may be distinguished from other approaches that share the same main goal, such as the Positive Youth Development and the Positive Psychology rationales which rely on clearly distinct conceptual frameworks (e.g., Developmental systems, Humanistic psychology; Tolan et al., 2016).

According to the SEL rationale as known today, SEL interventions are considered to be those which aim to promote SEC, through the explicit instruction of these intra- and interpersonal core skills, and based on a learner-centered learning approach (Durlak et al., 2015; Tolan et al., 2016). It is by means of this learner-centered approach that individuals become capable of identifying and regulating emotions, establishing and pursuing positive goals, appreciating, establishing and maintaining healthy relationships, making ethical, social and personal, responsible decisions, and of managing situations positively (Durlak et al., 2015). Considering this rationale, SEL is based on the idea that the acquisition of SEC occurs within social contexts through the relationships one establishes with others, but also through how each individual responds subjectively to these interpersonal experiences (Durlak et al., 2015). Additionally, the SEL rationale consistently states that SEC will act as a protection factor (Durlak et al., 2015). This approach assumes that SEC are an asset to which one may resort in order to better respond to potential risk situations, however the involvement in risk behaviors is not only predicted by the presence / absence of SEC but also by a set of different factors that should be taken into account (e.g., the context; Tolan et al., 2016). Additionally, it stems from the belief that SEC may be learned, trained and developed through a learner-centered and explicit teaching approach. Therefore, in this non-dispositional and non-dichotomous orientation, the SEL rationale is viewed as being detached from other movements such as for instance, Positive Youth Development and Positive Psychology. Indeed, while the latter share the common goal of promoting children and youths' optimal development, there is also divergence within these two orientations (Tolan et al., 2016).

This practice-centered approach, where multiple theoretical frameworks can inform the same program, coupled with the coexistence of other rationales that share a common goal, makes it difficult to establish a clear definition of the SEL rationale's frontiers. Furthermore, cultural appropriations of the SEL definition have served to increase this complexity (Cefai et al., 2018) and lead to the concurrence of multiple languages regarding the same construct (Greenberg et al., 2003; Humphrey et al., 2011; Jones and Bouffard, 2012). This simultaneity of different yet similar languages is mirrored by the different consortia of SEL worldwide (Durlak et al., 2015). With the constitution of the SEL rationale (i.e., Elias et al., 1997), a consortium was created in the US which, to date, is the most frequently mentioned when referring to SEL, namely the Collaborative for Academic, Social, and Emotional Learning (2020). However, as research on SEL interventions' impact on children and youths' social, emotional, and academic competencies began to increase and consolidate (e.g., Durlak et al., 2010, 2011; Sklad et al., 2012; Corcoran et al., 2018), other organizations emerged seeking to contribute to a global, yet culturally adjusted dissemination of the SEL rationale (Durlak et al., 2015; Cefai et al., 2018). Some examples of these other consortia are the European Network for Social and Emotional Competence (ENSEC, 2019) in Europe, KidsMatter and MindMatters frameworks in Australia (Australian Government, 2020), the Social and Emotional Aspects of Learning (SEAL) program in the UK (UK Government, 2010), and the Wallace Foundation (2020) in the US. Despite the diversity of terms used to refer to the same construct (e.g., Social and Emotional Learning vs. Social and Emotional Education, Social and Emotional Skills vs. Social and Emotional Competence), all of these consortia have highlighted the same five key-competencies (Cefai et al., 2018). Additionally, different terms, namely Social and Emotional Well-being, Non-cognitive skills, Soft skills, have been associated with the SEL rationale, although they refer to distinct specific competencies (e.g., flexibility) which emerge within other fields of study (e.g., mental health, neurosciences, vocational, and career) (Cefai et al., 2018).

As a result of the aforementioned issues, the literature on SEL has faced serious concerns regarding inconsistencies in operationalization processes, definition, and measurement (Humphrey et al., 2011). Furthermore, although some meta-analyses of reference in the area have made the distinction between rationales (e.g., Positive Youth Development and SEL), they have not clarified / discussed the underlying psychological theories of social emotional learning that are pertinent to the analyzed studies (e.g., Taylor et al., 2017), or justified the search terms used (e.g., Sklad et al., 2012). In addition, when said analysis were conducted, all the search terms were mixed (e.g., Durlak et al., 2011), thus compromising the reliability and validity of the findings.

Table 1 presents a synthesis of: (1) the various rationales that have coexisted with SEL for the promotion of children and youths' optimal development since the end of the twentieth century; (2) the multiple strategies that have been used for the promotion of SEC, within the SEL rationale; (3) the multiple terms that have been used to refer to SEL and SEC across the different consortia. A more in-depth analysis on

TABLE 1 | Synthesis of the multiple dimensions that increase the complexity of identifying and bordering the SEL rationale [based on the works of Elias et al. (1997), Durlak et al. (2015), Tolan et al. (2016), and Cefai et al. (2018)].

Examples of…	
… rationales seeking to promote children and youths' optimal development	Affective Education, Character Education, Citizenship / Civic Education, Deeper Learning, Emotional Intelligence, Health Promotion, Life Skills Training, Personal and Social Development, Positive Psychology, Positive Youth Development, Social and Emotional Learning, Social Competence, twenty-first Century Skills
… strategies used within interventions for the promotion of SEC	Cognitive therapy, Cognitive and behavioral therapy (CBT), Coping skills training, Emotional intelligence training, Intentions to behave training, Mindfulness, Social learning through modeling and feedback, Social skills training
… common terms used to define and refer to SEL and SEC in the literature	Social and emotional learning, Social and emotional education, Social and emotional skills, Social and emotional competence, Social and emotional well-being, Soft skills, Non-cognitive skills

the different common terms and rationales may be found in Cefai et al. (2018).

In short, SEL is not a conceptually driven theoretical understanding of SEC. Instead, it emerged as a subsuming overall framework for organizing many different preventive and promotive interventions, making the delimitation of clear boundaries between SEC and other psychological functioning categories a difficult endeavor (Tolan et al., 2016). Although several authors make reference to different theories that may inform SEL interventions regarding what to change, how to do so, and where / with whom, the field may be characterized as multiple isolated lines of empirical inquiry stemming from different theoretical frameworks, with unclear overlaps and distinctions (Tolan et al., 2016), thus lacking clarification and integration as reflected in prior research (e.g., Durlak et al., 2011; Sklad et al., 2012; Taylor et al., 2017).

Hence, for the purpose of this study, in an effort to guarantee homogeneity within the analyzed studies, SEL was operationalized as "the process through which children and adults develop the skills, attitudes, and values necessary to acquire social and emotional competence" (Elias et al., 1997, p. 2), with SEC being defined as the five key-competencies, which are common to all consortia for / approaches to SEL, i.e., self-awareness, self-management, social awareness, relationship skills, and responsible decision making (Durlak et al., 2015).

From SEL for Children and Youths to SEL Interventions for In-service Teachers

Since the inception of SEL, its research and intervention have faced three main waves in the trajectory toward a one whole school approach (Greenberg et al., 2003; Osher et al., 2016). While initial papers on SEL referred only to the importance and contribution of the promotion of SEC for children and youths' development, a more systemic approach soon began to emerge with the role of teachers being recognized. However, only recently has SEL for teachers *per se* been considered (Jennings and Greenberg, 2009; Durlak et al., 2015; Schonert-Reichl, 2017), resulting from the acknowledgment that (1) teachers could enhance the impact of SEL on students if they explicitly infused SEL within their classrooms; (2) and that teachers lacked explicit training in SEL and, therefore, professional development training for teachers on how to teach SEL programs' specific content to their students was required (Greenberg et al., 2003; Osher et al., 2016). On the other hand, most SEL programs continued to assume that teachers were prepared to effectively act as a social and emotional competent role model almost in a dispositional manner (Greenberg et al., 2003; Jennings and Greenberg, 2009; Durlak et al., 2015; Marques et al., 2019). These assumptions may have delayed the establishment of a SEL line of intervention specifically targeting teachers and their own SEC development, which has only begun to be addressed in the last decade (Schonert-Reichl, 2017; Marques et al., 2019), thus explaining why student-centered approaches have continued to be the main focus of SEL over time.

When applied to a professional development context, SEL interventions are described as a set of practices and policies which enhance personal development, positive interpersonal relationships, in addition to effective and ethical work and performance (Durlak et al., 2015). Consequently, and mirroring the aforementioned observations concerning SEL for children and youths, when considering SEL for teachers the main issues regarding the non-theoretically driven framework underlying the conceptualization of the rationale appear to gain prominence. Once again, the background literature on the SEL rationale for teachers suggests that this approach is more an operational than a conceptually driven framework (e.g., Jennings and Greenberg, 2009; Durlak et al., 2015; Schonert-Reichl, 2017). Nevertheless, this issue is yet to be studied (e.g., Marques et al., 2019) and deserves further clarification. Moreover, along with SEL for children and youths, SEL for teachers maintains the Emotional intelligence theory as a main theoretical framework of reference, but is also primarily informed by the Transactional model of stress and coping (Lazarus and Folkman, 1984; providing information on main teacher-specific stressors and strategies for stress management) and the Self-determination theory (Deci and Ryan, 1985; providing information on teacher-specific needs which might directly relate to an increased perception of professional competence and of how to promote motivation for behavior change and learning) (Jennings and Greenberg, 2009). In this scenario, and adopting an isomorphic three-level model as previously presented, these theoretical frameworks may contribute to informing the development of interventions and research with regard to the first two levels, i.e., what to change (content level), and how to change (strategy level). At the content level, when referring to SEL for teachers, SEC mirror a specific set of social, emotional, and cognitive skills, as presented in **Table 2**.

Additionally, up to now, SEL interventions have differed in, for example, their approaches, dosage, and the importance

TABLE 2 | Description of teacher-specific social, emotional, and cognitive skills within each SEC [retrieved from Jennings and Greenberg (2009), p. 495].

Domain	Specific skills
Self and social awareness	To recognize and understand emotions and emotional patterns of their own and of others. To understand / be aware of how their emotional expressions affect their interactions with others. To have a realistic understanding of their abilities and recognize their emotional strengths and weaknesses. To be culturally sensitive and understand different perspectives. To motivate learning in themselves and others, though the promotion and use of emotions. To build strong and supportive relationships through mutual understanding and cooperation. To effectively negotiate solutions to conflict situations.
Self and relationship management	To manage their behavior even when emotionally aroused by challenging situations. To regulate their emotions in healthy ways that facilitate positive classroom outcomes without compromising their health. To effectively set limits firmly, yet respectfully. To be comfortable with a level of ambiguity and uncertainty that comes from letting students figure things out for themselves.
Responsible decision making	To display prosocial values and decide ethically, based on the assessment of factors such as the impact of their decisions on themselves and others. To respect others and take responsibility for their decisions and actions.

placed on each SEC-related area (Wigelsworth et al., 2016). Particularly, as regards SEL interventions for teachers, we may find interventions following universal approaches (i.e., in which the contents presented are geared toward all teachers, regardless of the grade-level they teach or their individual characteristics; e.g., Jennings et al., 2013), or targeting specific needs (e.g., the contents presented are grounded in the challenges elementary teachers face within their classroom; Murray et al., 2018). As far as dosage is concerned, these interventions are widely distinct, varying from short-term actions such as workshops (e.g., 2-h length; Wills et al., 2018) to medium/long-term approaches such as programs (e.g., 50-h length; Carvalho, et al., 2017). Finally, concerning SEC-related areas, some SEL interventions for teachers emphasize only a specific domain (e.g., Domitrovich et al., 2016), while others target all five areas (e.g., Cook et al., 2017). Thus, considering such variability, further knowledge of the factors that may influence the impact of these interventions on teachers is needed in order to establish guidelines which may lead to effective SEL interventions, thus guaranteeing high-quality implementation (Durlak et al., 2015; Schonert-Reichl, 2017).

Although recent, the literature on SEL interventions specifically developed for teachers has drawn attention owing to its positive impact on both teachers' personal and professional levels, and its contribution not only to teachers' well-being and performance, but also those of their students (Durlak et al., 2015; Schonert-Reichl, 2017). Firstly, research has suggested an impact on teachers' SEC, which has consisted specifically of outcomes that directly express one or more of the five key-competencies addressed by the SEL rationale, referring to particular expressions therein (e.g., emotional acknowledgment, emotional regulation, social competence, and self-regulation). Besides the direct and proximal effect of these interventions on the promotion of the SEC domain, a high degree of SEC among teachers has also been linked to a further four distal and indirect domains. On a personal level, greater SEC have been associated with a decrease in teachers' psychological distress, referring to outcomes regarding psychological discomfort or internalizing problems (e.g., negative affect, rumination, stress, anxiety and depression symptoms, emotional exhaustion, and depersonalization); and in teachers' physical distress, comprising outcomes associated with subjective health complaints, and behavioral and physiological health indicators (e.g., ache-related symptoms, insomnia, cortisol levels, blood pressure, respiratory, and heart rate; e.g., Jennings et al., 2013, 2017; Roeser et al., 2013; Harris et al., 2016). However, on a personal level, a higher degree of SEC has also been linked with an increase in teachers' well-being, which specifically refers to outcomes related to personal well-being and positive emotions (e.g., positive affect, self-efficacy, personal accomplishment, job and life satisfaction; e.g., Jennings et al., 2013; Domitrovich et al., 2016; Carvalho, et al., 2017; Crain et al., 2017). Taken together, teachers with high SEC appear to be more capable of managing their job demands and achieving higher levels of work and home life satisfaction (e.g., Talvio et al., 2013; Crain et al., 2017). On a professional level, SEL interventions seem to have a distal impact on teachers' ability to manage classrooms and respond to their emotional challenges, specifically by positively impacting the classroom climate and instructional practices domain, which involves outcomes related to teacher practices and classroom climate (e.g., emotional and instructional support, personalized teacher-student interactions, and classroom management), thus leading to higher quality learning environments (e.g., Hagelskamp et al., 2013; Morris et al., 2013; Hickey et al., 2017; Murray et al., 2018). Additionally, due to the co-regulative nature of classroom interactions, when teachers act with SEC, they may also foster the development of SEC among their students (Jennings and Greenberg, 2009) which, subsequently, may lead to higher levels of student well-being and academic achievement (Durlak et al., 2011; Sklad et al., 2012; Taylor et al., 2017; Corcoran et al., 2018). In short, SEL interventions for in-service teachers appear to play a key role by helping them regulate their own emotions and deal more proficiently with their job requirements, thus, promoting a healthier classroom climate and students' social, emotional and academic learning (Osher et al., 2016; Schonert-Reichl, 2017).

Thus, SEL interventions designed for teachers have been developed with promising results (e.g., Roeser et al., 2013; Crain et al., 2017; Jennings et al., 2017), gradually calling out for systematic and consistent literature overviews regarding the impacts of SEL interventions on teachers, more specifically on their outcomes. Some recent systematic reviews (e.g., Emerson et al., 2017; Hwang et al., 2017; Lomas et al., 2017) and a meta-analysis (Klingbeil and Renshaw, 2018) have discussed the impacts of mindfulness-based interventions, which have been

presented as a powerful strategy through which SEL may be achieved, on teachers' psychological distress and well-being, and job performance. However, as previously discussed (**Table 1**), mindfulness-based interventions are not the only type of strategy available to promote SEC development. In fact, traditional techniques which did not resort to mindfulness (e.g., Cognitive therapy, CBT, Coping skills training, Emotional intelligence training), have also been used to promote SEC. Furthermore, mindfulness-based interventions may be used to develop the mindfulness competence *per se*, as a content, instead of targeting the development of SEC. Likewise, Carvalho and Queirós (2019) conducted a systematic review of 28 studies on the efficacy of stress management interventions for in-service teachers, however, not all stress management interventions can be considered SEL interventions. Additionally, to the best of our knowledge, only one literature review has been published to date concerning SEL interventions developed for in-service teachers (i.e., Marques et al., 2019). Nonetheless, this was a first approach to the topic with the sole aim of mapping the quantity and type of SEL interventions for in-service teachers available at the moment. Hence, systematic reviews or meta-analysis specifically addressing the impacts of SEL interventions developed for teachers on in-service teachers' personal and professional outcomes are needed.

Within the scope of meta-analytic studies, the aforementioned co-regulatory nature of classroom interactions should be taken into consideration. When referring to interventions for the professional development of teachers, the ultimate goal is always to promote a better educational climate and thus improved student-level outcomes (e.g., Freire et al., 2012). Therefore, even when SEL interventions for the development of teachers' SEC *per se* are developed, they can, sometimes, be developed as a sub-product of a more global intervention aiming to prepare teachers to intervene with students (i.e., teaching teachers to teach SEL to students, i.e., combined intervention targeting teachers and students' SEL; e.g., the 4Rs program; Brown et al., 2010). Hence, just as the SEC of teachers may indirectly affect students' SEC, well-being and performance, some literature has suggested that likewise, when students are more socially and emotionally competent, this may have an indirect effect on teachers' SEC, well-being and performance (e.g., Carvalho et al., 2021). Therefore, since combined interventions have different ultimate goals when compared to interventions specifically targeting teachers' SEC development and, since it is not possible at this point to isolate the direct and indirect effects of the combined interventions, which may increase the heterogeneity of the pool of data and compromise the results, for meta-analysis purposes, SEL interventions for in-service teachers effects should be estimated individually for the two types of interventions.

The Present Study

The aim of the present study is to conduct a systematic review with a meta-analysis of empirical studies assessing the efficacy of SEL interventions for in-service preK-12 (i.e., from pre-kindergarden to grade 12) teachers on their personal and professional outcomes. Regarding the systematic review process, with a more exploratory and comprehensive end, two research questions were established:

Q1. Did the pooled studies state the theoretical foundations underlying the design and implementation of their SEL interventions for teachers?

Q2. What quality indicators of empirical-evidence did the pooled studies consider when designing both the intervention and research?

Additionally, and in light of the prior literature, the following hypotheses were also established:

H1. SEL interventions for teachers will increase SEC, well-being and classroom climate and instructional practices, and decrease psychological and physical distress in teachers.

H2. SEL interventions for teachers' effects will be predicted by intervention dosage, cross-session training, and adequacy of content presented to teachers' teaching grade, such as the presence of (a) higher dosage, (b) cross-session training, and (c) contents adjusted to teachers' teaching grade will contribute to higher intervention effects.

Moreover, integrated in the meta-analytic study, this study aims to test the temporal stability and sleeper effects of the SEL interventions for teachers, and to explore whether the use of mindfulness techniques to promote SEL is a predictor of these interventions' effect.

METHOD

This study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2015). Regarding ethical considerations, since public documents are the object of study there are no need for institutional review boards approval (Cooper and Dent, 2011). Nevertheless, ethical obligations of methodological rigor were ensured. **Supplementary Material** with greater detail on the methodological procedures adopted (i.e., detailed information on databases consulted, selected descriptors, eligibility criteria, initial search results and the data collection process, presentation of the funnel plots to analyze possible publication bias, and variables included in the coding process) is provided.

Eligibility Criteria

In order to address our research questions with quality and consistency, the studies were required to present an empirical study (with quasi-experimental or experimental designs) on the efficacy of a SEL intervention for in-service preK-12 teachers in their personal and / or occupational outcomes. Thus, papers targeting university and / or pre-service teachers and those that did not access impacts on teacher-level variables were excluded. For the meta-analysis procedures to be possible, studies were only considered when sufficient information was reported to calculate the effect sizes of the interventions' impacts. Additionally, studies were included whenever the full-text version was available and published in Psychology or Educational peer-reviewed journals, after 1995, thus excluding papers published in non-peer reviewed journals and gray literature. No language constraints were applied.

Search Strategy

We began by systematically screening empirical studies, published in Psychology or Education journals, available on EBSCOhost web, b-ON, SCOPUS and / or SciELO databases. In accordance with the eligibility criteria, the search (conducted in mid-2020) was narrowed to: articles, with full-text available, containing empirical work, and published in peer-reviewed journals since 1995.

The search across databases was carried out through advanced search options, by crossing sets of keywords such as teacher, social and emotional learning, training, intervention, and program effectiveness, in the title, abstract or subject terms. To improve the sensitivity of the search, synonyms, different spellings, and singular/plural forms, verb forms, adjectives of the terms used as descriptors were considered. Additionally, in order to focus the analysis, we opted to restrict the search to studies that did not include the descriptor student (and derivatives) in the title. Whenever possible, studies were screened through a Boolean search. In order to deepen the search and to assure saturation of data, a hand search of reference lists, consortia guides and organization websites was also conducted to identify any further studies available.

This global analysis resulted in 774 initial records. After the removal of duplicates through SRA Deduplicator (Rathbone et al., 2015; $n = 113$), the titles and abstracts of the 661 identified studies were screened in order to select all the items that met the eligibility criteria. At this stage, all the records presented the title and abstract written in English. As a result, based on title and abstract screening, 582 studies were excluded. Subsequently, the full-text version of the 79 remaining studies that met the aims of this review was examined in detail. Finally, a total of 43 records meeting all the selection criteria were considered for the systematic review. The remaining 36 studies were excluded due to one of the following reasons: for not addressing a SEL intervention ($n = 14$), not aiming to promote SEC in teachers ($n = 6$), not assessing SEL intervention effect ($n = 2$), targeting pre-service teachers ($n = 4$), being a qualitative study ($n = 1$) or a systematic revision / meta-analysis ($n = 1$), not being published in a peer-review journal ($n = 1$), or not presenting a control group ($n = 7$). The majority of these 43 studies were written in English ($n = 40$) and the remaining records were written in Spanish ($n = 3$). These 43 studies were then grouped, considering the purpose of the meta-analytic procedure, into a subsample of 27 studies (i.e., targeting only teachers) and a subsample of 16 studies (i.e., those presenting a combined SEL intervention).

Study Coding

The 43 selected records were coded based on 25 criteria defined in accordance with PRISMA recommendations on data items (i.e., participants, intervention, comparisons, outcomes, and study design; Moher et al., 2015) and variables, highlighted in the literature as influencing the efficacy of interventions (e.g., dosage, facilitator, teaching grade; Gulamhussein, 2013) and quality of the research (e.g., randomization process; Higgins et al., 2011). The first author coded all the studies selected for the analysis. The interrater agreement (IRR) was then computed by calculating the percentage of agreement with two additional researchers with expertise in the SEL rationale, who used the criteria list to code 13 studies (i.e., 30.23%). To assess the IRR, since a fully crossed design was used (i.e., the three coders rated the same set of records), the intra-class correlation (ICC) was computed to evaluate the reliability regarding the metric criteria-variables (e.g., fidelity report), and the Kappa variant for three coders was computed to nominal criteria-variables (e.g., type of SEC assessed; Hallgren, 2012). An ICC of .96 was obtained, revealing an excellent IRR for the metric criteria-variables within the three coders (Hallgren, 2012). A mean Kappa of .64 was found for the nominal criteria-variables among the three coders, revealing substantial agreement (Hallgren, 2012). Prior to the data analysis, the three reviewers discussed the coding differences and the studies were re-coded, with all experts agreeing on the final code.

Outcomes

Outcomes were coded on the basis of the afore-mentioned five domains in Chapter 1.2, which were selected in accordance with the indications advanced in prior literature as to the main impact areas of SEL interventions (Jennings and Greenberg, 2009; Schonert-Reichl, 2017) and supported by previous research (e.g., Marques et al., 2019): SEC, Psychological distress, Physical distress, Well-being, and Classroom climate and instructional practices. The subgroup analysis was computed for two assessment points in time [i.e., time 2 (posttest) and follow-up], making it possible to test the temporal stability and sleeper effects of the SEL interventions for teachers.

Covariates

Prediction effects were tested for dosage of intervention, cross-session training, suitability of content presented to teachers' teaching grade, and use of mindfulness techniques. These variables were selected in accordance with Gulamhussein (2013), Higgins et al. (2011), Biglan et al.'s (2003) guidelines, and Klingbeil and Renshaw (2018) results. Dosage was re-coded as an ordinal variable with three levels: 1–14, 15–29, and 30 h or more. Cross-session training was coded as a dichotomous variable indicating the presence or absence of training between formal sessions. As regards suitability of content presented to teachers' teaching grade, this was re-coded as a nominal variable with three conditions considering whether the intervention addressed only class-level teachers (e.g., elementary school), only discipline-level teachers (e.g., high school), or both (considering a SEL intervention with non-specific to group characteristics). Use of mindfulness techniques to promote SEL was coded as a dichotomous variable indicating the use or not use of this strategy in the intervention.

Data Analysis

As the aim of the present study was to evaluate the impact of SEL interventions developed for teachers on teachers' personal and/or occupational variables, for the data analysis we coded and analyzed: (1) studies using the same intervention but taking different cohorts into consideration (e.g., replication, cultural adaptations) as distinct interventions; (2) papers using the same intervention and the same cohort, but reporting effects on different outcomes at time 2 or follow-up as a single

intervention. Therefore, a total of 39 interventions (presented in 43 studies) were considered for the systematic review. Then, a subsample of 25 interventions (presented in 27 studies) were eligible for the meta-analysis targeting only teachers outcomes; and a subsample of 14 interventions (presented in 16 studies) were considered for the meta-analysis targeting combined interventions' effects.

The pooled studies were included in a meta analytic random effects model, taking into account between-studies' heterogeneity. Hedges' *g,* as an unbiased standardized measure of effect, was estimated by retrieving the following information from the pooled studies: intervention and control group means, standard deviations and sample sizes. Whenever part of the previous information was not available, the standardized measure of effect was converted from *t* and *F* statistics. In addition to correcting Cohen's *d* for bias in small samples, Hedges' *g* makes it possible to estimate an effect based on different outcomes and metric scales by standardizing results across studies (e.g., Kline, 2004).

Anticipating high heterogeneity levels, effects were grouped according to the following dimensions: SEC, psychological distress, physical distress, well-being and classroom climate and instructional practices. Effects were targeted at time 2, but whenever possible, estimates were also provided for follow-up. Given that most of the studies reported several effects leading to within studies dependence, the random effects model was estimated using Robust Variance Estimation (RVE) with correction for small samples, allowing for intra-study correlation. The estimated effect was computed by allocating more weights to studies with smaller variance (Fisher and Tipton, 2015) and a sensitivity analysis performed to check if the computed effect changed according to different correlation values (Hedges et al., 2010).

The I^2 statistic was computed to measure heterogeneity across the studies and the following cut-off values were used for interpretation: $I^2 < 50\%$ suggesting low heterogeneity, 50–75% revealing moderate heterogeneity and >75% indicating high heterogeneity (Higgins et al., 2003). Prediction intervals for the estimated effects were computed to provide lower and upper bound values for future effects (Harrer and Ebert, 2018). Meta-regression models were fit to evaluate the role of the covariates on the estimated effects, namely intervention dosage, cross-session training, suitability of content presented to teachers' teaching grade, and use of mindfulness techniques. Estimates significance was provided when the 95% confidence interval (CI) did not include the 0.

Publication bias was assessed using sensitivity analysis following Vevea and Woods (2005) weight-function modeling, where a meta-analytic model adjusted for publication bias using *p*-value cut-points and a pre-specified vector of weights for each corresponding *p*-value is compared to an unadjusted model. For *p*-values below 0.05 all effect sizes survive selection, with the chance of survival dropping for *p*-values higher than 0.05. A pattern suggesting publication bias occurs when the estimated effect size decreases from the unadjusted to the adjusted model. The following intervals (and weights) were used: <0.001 (1), 0.001 < 0.01 (1), 0.01 < 0.05 (1), 0.05 < 0.10 (0.8), 0.10 < 0.20 (0.7), 0.20 < 0.30 (0.6), and 0.30 < 1 (0.5) (Coburn, 2018; Coburn and Vevea, 2019).

Effects were converted to Hedges' *g* using the package esc (Lüdecke, 2019). We used robusta (Fisher et al., 2017), meta (Schwarzer, 2007), metafor (Viechtbauer, 2010), and weightr (Coburn and Vevea, 2019) packages designed for R environment (R Core Team, 2018) to perform all meta-analytic analyses.

RESULTS

Descriptive Synthesis of the Selected Studies

The total sample comprised 39 interventions involving 3,004 in-service preK-12 teachers. A summary of general publication features can be found in **Table 3** and the full data concerning all the criteria analyzed may be found in the **Supplementary Tables 4.1–4.3**. As regards the publication dates, the first empirical studies [with a (quasi-)experimental design] concerning on evaluation of efficacy of a SEL intervention for in-service teachers on teachers' outcomes were published in 2008 (i.e., Raver et al., 2008; Webster-Stratton et al., 2008). However, these studies were still addressing combined interventions, with the professional development of teachers emerging as a sub-product of a global intervention. In our pool, the first study which addressed an individual SEL intervention (i.e., only targeting teachers) was not published until 2010 (i.e., Delgado et al., 2010), 15 years after the establishment of the SEL rationale. The majority of the 39 interventions assessed have been published in the last 6 years (2015–2020; 51.28%).

Most interventions were conducted in North America (61.54%) and Europe (30.77%). All eligible interventions were school-based interventions with a universal approach (i.e., preventive interventions targeting all teachers). Since the interventions considered were developed in educational contexts, an analysis of the school's area was conducted. Some of the studies (38.46%) did not report information concerning school area characteristics. Of those reporting this data, 15 interventions were conducted within urban areas, while six took place in combined areas (e.g., urban and sub-urban areas).

Additionally, the majority of interventions targeted only teachers' SEL (64.10%) of pre- and elementary school levels (48.72%), with a mean age of 40.55 years ($SD = 4.89$) and 11.20 years of professional experience ($SD = 3.67$). Regarding their content, most interventions addressed at least two SEC-related areas (89.74%). More specifically, 28 interventions addressed self-awareness, 28 intervened in self-management, 28 involved social-awareness, 27 considered relationship skills, and 10 focused on responsible decision making. Only four interventions targeted merely one SEC-related domain and the key-competence addressed across all the interventions was Relationship Skills. All these four interventions were combined interventions.

With regards to Q1, most of the studies did not state the conceptual framework underlying the development of the SEL intervention used (64.10%). When referring to the quality indicators considered by the pooled studies (i.e., Q2) regarding the intervention features, most interventions were

TABLE 3 | Report on general characteristics of the 39 reviewed interventions.

Characteristics	*N*	%
Publication date		
1995–2004	0	0.00
2005–2014	19	48.72
2015–2020	20	51.28
Intervention features		
Geographic area		
Asia	3	7.69
Europe	12	30.77
North America	24	61.54
School area		
Urban	15	38.46
Suburban	2	5.13
Semi-rural	1	2.56
Rural	0	0.00
Combination	6	15.38
Not reported	15	38.46
Target		
Only teachers	25	64.10
Teachers and students	14	35.90
Grade participants taught		
Class-level	19	48.72
Discipline-level	7	17.95
Combined	10	25.64
Not reported	3	7.69
State conceptual framework		
Yes	14	35.90
No	25	64.10
Dosage of intervention		
1–14 h	6	15.38
15–29 h	14	35.90
30 or more hours	19	48.72
Cross-session training		
Yes	16	41.03
No	23	58.97
Methodological features		
Independent research		
Yes	16	41.03
No	23	58.97
Intervention led by its author		
Yes	20	51.28
No	19	48.72
Randomization (control for selection bias)		
Participant-level	18	46.15
School-level	10	25.64
None	11	28.21
Blinding of participants and researchers (control for performance bias)		
Yes	2	5.13
No	22	56.41
Not specified	15	38.46
Blinding of outcome assessment (control for detection bias)		
Yes	13	33.33
No	6	15.38
Not specified	20	51.28
Incomplete outcome assessment (control for attrition bias)		
Yes	17	43.59
No	1	2.56
Not specified	21	53.85
Selective report (control for reporting bias)		
Yes	0	0.00
No	1	2.56
Not applicable	38	97.44
Fidelity report		
Yes	9	23.08
No	30	76.92
Time of assessment		
Pre-posttest	29	74.36
Pre-posttest and follow-up	10	25.64
Type of measures		
Self-report	31	79.49
Behavioral	3	7.69
Physiological	7	17.95
External observation	14	35.90
Outcomes assessed		
SEC	20	51.28
Psychological distress	23	58.97
Physical distress	11	28.21
Well-being	24	61.54
Classroom climate and instructional practices	17	43.59

delivered to the participants by a facilitator integrated in the original intervention development team (51.28%). Moreover, most of the interventions targeted class-level teachers, 25.64% of the interventions did not ground the addressed topics specifically to teachers' teaching grade. The length of these 39 interventions ranged from 2 to 50 h ($M = 26.36$, $SD = 10.14$, $Mdn = 28.00$), although most of them lasted more than 14 h (84.62%) [thumb rule proposed by (Gulamhussein, 2013)]. Additionally, most of interventions (58.97%) did not include assignments and/or monitoring activities between formal sessions (e.g., homework assignments, tutoring sessions, and ongoing coaching). Regarding the strategy used, in these 39 interventions, 22 used traditional techniques to promote SEL (e.g., CBT; 56.41%). The remaining 17 interventions (43.59%) resorted to the use of mindfulness techniques to increase SEL, of which 16 only targeted teachers and one intervention was a combined SEL intervention (i.e., Carvalho, et al., 2017). Some interventions were evaluated in more than one study, namely BEST in CLASS ($n = 2$), CARE ($n = 2$), Incredible Years—Teacher Classroom Management ($n = 5$), adapted MBSR ($n = 4$), RULER ($n = 3$), and SMART-in-Education ($n = 3$).

As regards the methodological features of the research design, there were 28 randomized-controlled trials [18 with a

teacher-level randomization (46.15%) and 10 with a cluster-level randomization (25.64%)] suggesting low risk of selection bias (Higgins et al., 2011), 16 studies led by independent research teams (41.03%), and nine studies reporting fidelity levels (23.08%). Additionally, as regards performance and detection bias, the risk of bias is unclear (Higgins et al., 2011). Concerning performance bias, it is important that neither the researchers nor the participants are aware of the condition to which the participant belongs during the research process, however, since most of the research teams are also responsible for the intervention delivery it is not possible to guarantee full blindness (56.41%), thus increasing the risk of bias. The same constraints were present for detection bias, leading to a silence within most studies regarding the procedures used to ensure blindness of outcome assessment (51.28%). Nevertheless, among those that stated some information regarding detection bias, most ensured blindness of outcome assessment (33.33%), revealing a low risk of bias. Moreover, with regards to control for attrition bias, most of the studies did not specify this information (53.85%) leading to unclear risk, but the majority of those reporting this bias explained the reasons for the attrition and also discussed how missing data had been handled (43.59%). Lastly, only one study did not report full data (i.e., Benn et al., 2012), leading to a low risk of reporting bias within the pool of the 39 interventions considered.

Since one of the eligibility criteria required quasi-experimental or experimental designs, all the studies considered presented at least pre-posttest data. Additionally, 10 studies also presented follow-up assessments (25.64%), ranging from 4 weeks to 1 year after posttest. As for the typology of measures used to assess the impact of the interventions on teachers' outcomes, 79.49% of the studies resorted to self-report measures, 35.90% used external observation measures, 17.95% presented physiological indicators and 7.69% applied behavioral tasks for assessment. In the 39 interventions reviewed, 12 used combined measures to test impacts on the variables assessed (30.77%).

Lastly, as regards outcomes, most of the studies evaluated the impact of the interventions on teachers' well-being (61.54%) and psychological distress (58.97%). In opposition, physical distress was the less gauged domain (28.21%). Furthermore, 26 out of the 39 interventions measured variables from more than one domain, while the impact of the remaining 13 interventions was tested on indicators from only one domain, namely classroom climate and instructional practices (92.31%) and psychological distress (7.69%).

Meta-Analysis Results

Firstly, the subsample of the 25 SEL interventions (across 27 studies) which only targeted teachers was considered for the meta-analysis procedure. Among the 25 pooled studies included in the meta-analysis, 249 effects were estimated at time 2, revealing a high level of within-study interdependence, which was taken into account using RVE. With regards to H1, significant effects were found for SEC, Psychological distress and Well-being, with Physical distress and Classroom climate and instructional practices being the only figures without statistical significance. Moderate heterogeneity was found for Psychological distress. All other effects revealed high heterogeneity, particularly Classroom climate and instructional practices. Prediction intervals were also wide. No significant effects were found for studies reporting follow-up measures (see **Table 4**). **Figures 1A,B** depict forest plots with averaged effects for each domain by plotted study.

An additional meta-analysis was performed for studies offering a combined intervention. A pool of 14 studies comprising 95 effects revealed non-significant effects (see **Table 4**). **Figure 2** depicts the forest plot with average effects by plotted study.

Meta-regression estimates to explore the role of covariates are shown in **Table 5** for studies targeting teachers at time 2. Due to the smaller number of studies and sample requirements (minimum of 10 studies) for simultaneously testing explanatory variables (Thompson and Higgins, 2002), the models were only adjusted for the dimensions with higher number of studies (i.e., SEC, Psychological distress and Well-being). In relation to H2, no significant effects were found regarding the role of covariates.

Finally, to assess publication bias, the Vevea and Woods (2005) sensitivity analysis was performed. For interventions only targeting teachers, there was a pattern of publication bias for SEC and Well-being effects. Both effects when corrected for publication bias decreased to 0.44 and 0.24, respectively. As for Psychological distress, the effect remained unaltered (−0.34) after the model correction.

DISCUSSION

Nowadays, teachers are faced with an imbalance of teaching demands (e.g., workload, classroom management, and interpersonal conflicts) and resources (e.g., teacher training), which impacts their personal lives and job performance (Jennings and Greenberg, 2009). Additionally, teaching-specific stressors have been referred to as mainly socio-emotional related (Roeser et al., 2013), thus leading to researchers worldwide investing in the development of SEL interventions to promote teachers' SEC (Schonert-Reichl, 2017). Nevertheless, to our knowledge, no studies had yet overviewed the impacts of SEL interventions for teachers on their personal and/or professional outcomes. Therefore, it was the aim of this research to review the existing evidence on the effects of SEL interventions on teachers' outcomes. To this end, following an in-depth literature research, a systematic review with meta-analysis was performed on 43 empirical studies (with a total of 39 interventions).

In order to achieve our goal, two research questions and two hypotheses were established. With regards to Q1, in keeping with other findings for SEL interventions for students (Tolan et al., 2016), the pooled studies did not, in their majority, clearly state the theoretical foundations to which they resorted to inform the design and implementation of their SEL interventions for teachers. Only approximately one third of the eligible studies presented clear information on the theoretical frameworks which guided the development of the SEL intervention used. This is particularly important, since it can nurture heterogeneity and

TABLE 4 | Weighted average effects with heterogeneity estimates and prediction intervals.

	Individual				Combined			
	g (SE)	95% CI	I^2	Prediction Interval	*g* (SE)	95% CI	I^2	Prediction Interval
T2								
SEC ($n = 19, k = 79$ / $n = 2, k = 14$)	0.59 (0.14)	[0.29, 0.90]	85.80%	[−0.83, 2.02]	0.04 (0.11)	[−1.40, 1.48]	59.20%	[−5.65, 5.73]
Psychological distress ($n = 20, k = 69$ / $n = 2, k = 3$)	−0.34 (0.11)	[−0.57, −0.10]	75.50%	[−1.37, 0.69]	−0.02 (0.34)	[−4.35, 4.31]	59.40%	[−6.98, 6.94]
Physical distress ($n = 11, k = 37$ / $n = 0, k = 0$)	−0.04 (0.19)	[−0.47, 0.38]	88.10%	[−1.68, 1.06]				
Well-being ($n = 21, k = 49$ / $n = 3, k = 7$)	0.35 (0.09)	[0.16, 0.54]	77.30%	[−0.67, 1.37]	0.34 (0.27)	[−0.92, 1.59]	83.90%	[−2.01, 2.69]
Classroom climate and instructional practices ($n = 5, k = 15$ / $n = 12, k = 71$)	1.26 (0.68)	[−0.61, 3.14]	96.00%	[−3.59, 6.11]	1.20 (0.61)	[−0.14, 2.53]	98.20%	[−3.49, 5.89]
Follow-up								
SEC ($n = 4, k = 11$/ $n = 0, k = 0$)	0.17 (0.25)	[−0.63, 0.98]	80.00%	[−1.49, 1.83]				
Psychological distress ($n = 2, k = 10$/ $n = 1, k = 1$)	−0.71 (0.18)	[−3.05, 1.63]	62.50%	[−6.58, 5.16]				
Physical distress ($n = 2, k = 10$/ $n = 0, k = 0$)	−0.12 (0.17)	[−2.28, 2.05]	47.40%	[−4.31, 4.08]				
Well-being ($n = 5, k = 12$/ $n = 1, k = 3$)	0.49 (0.26)	[−0.24, 1.22]	78.90%	[−1.10, 2.07]				
Classroom climate and instructional practices ($n = 0, k = 0$/ $n = 4, k = 20$)					1.26 (0.73)	[−1.07, 3.59]	96.30%	[−3.55, 6.07]

n (number of studies); k (number of within effects) with values to the left of the bar referring to individual interventions, and values to the right of the bar referring to combined interventions.

blur the frontiers of the SEL rationale, making it more difficult to compare the interventions with each other, thus limiting the estimate of robust and secure effects. Furthermore, this concern extends to the intervention and research procedures adopted which may contribute to improving the empirical-evidence of SEL intervention effects, namely by controlling for biases (Biglan et al., 2003; Higgins et al., 2011). Even though most of the studies presented some type of randomization, suggesting a low risk of selection bias (Higgins et al., 2011), with regards to the remaining procedures, the level of bias is more unclear. Most of the studies were not led by independent research teams and did not report fidelity assessment. Moreover, since the pooled studies resorted to the assessment of interventions' effects and most interventions were delivered by the researchers themselves, consequently most of the studies did not ensure full blindness of the participants and outcomes, which may increase the risk of bias (Higgins et al., 2011). Additionally, most of the studies did not present data from follow-up assessments and the data collection was mostly conducted through self-report instruments. Therefore, regarding Q2, it may be concluded that there is a need for future studies to improve their quality in terms of methodological processes which may ensure higher quality and validity of the SEL interventions' contributions.

With regards to the first hypothesis of the study, the results revealed that H1 was partially sustained. The findings indicated statistically significant medium effects of SEL interventions for teachers on SEC ($g = 0.59$), Well-being ($g = 0.35$), and Psychological distress ($g = -0.34$). These results are in line with the prior research that highlights the contribution of SEL interventions for teachers to teachers' personal and job performance-related dimensions (Schonert-Reichl, 2017). Impacts on Physical distress and Classroom climate and instructional practices were found to be non-significant. The absence of significant effects in the Physical distress dimension at posttest may be due to the fact that changes at the behavioral and physiological indicators' level emerged following a prior psychological change (e.g., perception). Thus, the aforementioned changes may take longer to appear (Tsang et al., 2015). On the other hand, the non-significant effects on Classroom climate and instructional practices may be associated with the high heterogeneity observed for this domain. Since the vast majority of studies assessing this domain used a multilevel approach to control for possible context effects (e.g., school in which the teachers were integrated) and were mainly homogeneous in terms of the specific strategies used in each intervention and their target, an alternative explanation for the extreme variance found between studies may be related to the approach used for the data collection. In fact, the studies evaluating the Classroom climate and instructional practices domain did so mainly through observation measures, without triangulating this data with data from other sources (e.g., informant-report measures) and other domains (e.g., SEC), which may have contributed to an increased bias and affected the results, causing more heterogeneity of effects. Future research should, therefore, be cautious when assessing SEL interventions' impact on teaching practices, namely ensuring that observations of teachers' behavior within their classroom are made by

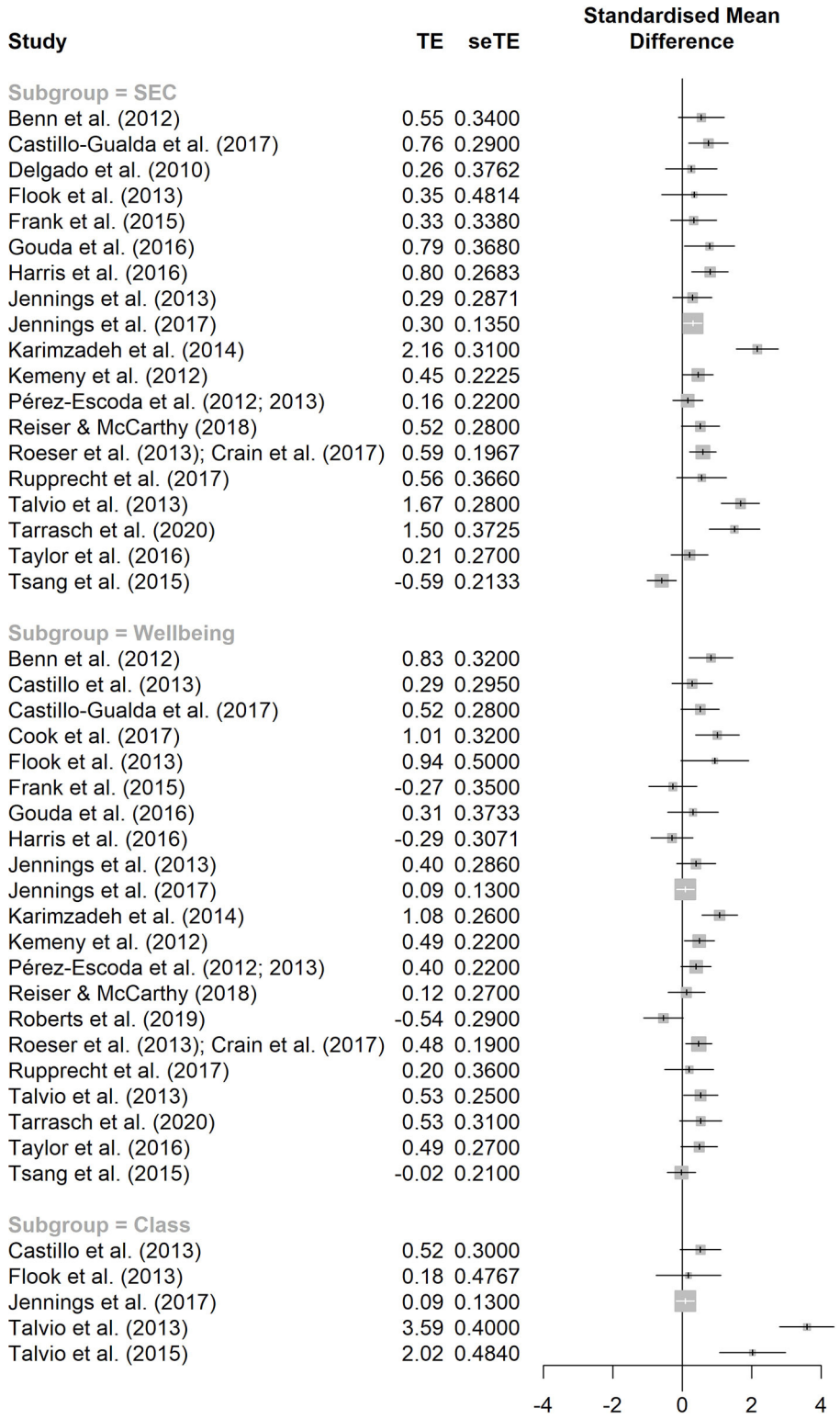

FIGURE 1 | (Continued).

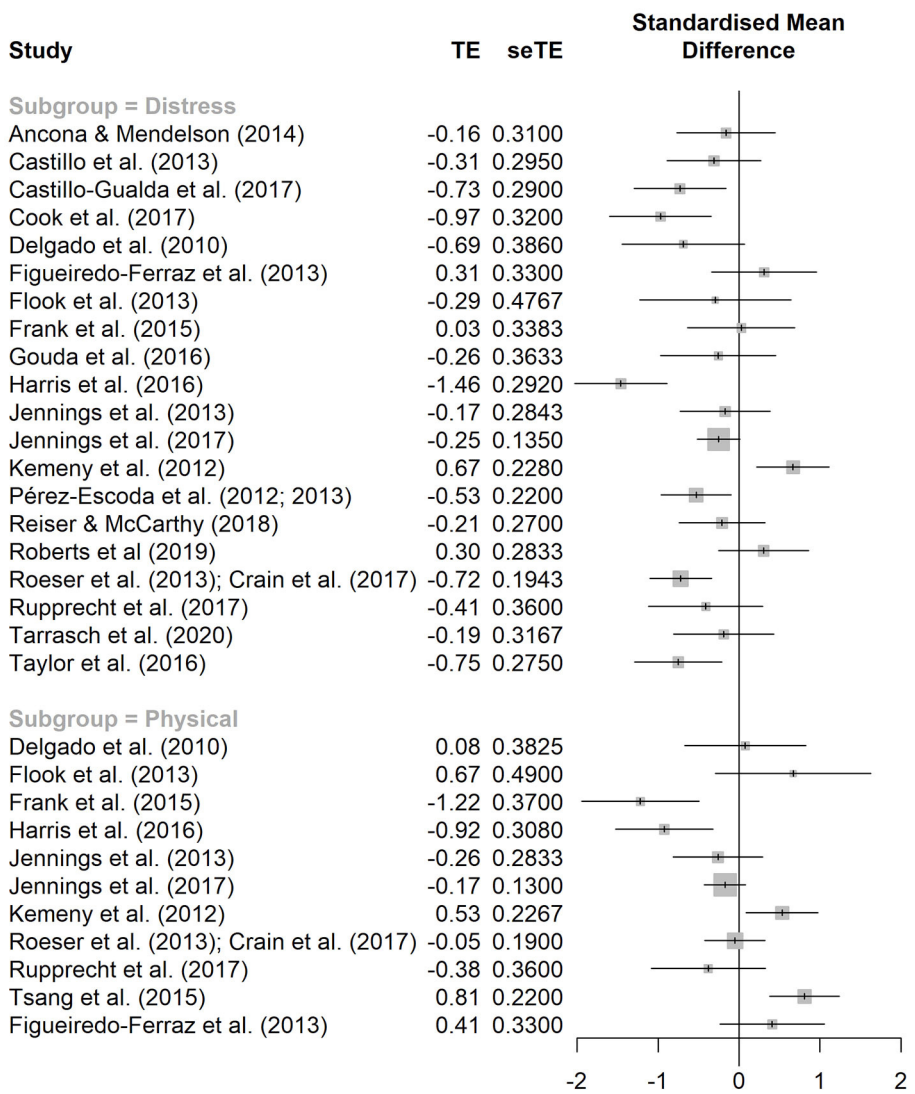

FIGURE 1 | (A) Forest plot with weighted average effects for the SEC, Well-being, and Classroom climate and instructional practices domains by study of interventions only targeting teachers. **(B)** Forest plot with weighted average effects for the Psychological distress and Physical distress domains by study of interventions only targeting teachers.

independent observers, multiple sources of data are gathered, and data from multiple domains (e.g., teachers' SEC) are crossed.

Moreover, there were no significant effects at follow-up. However, the pool of studies eligible for the assessment of stability and sleeper effects was small and, therefore, conclusions should be drawn with caution.

Additionally, combined interventions did not present significant impacts on teacher-level outcomes. This result may derive from the origin of this type of intervention. Combined SEL interventions are mainly developed targeting the students' SEC. Nevertheless, recognizing the role of teachers in students' development, some interventions also integrate an intervention (usually prior to the students' intervention) targeting teachers to help them react more socially and emotionally in their classrooms. Consequently, these modules targeting teachers' SEC are usually shorter and place greater emphasis on inter-personal SEC (i.e., social awareness and relationship skills) which may affect the results.

Furthermore, in accordance with the findings regarding SEL interventions targeting students, where significant effects where mainly found in children's SEC ($g = 0.57$; Durlak et al., 2011), our results showed that SEL interventions for teachers also had a higher impact on their SEC ($g = 0.59$), and a similar effect. Additionally, these findings suggest that SEL interventions for teachers also serve to improve perceived personal well-being and positive emotions and to reduce perceived psychological

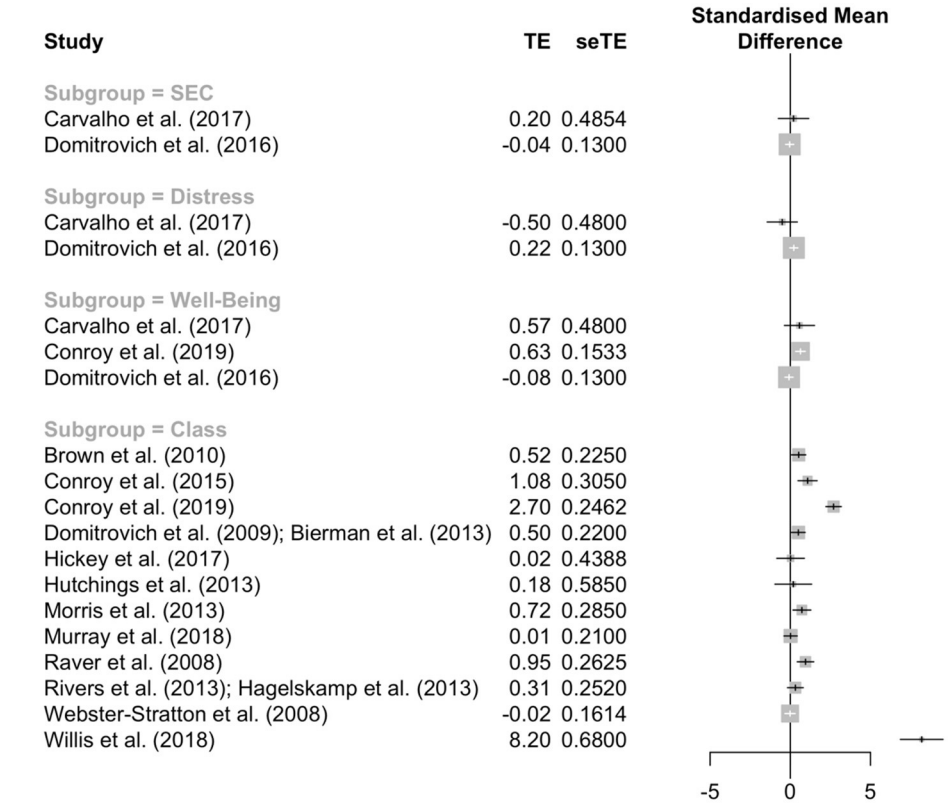

FIGURE 2 | Forest plot with weighted average effects of the five accessed domains by study of combined interventions.

TABLE 5 | Meta-regression models for covariates.

	Individual					
	SEC		Psychological distress		Well-being	
	B(SE)	95% CI	*B(SE)*	95% CI	*B(SE)*	95% CI
Intercept	0.13(0.66)	[−2.16, 2.42]	−0.07(0.30)	[−0.80, 0.66]	0.50(0.40)	[−0.50, 1.50]
Dosage (15–29 h)	1.07 (0.69)	[−2.24, 4.39]	−0.36 (0.27)	[−1.01, 0.30]	−0.06 (0.42)	[−1.22, 1.10]
Dosage (≥30 h)	0.86 (0.75)	[−1.97, 3.68]	−0.25 (0.29)	[−0.97, 0.47]	−0.16 (0.41)	[−1.24, 0.91]
Cross-training (yes)	0.10 (0.23)	[−0.42, 0.63]	0.42 (0.33)	[−0.34, 1.18]	−0.16 (0.28)	[−0.78, 0.46]
Teaching grade (class)	−0.23 (0.39)	[−1.20, 0.75]	0.01 (0.26)	[−0.62, 0.64]	−0.10 (0.25)	[−0.70, 0.49]
Teaching grade (discipline)	0.40 (0.41)	[−0.60, 1.39]	−0.33 (0.30)	[−1.03, 0.38]	−0.34 (0.37)	[−1.19, 0.51]
Mindfulness (yes)	−0.64 (0.42)	[−1.65, 0.36]	−0.18 (0.27)	[−0.86, 0.51]	0.24 (0.29)	[−0.42, 0.90]

For dosage, the reference group is 1–14 h; for cross-training, the reference group is no; for grade, the reference group is both; for use of mindfulness techniques, the reference group is no.

discomfort and internalizing problems, sustaining preventive action for ill-health issues (e.g., burnout) and promotive action for well-being and mental health (e.g., personal accomplishment, job satisfaction).

The findings suggest that this intervention approach may contribute to improving targeted outcomes for preK-12 in-service teachers. Nevertheless, the heterogeneity among the studies was high across the domains ($I^2 > 75.00\%$), suggesting the existence of covariates. In line with the aforementioned, prior literature has also found high levels of heterogeneity among SEL interventions for children ($I^2 = 91\%$; Durlak et al., 2011).

Lastly, in order to address H2, we tested for the impact of covariates. This hypothesis was rejected. Even though high heterogeneity levels among the studies were found, suggesting that more than 75% of between-study variance may be attributed to predictor variables, the tested potential covariates did not significantly impact treatment efficacy. This

finding may be due to the covariates that were selected (despite the selection being theoretically grounded), and to the methodological and conceptual issues that emerged across the studies (e.g., psychometric properties of the selected instruments, sample size that may compromise the power of the analysis computed). Also, due to the smaller number of studies and sample requirements, the test of the covariates' prediction effect presented limitations and could not be performed across all the domains. Consequently, more research is required to understand precisely which variables may be explaining the found variance. Furthermore, more in-depth research is needed in order to test and expand knowledge regarding the particular role of the considered covariates in SEL interventions for in-service teachers' impact on teachers' outcomes.

Furthermore, this study highlights some important methodological and conceptual aspects that should be addressed in future research in this area. First, our findings reinforce the current lack of research on SEL interventions for teachers' efficacy and the need for greater homogeneity of practices (Jennings et al., 2017). Additionally, our results revealed that most of the studies relied on small samples ($N < 100$), compromising the power of the computed analyses. Moreover, the majority of the eligible papers considered only self-report measures, which are affected by random reporting, social desirability, and may also mask the impact on SEC, as previously stated. Therefore, future research should test effects on larger samples and through multiple data collection methods (e.g., behavioral measures, informant-report measures, and direct observations). Furthermore, even though we only considered empirical studies, only two (i.e., Domitrovich et al., 2016; Roberts et al., 2019) used an active control group (i.e., alternative intervention) in addition to a passive control group (e.g., waiting list); few studies included follow-up assessments; and a minority of studies (<20%) presented information on fidelity in the delivery of the intervention. These methodological shortcomings are particularly problematic since they may compromise control of the Hawthorne effect, the study of maintenance and sleeper effects, as well as the identification of evidence-based practices and determinant components, which influence outcomes. Lastly, with regard to conceptual features, few of the studies explicitly presented the characteristics and contents of the interventions and the strategies used, and all the interventions were designed at an individual / micro level (i.e., targeting only teachers or teachers and their students), and these features may have had an important effect on the results found. Although these findings provided initial orientations as regards the factors taken into consideration during SEL interventions for teachers' development, in order to achieve the aspired results, further research is needed to deepen, validate and reinforce our results.

Limitations and Future Research

This study presents some limitations that should be considered when interpreting the data. First, due to the eligibility criteria, some research studies were excluded since they did not provide enough data for the estimation of effect sizes. Likewise, studies with non-experimental designs which used combined samples (i.e., teachers and other working professionals), papers that had not been published in peer-reviewed journals and gray literature were excluded. Although these options contributed to ensuring the quality of the research, they also may have led to a bias of the findings (Higgins et al., 2019). Resorting specifically to gray literature, its inclusion alone may, paradoxically, introduce bias (Higgins et al., 2019). Therefore, since the SEL rationale, and the interventions developed within this approach, are already heterogeneous and need further integration, the option was taken to minimize the possible entropy through the restriction of eligible studies, in order to guarantee the validity of the meta-analytic procedure. However, considering the expanding research in this area, it is important for future research to conduct replications of this initial meta-analysis in order to extend our findings. Moreover, due to the heterogeneity of contents addressed by the interventions and outcomes assessed, we were not able to test for finer effects. It would be interesting for future research studies to analyze specific effects on the sub-dimensions of outcome domains (e.g., within the scope of psychological distress, understanding SEL interventions' impact on teachers' burnout levels), and to test for possible distinct effects among different SEC-related areas (e.g., self-regulation). Thus, future meta-analyses should investigate the specific pathways our analysis did not take, due to its wider view, with greater precision.

As for the analysis itself, high levels of heterogeneity among the studies were found, suggesting that between-study variance was explained by covariates. However, despite the fact that the predictors' selection was based on prior literature recommendations, the tested covariates did not contribute to explaining the heterogeneity found. Moreover, the 95% range of prediction intervals contain values below and above 0, meaning effects in new studies may be on the opposite side of the summary point estimate presented in the current meta-analysis. This is consistent with the high heterogeneity found, which tends to be higher for continuous outcomes (IntHout et al., 2016). Despite the high heterogeneity of the effects, they do not appear to be explained by the covariates deemed relevant in the literature, thus suggesting the need for future research to explore other predictors. This result also points to the need to develop far more theoretically adjusted interventions, since a great diversity of forms of implementation, theoretical frameworks, and methodological procedures (e.g., data collection protocols used, outcomes assessed, fidelity assessment, and control for risk of biases) regarding SEL interventions' implementation and evaluation was observed. Hence, in this context, this systematic review with meta-analysis contributed particularly to inform and highlight the need to build more solid and well theoretically grounded SEL interventions for teachers.

Moreover, there are several statistical methods to evaluate publication bias, as may be observed in the work of Renkewitz and Keiner (2019), which shows the non-existence of a single best detection method, and that no detection method yields "proof" of bias. We used Vevea and Woods (2005) approach as a sensitivity analysis, and a decrease was found in the point estimates for the SEC and Well-being domains, suggesting a pattern of publication bias. This finding reinforces the aforementioned cautiousness of the achieved results and the need to further promote the theoretical and methodological soundness of interventions

(Renkewitz and Keiner, 2019). Additionally, this result (along with the absence of publication bias for the Psychological distress domain, which also presents the lowest levels of heterogeneity) stresses the importance of a careful and more robust selection of methodological procedures. More specifically, the suggestion of more consistency of the data within the Psychological distress domain may be due to the fact that, there is, in fact, less divergence of the variables assessed in this domain, and also a tendency to use the same well-established instruments (e.g., the Maslach Burnout Inventory to evaluate burnout symptoms).

Theoretical and Practical Implications

Bearing the aforementioned restrictions in mind, SEL interventions for teachers appear to have, on average, moderate impacts on improving teachers' SEC and Well-being, and reducing their Psychological distress symptoms. Taken together, these results reinforce the potential of SEL for teachers' personal and professional outcomes, thus corroborating the relevance of including SEL approaches in teacher training. Also, due to its favorable contributions for teachers' well-being and job performance, these findings also sustain and reinforce the importance to future studies to review, reflect and discuss the need to explicitly integrate SEL for pre-service and novice teachers initial preparation (Schonert-Reichl et al., 2017).

In addition to illustrating how this type of intervention may play a significant role in teacher training and consequent performance, our findings allow us to draw some insights as regards the design of research studies. Firstly, the results emphasize the importance of developing more theoretically and methodologically robust SEL interventions for teachers, in order to ensure higher quality and validity of the research and provide better and more reliable empirical evidence of SEL intervention effects (Biglan et al., 2003; Higgins et al., 2011). It is, therefore, important for future research on the efficacy of SEL interventions to evaluate maintenance and sleeper effects more consistently, namely through the inclusion of follow-up assessment. Moreover, due to the between-studies variance and suggestion of publication bias for the SEC and Well-being domains, it may be important to reflect on the instruments used to measure the assessed constructs. It may be the case that since the eligible studies tested highly heterogeneous and distinct variables through multiple instruments, the found variance may reflect an inconsistency in the evaluation procedures. Thus, a more suitable match between the selected instruments and the variables under study should be a concern for future studies. Additionally, it is crucial to align the selected variables with the intervention objectives and addressed contents. Most of the studies showed a mismatch among these three methodological aspects or did not provide enough information on the objectives and contents of the interventions, making this relationship unclear. Moreover, research using repeated measures and longitudinal designs is needed to test other potential moderators and mediation effects that help to extend current knowledge and develop more robust guidelines for these types of interventions.

Likewise, our results provide important clues for the development of specific guidelines on the design of SEL interventions for teachers. Firstly, the inconsistent and mostly silent results regarding the theoretical frameworks used to ground the intervention immediately places limitations on the comparison and evaluation of the SEL interventions for teachers. The theoretically based interventions are, nevertheless, considered one of the main features of good practices (e.g., Durlak et al., 2015).

Moreover, the predictive role of the specific content features found in this study appears to indicate that, as regards SEL interventions for teachers, the customization of contents to specific groups of teachers (i.e., class-level and discipline-level teachers) did not play a significant role in the assessed domains. Therefore, tailoring the intervention to a specific group of teachers (i.e., class-level or discipline-level teachers) does not appear to be particularly relevant. However, regardless of the chosen approach, SEL interventions should provide opportunities for teachers to be involved in activities that explicitly promote reflection and perspective taking in a group setting, thus enabling them to share ideas and experiences. Irrespective of these insights, results were not tested across all the domains (due to data conditionings), and therefore, more research is needed to replicate and verify these factors.

Furthermore, results suggest that, contrary to what was expected, dosage, cross-session training [as suggested by Gulamhussein (2013)] and the use of mindfulness techniques [as suggested by Klingbeil and Renshaw (2018)] did not predict the effect of SEL interventions. Although additional research is needed to clarify these potential influences, the findings of this study should be considered by intervention developers when planning the structure and features of new interventions. For example, perhaps a more effective duration (i.e., distance between 1st and last training session) and frequency of the intervention may play a more crucial role in SEL interventions for teachers' effectiveness than a higher number of formal training hours (i.e., dosage). Also, despite the promising results found in prior literature (e.g., Klingbeil and Renshaw, 2018), the use of mindfulness techniques applied to the development of SEC appears to have a similar effect to that of traditional SEL techniques.

Finally, it is also important to note that all the eligible interventions were designed at an individual / micro level, at best including both teachers and students, and using a school-based primary level approach. No interventions designed at an organizational level (i.e., involving all school-community members) were found, or any that considered the baseline level of teachers' SEC. Therefore, since prior literature underlines the importance of promoting changes at an organizational level in order to produce long-lasting improvements (e.g., Durlak et al., 2015), there is a need for future research on SEL interventions for teachers to consider the contribution and effectiveness of organizational-level interventions. Likewise, as interventions to date have been developed on the basis of universal level approaches, it may be important to adjust the interventions to teachers' baseline characteristics and sketch SEL interventions according to a multi-tiered approach. Within this scenario, as more methodologically rigorous studies emerge, research including meta-analytic reviews should be conducted to refine and extend our findings.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

SO: designed and executed the study, analyzed the data, wrote, edited, and revised the manuscript. MSR: assisted with the design, collaborated with the data analyses, the writing, and the editing of the final manuscript. NSP: collaborated with the data analyses and the writing of the manuscript. AM-P: assisted with the design and execution of the study, collaborated with the data analyses, the writing, and the editing of the final manuscript. AMV-S: assisted with the design and execution of the study, collaborated with the writing, and editing of the final manuscript. All authors approved the final version of the manuscript for submission.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.677217/full#supplementary-material

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Two Forms of Social Inequality in Students' Socio-Emotional Skills: Do the Levels of Big Five Personality Traits and Their Associations With Academic Achievement Depend on Parental Socioeconomic Status?

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Some researchers and policymakers advocate a stronger focus on fostering socio-emotional skills in the hope of helping students to succeed academically, especially those who are socially disadvantaged. Others have cautioned that this might increase, rather than reduce, social inequality because personality traits conducive to achievement are themselves unevenly distributed in disfavor of socially disadvantaged students. Our paper contributes to this debate. Analyzing representative, large-scale data on 9,300 ninth graders from the German National Educational Panel Study (NEPS) and using the Big Five personality traits as a measure of socio-emotional skills, we cast light on two related yet distinct aspects of social inequality in socio-emotional skills: First, do *levels* of personality traits conducive to achievement vary as a function of students' parental socioeconomic status (pSES)? Second, do the *returns* to personality traits in terms of trait–achievement relations vary as function of pSES? Results showed that differences in Big Five traits between students with different pSES were small ($0.04 \leq |r| \leq 0.09$), especially when compared with pSES-related differences in cognitive skills (fluid intelligence) and sex-related differences in personality. The returns to Conscientiousness—the personality trait most relevant to achievement—in terms of its relations to academic achievement were higher in higher- vs. lower-SES students. Trait–achievement relations did not vary as a function of pSES for the other Big Five traits. Overall, both types of inequality were limited in magnitude. We discuss the implications of these findings for policy and practice and delineate directions for further research.

Keywords: socio-emotional skills, Big Five, personality, social inequality, socioeconomic status, academic achievement, GPA

INTRODUCTION

Fostering socio-emotional skills—which are often conceptualized according to the Big Five framework of personality traits (Abrahams et al., 2019)—through school-based programs and similar interventions has been welcomed as a possible conduit for improving students' academic achievement and life outcomes more generally (e.g., Kautz et al., 2014; Sánchez Puerta et al., 2016; Chernyshenko et al., 2018; Bleidorn et al., 2019; Malanchini et al., 2019). Both researchers and policymakers have espoused the hope that fostering socio-emotional skills particularly among socially disadvantaged students might be a way to reduce social inequality in academic achievement and related outcomes (Damian et al., 2015; Arias et al., 2017; Sisk et al., 2018; Grosz et al., 2021).

Such hopes are founded on the observation that personality traits have robust links to school achievement and other life outcomes (e.g., Roberts et al., 2007; Poropat, 2009; Gutman and Schoon, 2013; OECD, 2015; Borghans et al., 2016; Lechner et al., 2017; Soto, 2019) and may change through educational experiences (Göllner et al., 2017; Brandt et al., 2019). Additionally, these hopes rest on two often implicit assumptions: first, that students from a lower-SES background are at a disadvantage compared with their higher-SES peers when it comes to levels of personality traits such as Conscientiousness and Openness, just as they are when it comes to cognitive skills measured through standardized tests (Damian et al., 2015; Spengler et al., 2015); second, that personality traits conducive to achievement might have greater benefits for students from lower-SES backgrounds (Shanahan et al., 2014; Damian et al., 2015) and might thus compensate for social disadvantage.

The extent to which these assumptions hold is critical in determining whether intervention programs that aim to reduce social inequality by fostering skills and traits conducive to achievement can live up to their promise. However, whereas the links between personality and school achievement are well-established, these additional assumptions have received little research attention. Only few studies have examined the interplay of personality, parental socioeconomic status (pSES), and academic achievement (for an overview, see Ayoub et al., 2018).

In the present study, we contribute to this debate by casting new light on two types of social inequality in students' socio-emotional skills that correspond to the two assumptions mentioned above: (1) *differential levels* of socio-emotional skills related to students' parental socioeconomic status (pSES); and (2) *differential returns* to socio-emotional skills in terms of associations between the Big Five and academic achievement related to students' pSES. We focus on relations between pSES as measured by the highest International Socio-Economic Index (HISEI) of occupational status (Ganzeboom et al., 1992), Big Five personality traits as a global measure of students' socio-emotional skills, and school achievement as measured by grade point average (GPA). For this purpose, we use large-scale data representative of ninth-grade students in Germany.

SOCIO-EMOTIONAL SKILLS AND SCHOOL ACHIEVEMENT

Like most previous studies, we use the Big Five model of personality as an organizing framework for conceptualizing socio-emotional skills. The Big Five is the dominant model of individual-difference traits (i.e., typical patterns of thoughts, behaviors, and emotions; John et al., 2008). The Big Five personality traits can be viewed as human capital, skills, or resources because (1) they are conducive to achievement and attainment, and (2) they represent relatively consistent patterns of behavior, cognition, and emotion that are shaped in part by socialization and learning, despite often substantial heritability (Vukasović and Bratko, 2015; Kandler and Zapko-Willmes, 2017).

A sizable body of evidence attests to the relevance of the Big Five personality traits for school achievement. Meta-analyses (Poropat, 2009; McAbee and Oswald, 2013) and large-scale studies (e.g., Borghans et al., 2016; Lechner et al., 2017) show that Conscientiousness and Openness, in particular, are related to better academic achievement—above and beyond cognitive ability. Meta-analytic effect sizes in Poropat (2009) were $r = 0.24$ for Conscientiousness and $r = 0.09$ for Openness after adjusting for cognitive ability. The other three Big Five traits had smaller and more varied associations with achievement—the correlation between Agreeableness and achievement, for example, was $r = 0.07$ [but see Brandt et al. (2020)]. These findings have stimulated interventions to improve student outcomes by fostering traits conducive to school achievement—particularly traits from the Conscientiousness family—thus far with mixed success (Arias et al., 2017; but see Alan and Ertac, 2018; Alan et al., 2019, and Sisk et al., 2018, for encouraging findings).

SOCIAL INEQUALITY IN THE LEVELS OF SOCIO-EMOTIONAL SKILLS

In marked contrast to the links between pSES and cognitive ability and achievement, and the links between personality and achievement, the associations between pSES and offspring personality traits have been rarely directly investigated. As Ayoub et al. (2018, Study 1) noted, pSES–personality links were typically not the focus of the studies summarized in their recent meta-analysis. Instead, they were only incidentally reported, for example, because pSES or personality were included as covariates in analyses with a different substantive focus. Consequently, there is a dearth of theoretical groundwork specific to the pSES–personality interface.

Notwithstanding this dearth, there are several more general theoretical arguments why pSES should be related to offspring personality traits (see also Ayoub et al., 2018). The first argument is that pSES shapes the developmental contexts in which children are raised and thereby also their personality. For example, children with lower pSES are, on average, exposed to home environments that are less cognitively stimulating, that are marked by lower parental involvement, greater stress and heightened conflict, and that are situated in less affluent and

secure neighborhoods whose less well-funded schools do not offer the same educational opportunities as those attended by higher-SES children (e.g., Bradley and Corwyn, 2002; Kiernan and Huerta, 2008; Donkin et al., 2014; Ryabov, 2020). This multitude of contextual influences may, in turn, shape personality traits in the same way they shape cognitive ability, achievement, and aspirations (e.g., Becker et al., 2012; Damian et al., 2015; Guill et al., 2017). The notion that lower-pSES children are less likely to develop traits conducive to achievement is called the structural amplification hypothesis (Shanahan et al., 2014). Similar ideas are foundational to the family stress model (Conger and Conger, 2002; Masarik and Conger, 2017) and the family investment model (Conger and Donnellan, 2007; Sohr-Preston et al., 2013). Building on these ideas, perhaps the two most plausible consequences of heightened stress and lower cognitive stimulation among lower-SES children are lower levels of Openness to Experience and Conscientiousness and lower levels of Emotional Stability compared with higher-SES children.

Another argument for why pSES and offspring personality might be related draws on behavioral genetics. Personality traits are strongly heritable (Vukasović and Bratko, 2015), and heritability appears to increase with age (Zheng et al., 2019). Children's educational achievement and attainment are also heritable (e.g., Demange et al., 2020), as are specific personality traits conducive to higher educational achievement (e.g., Tucker-Drob et al., 2016; Malanchini et al., 2019; Mõttus et al., 2019). This leads to the notion that children inherit genes from their parents that shaped parents' personality and SES and that, in turn, shape childrens' personality as well as their achievement and later-life SES. Thus, whereas the first argument assumes social causation of personality differences by pSES through contextual effects on development, the second assumes genetic causation as the main reason for the pSES–personality association. Of course, as the developmental systems perspective highlights, social and genetic causation are neither mutually exclusive nor independent, but closely intertwined through gene–environment correlation and interaction as well as through epigenetic processes which, in turn, co-act with individual agency (Ford and Lerner, 1992; Lerner and Overton, 2017; see also Roberts, 2018).

Existing evidence, albeit sparse, provides qualified support for the idea that pSES, and personality traits are related. A recent meta-analysis by Ayoub et al. (2018) found that higher pSES was linked to higher offspring Openness ($r = 0.14$). Associations with other personality and temperament traits were small, leading these authors to conclude that Openness is the only personality trait that shows relevant pSES-related inequality. However, effect sizes varied widely across studies. Sutin et al. (2017) tested the association between parents' educational levels and offspring personality traits in 7 samples (age range 14–95 years) and meta-analytically combined the results. They found that parental educational attainment was positively related to offspring Openness, Extraversion, and Emotional Stability. Associations between pSES and offspring personality were the same for adopted and biological children, underscoring environmental/behavioral influences of pSES on personality, and supporting social causation. Sutin et al. (2017) argued that a higher income enables parents to provide more diverse experiences to their offspring, which fosters the development of their Openness. Unexpectedly, as in Ayoub et al. (2018), there was no association between parental education and offspring Conscientiousness, save a *negative* association in younger cohorts.

SOCIAL INEQUALITY IN THE RETURNS TO SOCIO-EMOTIONAL SKILS

Even fewer studies have analyzed possible interactions between pSES and offspring personality traits. Such interactions could reveal whether the returns to traits such as Openness and Conscientiousness with regard to school achievement are the same or different for children from lower- vs. higher-SES families. Most research on pSES, personality, and achievement has focused on linear effects of personality on achievement (for a meta-analysis, see Poropat, 2009). Further studies have investigated personality as a mediator in the pSES–achievement relation. Steinmayr et al. (2010), for example, found that Openness, and to a lesser extent Conscientiousness, mediated the association between parent's education and students' grades in the academically most demanding school track in Germany. Only more recently have studies explored differential returns to personality traits for achievement depending on factors such as grade level (e.g., Vedel and Poropat, 2017), school subject (Spengler et al., 2013; Israel et al., 2019; Meyer et al., 2019; Brandt et al., 2020), school track (Brandt et al., 2020), and pSES (Ayoub et al., 2018, Study 2). Theoretical work specific to interactions between pSES and offspring personality is in commensurately short supply.

Two general theoretical perspectives exist on such interactions in research on SES and life outcomes (see also Damian et al., 2015). The first is the resource substitution hypothesis (Mirowsky and Ross, 2003), which states that individual characteristics (including, perhaps, personality traits) can compensate for structural disadvantages that flow from a lower pSES. This implies *compensatory* interactions whereby achievement may be high for lower-SES students if they possess high levels of personality traits conducive to achievement. Conversely, achievement may be high even in the absence of favorable personality traits if pSES is high. In the former case, higher Conscientiousness (i.e., self-discipline, industriousness), for example, may compensate for a lack of structure and parental involvement in a low-SES household.

The opposite view is the resource amplification or "Matthew effect" hypothesis (Walberg and Tsai, 1983; see also Blossfeld and von Maurice, 2011). It holds that structural characteristics such as a higher SES and individual characteristics such as higher levels of achievement-related personality traits coalesce in producing life outcomes. Applied to the present case, this perspective would predict *synergistic* interactions, whereby achievement is highest when both pSES and personality traits conducive to achievement are high. This implies that children from higher-SES backgrounds, who are already socially privileged, would benefit disproportionately from having the "right" traits.

There is evidence, albeit scarce, to support each of these competing views. Shanahan et al. (2014), for example, found evidence for the resource substitution hypothesis in adolescent middle and high school students in the United States. Students from a lower socioeconomic background were more likely to attain a higher level of educational attainment if they had higher levels of Agreeableness, Openness, and Emotional Stability. At the same time, higher levels of these traits were less likely among students from low-SES households. In another study, Damian et al. (2015) found some evidence for compensatory effects of Extraversion and Conscientiousness in U.S. high school students; these effects were robust when controlling for cognitive ability. The authors found support for the Matthew effect only in terms of cognitive ability, but not personality. Analyzing a very large but selective online sample, Ayoub et al. (2018, Study 2), found synergistic interactions between parental education and all Big five traits, although these interactions were small in size.

In the German context, which is the focus of the present study, Brandt et al. (2020) investigated whether personality–achievement relations differ depending on school tracks in the historically three-tiered German secondary school system. They found that Conscientiousness and Agreeableness, and partly also Openness, were more strongly related to academic achievement in mathematics and German in the highest (academically oriented) track, in which higher-SES students are concentrated, than in the lowest (vocationally oriented) track, in which lower-SES students are prevalent. The interactions they found were more in line with the resource amplification (Matthew effect) hypothesis than with the resource substitution hypothesis. Although that study did not investigate pSES but school tracks as a moderator of personality–achievement relations, the school tracks to which students in Germany are assigned after primary school strongly depend on pSES—a fact that researchers have long deplored (e.g., Baumert et al., 2006; Maaz et al., 2008; Chmielewski et al., 2013; Chmielewski and Reardon, 2016). Thus, it is conceivable that the differential returns to personality traits by school track observed in Brandt et al. (2020) partly reflect differential returns related to pSES. The interplay between between-school tracking and pSES as moderators of the personality–achievement relations is currently poorly understood.

Although the resource substitution and resource amplification perspectives are mutually exclusive for a single trait, they may both be true but for different traits. For example, a study on personality traits as predictors of successful educational transitions from school to work (but not school achievement) in Germany found mainly synergistic interactions between pSES and Openness but also a few compensatory interactions with other traits (Nießen et al., 2020).

In sum, little research has addressed possible interactions between pSES and offspring personality, and extant findings are inconclusive. The verdict is not yet in on which of the two perspectives—resource substitution or resource amplification—more accurately describes how pSES and personality interact in predicting achievement, particularly in the German school system, where students are tracked into educational pathways early in their school lives (generally at age 10).

AIMS AND RESEARCH QUESTIONS OF THE PRESENT STUDY

In sum, existing evidence shows that pSES is related to children's personality traits, especially to Openness—and apparently both through social causation and shared genetic influences (Sutin et al., 2017; Ayoub et al., 2018, Study 1). Moreover, there is evidence—albeit very scarce—to suggest that the returns to personality traits differ as a function of pSES. However, existing evidence varies widely with regard to the type and quality of personality and outcome measures, size and composition of samples, study design, and other factors (see overview in Ayoub et al., 2018, Study 1). Hence, it is unclear how these factors affected the pSES–personality estimates in these studies. Moreover, most prior research hails from the North American context and is based on small and non-representative samples (for a notable exception, see Sutin et al., 2017). No previous work has investigated whether mean-levels or returns to personality traits differ by pSES in representative German samples (but see Steinmayr et al., 2010, for a small-scale study in Germany).

Our present study adds to the body of evidence on the interplay between pSES, personality, and achievement. Using large-scale representative data on ninth-grade students from the German National Educational Panel Study (NEPS), we seek to answer two questions that to date have only partly been resolved. First, do students from higher- and lower-SES families differ in personality traits that are conducive to achievement (social inequality in the levels of socio-emotional skills)? While we are cognizant of the genetic entwinement of pSES, personality, and achievement, here we build on the family stress and family investment models (Conger and Donnellan, 2007). We hypothesize that the two personality traits that are most conducive to achievement, Conscientiousness, and Openness (Poropat, 2009), are higher in students from more socially advantaged families. We also expect Negative Emotionality to be lower and Extraversion and Agreeableness to be higher in higher-SES students. As points of comparison, we report sex-related differences in Big Five personality traits (i.e., another well-known predictor of personality differences; Schmitt et al., 2008) and pSES-related differences in cognitive ability (i.e., another student outcome predicted by pSES; Damian et al., 2015; Spengler et al., 2015). Although not the focus of our investigation, including these effects will make it easier to interpret the magnitude of any pSES-related differences we find.

Second, do the returns to personality traits in terms of their links to school achievement (i.e., GPA) vary as a function of pSES? In other words, are personality traits differentially related to achievement in students from higher- vs. lower-SES families? Given the inconclusive prior evidence on this issue, we have no apriori hypotheses. We will test interactions between pSES and personality in an exploratory fashion and examine whether any potential interactions resemble the resource substitution or resource amplification (Matthew effect) patterns.

In addressing this second research question, we also pay heed to the close connections between pSES and the school tracks to which students are assigned in the German educational

system. As noted earlier, Germany is a context in which students are clustered into relatively homogenous learning groups after primary school according to their previous achievement (e.g., Chmielewski et al., 2013). Research shows that school tracks moderate personality–achievement relations in Germany (Brandt et al., 2020), and that between-school tracking can increase social inequality because the tracks to which students are assigned after primary school depend strongly on pSES (Baumert et al., 2006; Maaz et al., 2008; Chmielewski and Reardon, 2016). We will therefore control for school track and its interactions with personality.

MATERIALS AND METHODS

Sample

We used data from Starting Cohort 4 of the German National Educational Panel Study (NEPS), an ongoing multi-cohort panel study on educational trajectories and returns to education in Germany (Blossfeld et al., 2011). Starting Cohort 4 comprises a representative sample of 16,425 ninth graders in German secondary schools. The present analyses used data from Waves 1 and 2, which were collected in the form of paper-and-pencil interviews (PAPI) some months after the beginning and near the end of ninth grade (November 2010–January 2011 and May 2011–July 2011, respectively).

We excluded students from special schools and from schools that do not give grades (Waldorf schools), as well as students with missing values or unclear information on their school tracks (n = 2,032). We further excluded students with missing values on any (or on a combination) of the other relevant study variables—that is, personality (n = 2,074), pSES (n = 4,350), academic achievement (n = 1,912), cognitive ability (n = 2,472), sex (n = 880), and migration background (n = 1,920). The final sample size for the complete case analysis consisted of $N = 9{,}300$ students. The average age at Wave 1 was 15.1 years ($SD = 0.60$); 51.8% were female.

Measures

Supplementary Table 1 provides descriptive statistics and correlations of all study variables.

Personality

The Big Five personality traits were assessed with the BFI-10 (Rammstedt and John, 2007), a short version of the Big Five Inventory measuring each Big Five dimension with one positively keyed and one negatively keyed item, plus an additional item for Agreeableness (i.e., 11 items in total). The BFI-10 was administered in Wave 1. Students rated all items on a 5-point scale ranging from 1 (*does not apply at all*) to 5 (*fully applies*). Using positively and negatively keyed items removes bias from acquiescent responding ("yeah-saying"), a response style often observed in individuals with lower SES or lower cognitive ability (e.g., Lechner and Rammstedt, 2015).

Earlier studies supported the retest reliability of the BFI-10 scales as well as its convergent validity with longer scales (Rammstedt and John, 2007; Rammstedt et al., 2020). Reliabilities in the present sample (column "internal consistency" in **Supplementary Table 1**) were satisfactory. Moreover, through latent measurement models, we established that a model with five factors and an acquiescence factor (as in Brandt et al., 2020) had good fit to the data and showed (partial) scalar measurement invariance across students from different pSES quartiles. For details, see **Supplementary Tables 2, 3**.

Parents' Socioeconomic Status

We used the highest International Socio-Economic Index (HISEI) of occupational status (Ganzeboom et al., 1992; Ganzeboom, 2010), assessed in Wave 1, as a measure of pSES. In line with the international and national assessment standards, students described their parents' occupation ("What do your parents currently do? E.g., car mechanic, sales clerk, high school teacher, civil engineer") in responses to two open-ended questions, one referring to the mother's and one to the father's occupation. Responses to these questions were coded based on the International Standard Classification of Occupation 2008 (ISCO-08; ILO, 2012). Next, the ISCO-08 code of each parent separately was assigned an ISEI-08 score (Ganzeboom, 2010). ISEI-08 ranks occupations on a scale from 10 (e.g., kitchen helpers) to 90 (e.g., judges) based on the average level of education and average earnings of job holders (Ganzeboom, 2010). The HISEI-08 score was calculated by selecting the higher of the two parents' ISEI-08 scores. HISEI is a well-established measure in educational studies such as the Programme for the International Student Assessment (PISA; OECD, 2019).

Academic Achievement (GPA)

We assessed academic achievement via school grades. In Wave 2, students were asked to report their last mid-year report card grades in German, mathematics, physics, chemistry, and biology (or natural sciences, a school subject in some federal states that combines physics, chemistry, and biology). We computed the GPA across these six school subjects (Cronbach's α = 0.87). In Germany, academic achievement ranges from 1 (*very good*) to 6 (*failed*). To facilitate interpretation, we inverted the academic achievement such that higher values corresponded to higher achievement.

Additional Variables

The additional variables included in our analyses were cognitive ability, school track, sex, and migration background. We included sex and cognitive ability in order to compare any pSES-related differences we found against sex-related differences in personality as well as against pSES-related differences in cognitive ability. This allowed for a more meaningful interpretation of pSES-related differences in the Big Five. Moreover, we included cognitive ability, sex, school track, and migration background in our analyses regarding the second research question (returns to personality traits) in order to, again, compare effect sizes of personality against these other variables; and to control for potential confounders of the personality–achievement association and the interactions between personality and pSES. Note that controlling for these additional variables provides conservative estimates of the personality–achievement relations because personality traits may be partial mediators of the

links between gender, migration background, and school track and achievement.

Cognitive ability was measured in Wave 2 with the NEPS matrices test (NEPS-MAT), an indicator of reasoning ability (fluid intelligence). NEPS-MAT is a 12-item matrices test similar to Raven's Standard Progressive Matrices. Each item comprises a matrix of different geometrical elements with one field remaining free. Respondents have to deduce the logical rules on which the pattern of geometrical elements is based in order to select from the options provided the correct element for the free field. The items are scored as 1 (*solved*) or 0 (*not solved*); we used the sum score across all 12 items, ranging from 0 to 12 (Cronbach's $\alpha = 0.66$).

Within Germany's historically three-tiered secondary school system (*Hauptschule*, *Realschule*, and *Gymnasium*), today there are many different school types. In all federal states, the *Gymnasium* (or a *Gymnasium* stream within another school track) gives direct access to tertiary education (university/university of applied sciences), whereas the lower school tracks, *Hauptschule* and *Realschule* (or their respective streams in other school types) do not. Therefore, we grouped the various German school tracks into academically oriented school tracks (n = 3,996; *Gymnasium* and *Gymnasium* streams) and vocationally oriented school tracks (n = 5,304; *Hauptschule*, *Realschule*, and their respective streams in other school types). After primary school, students are selected into academically oriented or vocationally oriented school tracks based largely on their prior academic achievement. While students in academically oriented tracks typically have 12–13 years of schooling and often transition to tertiary education, students in vocationally oriented tracks typically have 9–12 years of schooling and often transition to vocational education and training.

In line with the literature (e.g., OECD, 2019), we assessed migration background via students' self-reports of their own and their parents' country of birth at Wave 1. We distinguished between students without a migration background (i.e., student and both parents born in Germany) and students with a migration background (i.e., student and/or at least one parent born abroad).

Statistical Analyses

We analyzed the two types of social inequality in social-emotional skills (differential levels and differential returns) as follows: First, we examined whether students' mean levels of personality traits (Big Five) differed depending on their pSES (HISEI). We tested this research question in two ways. On the one hand, we examined linear correlations of the Big Five dimensions with pSES (treated as a continuous variable). On the other, hand, we examined mean-level differences by pSES group. To do so, we performed a quartile split on the HISEI variable to obtain four equally sized pSES groups and analyzed the mean-level differences in each of the Big Five dimensions using analyses of variance (ANOVA). The analyses by quartile provided an opportunity to quantify pSES-related differences as *group* differences, which may be more readily interpretable than a linear correlation.

Second, we investigated whether the associations between personality traits and achievement (GPA) differed depending on pSES (HISEI). The parameter of interest here are the interactions between each of the Big Five traits and HISEI. For this purpose, we initially regressed academic achievement on the students' (*z*-standardized) Big Five traits, HISEI (standardized) and the Big Five × HISEI interactions (Model I). In a next step (Model II), we additionally incorporated school track, sex, and migration background as well as their respective interactions with the Big Five and cognitive ability. This allowed us (1) to gauge the extent to which the differential returns to the Big Five were unique or could be explained by fundamental sociodemographic characteristics, and (2) to compare the (differential) returns to personality with those to cognitive ability. To do so, fluid intelligence (standardized), sex (dummy coded: 0 [*female*], 1 [*male*]), migration background (dummy coded: 0 [*no*], 1 [*yes*]), school track (dummy coded: 0 [*academically oriented*], 1 [*vocationally oriented*]), the Big Five × school track, and the intelligence × school track interactions were added to the model.

For collinearity diagnostics, we computed the variance inflation factor (VIF) for our regression models. VIF was consistently below 5. More precisely, the VIF of the Model I predictors ranged between 1.02 and 1.09 and the VIF of the Model II predictors ranged between 1.05 and 4.62. This demonstrates that multicollinearity was not an issue in our analyses.

RESULTS

Differential Levels of Personality Traits

Do students' personality traits differ depending on their pSES? As shown in **Table 1**, we found small correlations between the Big Five and HISEI. Students with higher pSES reported lower (not higher) Conscientiousness, higher Openness, Extraversion, and Emotional Stability, and lower Agreeableness than students with lower pSES. Effect sizes were all small in size ($0.04 \leq |r| \leq 0.09$), below the 20th percentile of correlations in individual-differences research (Gignac and Szodorai, 2016). The largest correlations of pSES were those with Openness, $r = 0.09$, 95% CI [0.07, 0.11]; Conscientiousness, $r = -0.07$, 95% CI [−0.05, −0.09]; and Extraversion, $r = 0.07$, 95% CI [0.05, 0.09]; followed by Emotional Stability, $r = 0.06$, 95% CI [0.04, 0.08], and Agreeableness, $r = -0.04$, 95% CI [−0.06, −0.02].

Examining the mean-level differences of the highest vs. lowest HISEI quartiles provides another way to quantify the personality trait differences we observed. The mean-level differences in the Big Five traits between the highest and lowest quartile of pSES reached standardized effect sizes of up to $d = 0.20$, which is conventionally regarded as a "small" effect.

To facilitate interpretation of the effect sizes, we compared these pSES-related differences in students' levels of the Big Five personality traits with the differences observed in cognitive ability (fluid intelligence). We found a small- to medium-sized correlation between fluid intelligence and parental HISEI, $r = 0.21$, 95% CI [0.19, 0.23], corresponding to the 55th percentile of correlations in individual-differences research (Gignac and Szodorai, 2016). Comparing levels of cognitive ability between

TABLE 1 | Mean differences in personality (Big Five) and cognitive ability (fluid intelligence) related to pSES.

	Total		Differences related to parental socioeconomic status (pSES, as measured by HISEI)						
	(*N* = 9,300)		Very low 1st quartile	Rather low 2nd quartile	Rather high 3rd quartile	Very high 4th quartile		4th quartile vs. 1st quartile	Linear correlation with pSES
	Range	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	η^2	Cohen's *d*	*r*
Personality									
Conscientiousness	1–5	3.17 (0.88)	3.23 (0.86)	3.22 (0.87)	3.18 (0.88)	3.06 (0.88)	0.006	−0.20	−0.07
Openness	1–5	3.50 (0.94)	3.40 (0.90)	3.46 (0.94)	3.53 (0.97)	3.59 (0.95)	0.006	0.20	0.09
Emotional Stability	1–5	3.23 (0.86)	3.16 (0.85)	3.23 (0.87)	3.23 (0.84)	3.29 (0.87)	0.003	0.15	0.06
Extraversion	1–5	3.46 (0.88)	3.35 (0.89)	3.47 (0.88)	3.46 (0.88)	3.53 (0.89)	0.005	0.20	0.07
Agreeableness	1–5	3.46 (0.66)	3.47 (0.65)	3.49 (0.67)	3.47 (0.67)	3.42 (0.65)	0.001	−0.08	−0.04
Cognitive ability									
Fluid intelligence	0–12	8.84 (2.37)	8.19 (2.56)	8.65 (2.40)	8.98 (2.31)	9.43 (2.07)	0.037	0.54	0.21

N = 9,300. HISEI: Highest International Socio-Economic Index of occupational status. The table shows the manifest and unweighted sum score for fluid intelligence across all 12 binary matrices and mean scores for the Big Five personality traits. All linear correlations with pSES (column r) are statistically significant at p < 0.01. Likewise, all mean differences (4th quartile vs. 1st quartile) are statistically significant at p < 0.01.

the highest vs. lowest HISEI quartiles revealed a mean difference of about half a standard deviation ($d = 0.54$). Hence, pSES-related differences in students' cognitive ability were more than twice as large compared with pSES-related differences in the Big Five.

In addition, we compared the effect sizes (η_p^2) of the pSES-related differences in the Big Five traits with differences related to school track, sex, and migration background. To do so, we conducted analyses of variance in a 4 (HISEI quartiles) × 2 (school track: academically oriented vs. vocationally oriented) × 2 (sex: female vs. male) × 2 (migration background: no vs. yes) between-subjects design. The most sizable differences in the Big Five traits were observed for sex, particularly in relation to Conscientiousness ($\eta_p^2 = 0.023$), Openness ($\eta_p^2 = 0.023$), and Emotional Stability ($\eta_p^2 = 0.028$). Compared with sex-related differences in personality traits, the differences related to pSES, school track, and migration background were small to non-existent (see **Supplementary Table 4** for details).

To sum up, personality differed depending on pSES. However, pSES-related differences in personality were substantially smaller than sex-related differences in personality. Moreover, pSES-related differences in personality were smaller than those in cognitive ability.

Differential Returns to Personality Traits

Do personality–achievement relations differ depending on pSES? Results from Model I ($R^2 = 0.092$) revealed that Conscientiousness was positively associated with academic achievement, $\beta = 0.25$, 95% CI [0.23, 0.27]; so too, was pSES, $\beta = 0.17$, 95% CI [0.15, 0.19]. Importantly, there was a statistically significant interaction between Conscientiousness and parental HISEI, $\beta = 0.05$, 95% CI [0.03, 0.07], $\Delta R^2 = 0.002$. **Figure 1** illustrates the interaction for students with different levels of pSES. In students whose pSES was high (+1 *SD*), Conscientiousness was more strongly associated with academic achievement, $\beta = 0.30$, 95% CI [0.27, 0.33], compared with students with a low pSES (−1 *SD*), $\beta = 0.21$, 95% CI [0.18, 0.24].

The interaction between pSES and Conscientiousness in predicting GPA held after including the additional covariates (Model II: $R^2 = 0.150$; see **Table 2** for detailed results). Specifically, the pattern of results remained the same even after controlling for school track and its interactions with personality, $\beta = 0.03$, 95% CI [0.01, 0.05], $\Delta R^2 = 0.001$ (see **Figure 1**).

The associations of the other Big Five dimensions with academic achievement were small ($\beta = -0.03$–0.04). Moreover, none of the other Big Five dimensions had differential associations with academic achievement depending on pSES, as evident from the near-zero interaction effects. Thus, only for Conscientiousness but none of the other traits did trait–achievement relations differ.

Finally, we compared differential returns to personality with differential returns to cognitive ability. Our results revealed, first, that the strength of the association of Conscientiousness with academic achievement ($\beta = 0.32$) was comparable with that of fluid intelligence ($\beta = 0.26$). Second, and in contrast to Conscientiousness, the relation between fluid intelligence and academic achievement did not depend on pSES, $\beta = 0.02$, 95% CI [0.00, 0.04].

DISCUSSION

Socio-emotional skills such as the Big Five personality traits have received increased attention as a potential target for interventions aimed at improving students' academic outcomes and reducing the achievement gaps between students from diverse socio-economic backgrounds (e.g., Kautz et al., 2014; Sánchez Puerta et al., 2016; Chernyshenko et al., 2018; Bleidorn et al., 2019; Malanchini et al., 2019). However, whether personality traits are an apt target for intervention remains unclear, because the interplay between pSES, personality traits, and academic achievement is poorly understood. In this study, we added to this debate by examining two forms of social inequality in personality: (1) differences in students' *levels* of personality traits depending

TABLE 2 | Academic achievement regressed on the Big Five personality traits, fluid intelligence, HISEI, school track, sex, and migration background.

	Model I			Model II		
	β	95% CI	*p*	β	95% CI	*p*
Conscientiousness	**0.25**	[0.23, 0.27]	0.000	**0.32**	[0.29, 0.35]	0.000
Openness	**0.03**	[0.01, 0.05]	0.008	0.02	[−0.01, 0.05]	0.124
Emotional Stability	**0.04**	[0.02, 0.06]	0.000	**0.07**	[0.04, 0.10]	0.000
Extraversion	**−0.03**	[−0.05, −0.01]	0.001	**−0.06**	[−0.09, −0.03]	0.000
Agreeableness	**−0.02**	[−0.04, 0.00]	0.035	**−0.06**	[−0.09, −0.03]	0.000
HISEI	**0.17**	[0.15, 0.19]	0.000	**0.10**	[0.08, 0.12]	0.000
Conscientiousness × HISEI	**0.05**	[0.03, 0.07]	0.000	**0.03**	[0.01, 0.05]	0.007
Openness × HISEI	0.00	[−0.02, 0.02]	0.886	0.00	[−0.02, 0.02]	0.769
Emotional Stability × HISEI	−0.01	[−0.03, 0.01]	0.566	−0.02	[−0.04, 0.00]	0.054
Extraversion × HISEI	0.01	[−0.01, 0.03]	0.554	0.02	[0.00, 0.04]	0.092
Agreeableness × HISEI	0.01	[−0.01, 0.03]	0.320	0.02	[−0.01, 0.04]	0.126
Fluid intelligence				**0.26**	[0.22, 0.30]	0.000
School track (0 = academic, 1 = vocational)				**−0.11**	[−0.15, −0.06]	0.000
Sex (0 = female, 1 = male)				0.00	[−0.04, 0.04]	0.997
Migration background (0 = no, 1 = yes)				**−0.14**	[−0.19, −0.09]	0.000
Fluid intelligence × HISEI				0.02	[0.00, 0.04]	0.051
Fluid intelligence × school[a]				**−0.08**	[−0.13, −0.03]	0.002
Conscientiousness × school[a]				**−0.07**	[−0.11, −0.03]	0.002
Openness × school				−0.01	[−0.06, 0.03]	0.507
Emotional Stability × school[a]				**−0.07**	[−0.11, −0.02]	0.002
Extraversion × school[a]				**0.07**	[0.03, 0.11]	0.001
Agreeableness × school[a]				**0.06**	[0.01, 0.10]	0.010
R^2	**0.092**		0.000	**0.150**		0.000

N = 9,300. Model I: Big Five, HISEI and Big Five × HISEI interactions; Model II: Big Five, HISEI, fluid intelligence, school track, sex, migration background, Big Five × HISEI, Big Five × school track, intelligence × HISEI, and intelligence × school track. HISEI: Highest International Socio-Economic Index of occupational status. Significant model parameters (p < 0.05) are in bold print. [a]See ***Supplementary Figures 1–5*** *for interaction plots.*

on pSES; and (2) differences in the *returns* to personality traits in terms of differential personality–achievement relationships depending on pSES. Our results partly replicate and partly deviate from previous findings.

Differences in the levels of personality traits related to students' pSES were small—and clearly smaller than gender differences in personality and differences in cognitive ability depending on pSES, which we took as a reference point. The largest pSES-related differences emerged for Openness to Experience and Conscientiousness, which happen to be the two Big Five traits that are most strongly related to academic achievement (Poropat, 2009), including in Germany (Lechner et al., 2017). Specifically, higher-SES students reported higher levels of Openness ($r = 0.09$). A correlation of this size corresponds roughly to the 20th percentile of all effect sizes observed in individual differences research according to the meta-analytically derived guidelines proposed by Gignac and Szodorai (2016). This correlation replicates the pSES-related differences in Openness reported in the recent meta-analysis by Ayoub et al. (2018) and a large-scale study by Sutin et al. (2017). The extent to which the pSES–Openness association reflects social causation (e.g., Sutin et al., 2017) or heritability (e.g., Mõttus et al., 2019) deserves further scrutiny in future work.

With regard to Conscientiousness, higher-SES students reported lower (not higher) levels of Conscientiousness than their lower-SES peers ($r = -0.07$). This finding differs from Ayoub et al. (2018) but replicates a finding by Sutin et al. (2017) in the younger samples (age ca. 14–30 years) and more recent cohorts that they analyzed. The slightly lower levels of Conscientiousness among high-SES students are at odds with the idea that a higher SES favors the development of Conscientiousness (family investment model; Conger and Donnellan, 2007) or that low SES impairs the development of Conscientiousness because lower-SES families cannot provide children with learning opportunities or stimulation comparable with those provided by higher-SES families (family stress model; Conger and Conger, 2002). One can speculate that parents working in jobs with lower occupational prestige might foster diligence and a will to achieve in their offspring, possibly because their lower-status positions require such traits more than higher-status positions do.

Notably, the lack of major pSES-related differences in the levels of personality traits are unlikely to have been an artifact of the measures used in NEPS. By comparing pSES-related differences in the Big Five traits with the—often sizable—sex-related differences in the same traits, we established that the Big Five traits do not, in general, lack sensitivity for potential differences between sociodemographic subgroups. In turn, the

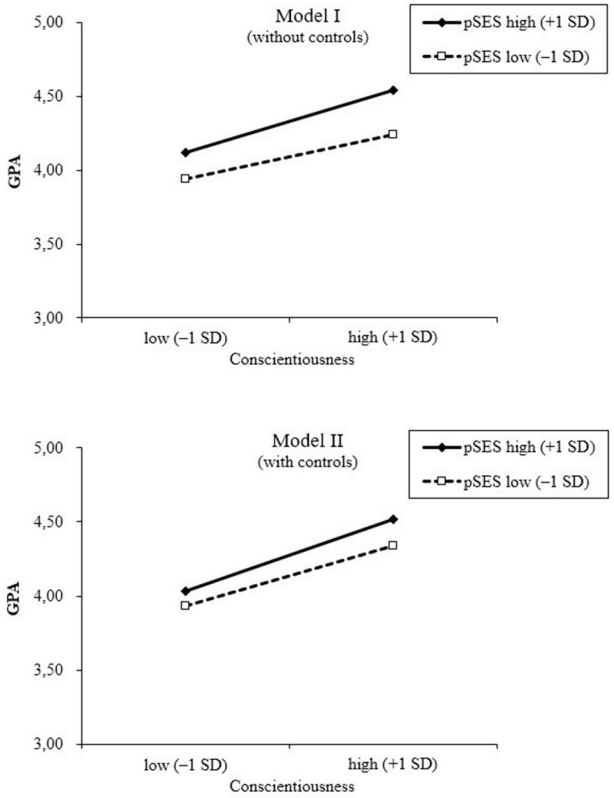

FIGURE 1 | Associations of personality (Conscientiousness) with academic achievement (GPA) by socioeconomic status (HISEI). Model I: Big Five, HISEI, and Big Five × HISEI interactions; Model II: Big Five, HISEI, fluid intelligence, school track, sex, migration background, Big Five × HISEI, Big Five × school track, intelligence × HISEI, and intelligence × school track. Academic achievement was computed as the average across six school subjects (German, math, physics, chemistry, biology, science) of the mid-year report card and was inverted such that higher values corresponded to higher achievement.

considerable differences in cognitive ability between students with different pSES as measured by HISEI show that social inequality in cognitive ability was much stronger than that in personality traits.

With regard to social inequality in the returns to personality, we found only limited evidence that personality–achievement relations differ depending on students' pSES. The only statistically significant interaction was pSES × Conscientiousness: Conscientiousness was more strongly related to GPA among students from higher-SES families (although higher-SES students, on average, reported slightly lower levels of Conscientiousness than students from lower-SES families). This finding is in line with the resource amplification hypothesis, but it deviates from the results obtained by Ayoub et al. (2018, Study 2), who found support for the resource substitution hypothesis (i.e., the grades of lower-SES students in a large but likely non-representative online sample benefitted more from higher Conscientiousness). Our results suggest that students from higher-SES backgrounds gain more than lower-SES students from the same levels of Conscientiousness in terms of better academic achievement. This *pSES* × *Conscientiousness* interaction shrank but still held even after controlling for students' school tracks and the interaction between personality and school track. As we explained earlier, school tracks are a key conduit for the intergenerational transmission of SES and achievement/attainment in the historically three-tiered German school system (e.g., Baumert et al., 2006; Maaz et al., 2008). Our results suggest that the *pSES* × *Conscientiousness* interaction is partly independent of school track, which Brandt et al. (2020) found to be a moderator of trait–achievement relations in the German school system. As was the case with the *pSES* × *Conscientiousness* interaction in the present study, school track in the Brandt et al. (2020) study moderated trait–achievement relations largely as the resource amplification hypothesis would predict (personality traits were more strongly related to achievement in the higher school tracks).

The mechanisms behind the *pSES* × *Conscientiousness* interaction in our study and other *pSES* × *personality* interactions in earlier studies (e.g., Damian et al., 2015; Ayoub et al., 2018) as well as the *school track* × *personality* interactions observed by Brandt et al. (2020) have yet to be uncovered. Such interactions may indicate resource substitution or amplification; but they may also reflect differential trait activation (Tett and Burnett, 2003) depending on school context (e.g., social composition of students; achievement-related norms and expectations). School contexts differ for higher- and lower-SES students because of pSES-related selection into different school types. For example, students with a lower pSES are often selected into lower, vocationally oriented tracks (Maaz et al., 2008) that demand and promote Conscientiousness less than higher, academically oriented tracks do (Brandt et al., 2020). It may also be the case that teachers' grading practices, and especially the extent to which they reward certain student traits, differ depending on students' pSES and/or track. Future research should explore these possibilities. Overall, however, the almost complete absence of *pSES* × *personality* interactions supports the "independent effects hypothesis" (Damian et al., 2015), which states that pSES and personality traits largely operate as independent resources.

LIMITATIONS

Three limitations of our study should be mentioned. First, its correlational design precludes causal interpretations. For example, the pSES–trait and pSES–achievement relations cannot be unequivocally interpreted as reflecting *social* causation. There might be unobserved confounders such as shared genetic influences behind these relationships (e.g., Tucker-Drob et al., 2016; Mõttus et al., 2019). Moreover, our study's cross-sectional design meant that we could not untangle the temporal dynamics of the interplay between pSES, socio-emotional skills, and achievement. Future studies could gain additional insights by tracing this interplay from early childhood into adolescence.

Second, we only had an ultra-short measure of personality at our disposal. Research shows that short scales work better than often assumed. For example, the 10-item BFI-10 and the 15-item BFI-2-XS largely reproduce trait–outcome relations of (often much) longer scales (e.g., Thalmayer et al., 2011; Rammstedt et al., 2020). Reassuringly, the observed pSES–trait relations were largely in line with those found in the recent meta-analysis by Ayoub et al. (2018) and the study by Sutin et al. (2017). Moreover, it is beneficial that the BFI-10 controls for acquiescence, which is a likely source of bias in the pSES–personality association because acquiescence is higher in individuals with lower education (Rammstedt et al., 2010) and lower cognitive ability (Lechner and Rammstedt, 2015). However, ultra-short measures such as the BFI-10 do not allow for facet-level analyses, which are often a more promising level of abstraction in trait–outcome research (e.g., Danner et al., 2020; Mõttus et al., 2020). Hence, it would be desirable for future research to revisit the interplay between pSES, socio-emotional skills, and achievement using faceted measures of personality. Future research should also move beyond personality self-reports and include observer ratings to probe pSES-related differences in parent- and/or teacher-reported personality. This may allow for additional insights, for example, into whether teachers rate students' personalities differently than students themselves depending on students' pSES (i.e., whether there are discrepancies between teachers' perceptions and students self-concepts depending on pSES, e.g., because of stereotyping).

Third, our analyses focused on secondary school students in Germany. Although the links between pSES and the Big Five traits that we found were comparable with those reported in prior research from other (mostly Western) countries, the interplay between pSES, school tracks, personality, and achievement might depend more strongly on the institutional (e.g., the tracking system) and cultural (e.g., norms and expectations regarding what constitutes desirable personality traits) makeup of a country. Cross-nationally comparative research could therefore arrive at a better understanding of the role of context in the interplay between pSES, personality, and achievement.

CONCLUSION

Our findings suggest that social inequality in both the levels of personality traits and the returns to personality traits is limited. There were no or only small pSES-related personality differences among students. The largest correlation of pSES was that with Openness ($r = 0.09$). We also found that the personality–achievement relations did not depend on pSES—with one important exception: Students from lower-SES families did not benefit from their Conscientiousness as much as students from higher-SES families did. This effect appeared to be small, but it was at least partly independent of the school tracks that students attended. The latter result adds a cautionary note for researchers and practitioners who hope that fostering socio-emotional skills especially among socially disadvantaged students might be a viable strategy to reduce inequality in achievement. Lower-SES students were neither at a disadvantage when it came to Conscientiousness, nor did they benefit from higher levels of Conscientiousness as much as their higher-SES peers did. This does not rule out the possibility that fostering traits such as Openness or Conscientiousness benefits students' achievement, but it does cast some doubt on whether this would reduce inequality in achievement.

DATA AVAILABILITY STATEMENT

Publicly available datasets were analyzed in this study. This paper used data from the National Educational Panel Study (NEPS): Starting Cohort 4–9th Grade, doi: 10.5157/NEPS:SC4:10.0.0. From 2008 to 2013, NEPS data were collected as part of the Framework Programme for the Promotion of Empirical Educational Research funded by the German Federal Ministry of Education and Research (BMBF). As of 2014, the NEPS survey is carried out by the Leibniz Institute for Educational Trajectories (LIfBi) at the University of Bamberg in cooperation with a nationwide network.

ETHICS STATEMENT

Ethical approval was not provided for this study on human participants because this paper uses secondary data from the German National Educational Panel Study (NEPS). All data collections that took place as part of NEPS were reviewed and approved under German law and research ethics codes. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

CL: funding acquisition (lead), conceptualization, methodology, project administration, writing—original draft, and writing—review & editing. JB: funding acquisition, conceptualization, data curation, formal analysis, methodology, visualization, and writing—original draft. NB: conceptualization, methodology, and writing—review & editing. BR: funding acquisition, conceptualization, and writing—review & editing. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

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Equity in Social Emotional Learning Programs: A Content Analysis of Equitable Practices in PreK-5 SEL Programs

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As the positive impact of social emotional learning (SEL) has become widely recognized, there is increasing demand for SEL programs to address the diverse cultures, identities, and experiences of all students in the classroom, in particular students of color and other youth impacted by structural inequality. SEL programs increasingly provide resources and guidance to ensure that diverse students are represented in materials and content and to help educators understand how culture plays a role in the development and expression of SEL competencies. However, few programs are intentionally designed with equity in mind and even fewer examine how historical and structural inequalities impact both the teaching and learning of SEL skills. While many believe that SEL is well-positioned to play a role in creating learning environments where students of all cultures, races, identities, and backgrounds feel safe, respected, and empowered, the link between equity and SEL is not always clear. Furthermore, despite existing well-established, research-grounded practices from which to draw in other fields, the field of SEL currently lacks a coherent and unified definition of what constitutes equitable SEL and what equitable SEL looks like in the classroom. As schools and other educational settings strive toward creating more equitable learning environments for students, the field of SEL needs a clearer viewpoint and explicit practices describing how equity can be better integrated into SEL programming and practice. This paper describes the need for equitable SEL, summarizes existing research and practices, and provides a set of recommendations for implementing them effectively in schools and other educational settings. We begin with a brief exploration of the relationship between educational equity and SEL, describing the potential for SEL to create more equitable, inclusive, and just learning environments. Next, we present key perspectives from the literature that shape current views on how issues of equity can be integrated into SEL programming and practice, proposing a set of principles and definition for equitable SEL. Finally, we discuss the current state of PreK-5 SEL programs, using findings from a content analysis to describe the extent to which programs address equity in lessons and promote transformative SEL skill building.

Keywords: social emotional learning, trauma-informed practice, equity, cultural competence, culturally sustaining pedagogy, social justice education, transformative SEL, research

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INTRODUCTION

Social and emotional learning, or SEL, refers to the process through which individuals learn and apply a set of social, emotional, and related skills, attitudes, behaviors, and values that help direct their thoughts, feelings, and actions in ways that enable them to succeed in school, work, and life (Jones et al., 2017a). Research indicates that when implemented effectively, high-quality, evidence-based SEL programs have positive impacts on children's social, emotional, behavioral, and academic outcomes as well as teacher practices and the culture and climate of schools (Diamond et al., 2007; Bierman et al., 2008; Raver et al., 2009; Brown et al., 2010; Durlak et al., 2011; Jones et al., 2011; Sklad et al., 2012). Nevertheless, some have raised questions about the relative value, meaning, and efficacy of SEL programs for diverse populations, including students of color and other youth impacted by structural inequality in the United States (Simmons et al., 2018; Jagers et al., 2019). In addition, some recent work has been directed toward examining whether SEL programs effectively support the well-being of all students by sufficiently reflecting, affirming, and sustaining their cultural identities in the classroom (Castro-Olivo, 2014).

SEL programs increasingly provide resources and guidance to ensure that diverse students are represented in materials and content and to help educators understand how culture plays a role in the development and expression of SEL competencies. However, few programs are intentionally designed with equity in mind and even fewer examine how historical and structural inequalities impact both the teaching and learning of SEL skills. While many believe that SEL can play a role in creating learning environments where students of all cultures, races, identities, and backgrounds feel safe, respected, and empowered, the link between equity and SEL is not always clear. Furthermore, despite existing, well-established, research-grounded practices from other fields on which to draw, the field of SEL currently lacks a coherent and unified definition of what constitutes equitable SEL and what equitable SEL looks like at the classroom level. As schools and other educational settings strive toward creating more equitable learning environments for all students, the field of SEL needs a clearer viewpoint and explicit practices describing how equity can be better integrated into SEL programming and practice.

With this in mind, this paper addresses three questions: 1) What is the relationship between educational equity and SEL in the United States?, 2) How can we define equitable SEL for the United States context?, and 3) How are existing SEL programs addressing issues of equity and what are areas of strength and opportunities for growth? This paper begins with a brief exploration of the relationship between educational equity and SEL, describing the potential for SEL to create more equitable, inclusive, and just learning environments. Next, we present key perspectives from the literature that shape current views on how equity can be explicitly and intentionally integrated into SEL programming and practice, proposing set of principles and definition for equitable SEL. We then discuss the current state of SEL programs designed for early childhood and elementary-age students, using findings from a recent content analysis of SEL programs to describe the extent to which they address equity in lessons and promote transformative SEL skill building in young children. Finally, we conclude with a discussion of our findings, their limitations, and implications for SEL practice.

WHAT IS THE RELATIONSHIP BETWEEN SOCIAL EMOTIONAL LEARNING AND EDUCATIONAL EQUITY IN THE UNITED STATES?

Defining Educational Equity

In the field of education, the term "equity" is often viewed in conflicting ways and at times used as a label, goal, or decision-making lens without clear definition or operationalization (Osher et al., 2020). Furthermore, the terms "equity" and "equality" are often used interchangeably despite having important distinctions. Equality refers to what is fair for the group, focusing on providing access to the same opportunities to everyone despite specific needs. Equity, on the other hand, attempts to identify the specific needs of those within the group, focusing on what is fair for the individual. Common themes among definitions of equity include universal access to high-quality educational opportunities, fairness, inclusion, and the eradication of discriminatory practices and prejudice within the education system (The Aspen Education & Society Program and the Council of Chief State School Officers, 2017; NSBA, 2019). In the United States, the need to address pervasive ethnic and racial disparities directly within the educational system has also become a primary focus of conversations on advancing educational equity (de Brey et al., 2019; Morgan and Amerikaner, 2018; NEA, 2020; Pearman et al., 2019; U.S. Department of Education, 2016). Recently, the Black Lives Matter movement and nationwide uprisings against police brutality have led to a significant shift in conversations about how to address racial inequality and structural inequity in education. The recent focus on race has led to a closer examination of inequities that exist in schools and an increase in educators—particularly White educators—who see the need to makes changes to their own practice.

Given the above, we define educational equity for the United States context as the intentional counter to systemic and institutionalized inequality, privilege, and prejudice in the education system and the simultaneous promotion of conditions that support the well-being of students who most experience inequity and injustice. This conceptualization is derived from Osher et al. (2020) description of robust equity, which combines commonly accepted aspects of educational equity like fairness and inclusion with the broader, more expansive systems-focused approach to racial equity which includes dismantling systems of oppression and addressing the legal, political, social, cultural, and historical contributors to inequity that exist within broader societal and institutional structures in the United States.

While some aspects of equity in United States education must be addressed at a systems level (e.g., school disciplinary policies, hiring practices and diversity recruitment, student tracking and ability grouping, etc.), we focus on SEL practices that can be put

into action by individual schools and other educational settings to create more equitable learning environments for all students. Equity-oriented practice at the school level includes 1) ensuring equally high outcomes for all students and making certain that success and failure are no longer linked to student identity—racial, cultural, economic, or otherwise; 2) interrupting inequitable practices, examining biases, and creating inclusive multicultural learning environments for all adults and children; and 3) discovering and cultivating the unique gifts, talents, and interests of every student (National Equity Project, 2020). Equitable schools work toward delivering the educational experiences that students need and deserve, particularly students of color and other youth impacted by structural inequality. Equity-oriented practice improves opportunities and outcomes for all children regardless of background or situation (Braveman and Gottlieb, 2014; Simmons et al., 2018), but is of particular significance for those furthest from opportunity, including students of color, English language learners, low-income students, students with disabilities, and other youth impacted by structural inequality (Jagers et al., 2019).

Alignment Between Educational Equity and Social Emotional Learning

In order to create respectful, inclusive, and responsive learning environments that benefit all students, it is essential to consider the link between educational equity and students' social and emotional development. The relationship between SEL and educational equity is reciprocal: SEL can advance the aims of educational equity by supporting all students to feel welcome, seen, and competent at school. At the same time, an intentional focus on equity enhances SEL practice by ensuring that SEL is relevant, accessible, and beneficial for all students. In fact, high-quality SEL programs facilitate and rely upon many of the same practices that contribute to more equitable and inclusive learning environments, such as 1) fostering a caring and just culture and climate; 2) building student voice and agency; 3) cultivating understanding and respect for cultural differences; and 4) emphasizing asset-based approaches to skill development.

Yet while SEL as an approach is well-positioned to create more equitable schools and learning environments, SEL is not by definition equitable, nor does it inherently promote equity. Many scholars argue that to truly support the growth and development of all students, SEL must also intentionally counter inequality, institutional privilege and prejudice, and the systems of oppression that hinder and harm students of color and other youth impacted by structural inequality (Gregory and Fergus, 2017; Aspen, 2018; Jagers et al., 2018; Simmons et al., 2018; Jagers et al., 2019; Weaver, 2020). Although elements of effective SEL programming may support and align with equitable learning practices, that does not guarantee that SEL programming always affirms and incorporates diverse cultures and identities, builds student voice and agency, and explicitly confronts and works to disrupt power and privilege. Indeed, some SEL programming has been criticized for not feeling relevant or relatable to students of color because it reinforces the behavioral, social, and cultural norms prioritized by dominant groups—especially those of white, middle-class society—without taking into consideration the values and experiences of diverse populations (Simmons, 2017; Brion-Meisels et al., 2019; Jagers et al., 2019). Without an explicit and intentional consideration of how culture and power structures impact social and emotional skill development, educational settings run the risk of unknowingly using SEL to push students to conform to dominant cultural practices in ways that conflict with or erase their own cultural identity or their own experiences with and feelings about the world (Brion-Meisels et al., 2019; Love, 2019; Stearns, 2019). When used as a tool to confront systemic inequality head on, SEL can empower students to think critically and strategically about their circumstances and the world in which they live; develop students' ethnic, racial, and social identities; build students' self-efficacy and agency; and draw heavily on funds of knowledge from within local communities, many of which have their own well-established practices for emotion regulation, self-care, communication, and collective wellbeing.

WHAT IS EQUITABLE SOCIAL EMOTIONAL LEARNING?

In recent years, leading SEL researchers have proposed ways that SEL can be designed and implemented equitably, drawing from scholars in the fields of social justice and anti-bias education and culturally responsive and culturally sustaining pedagogies who have been leading this work for many decades. These fields, while distinct from that of SEL, offer well-established, research-grounded practices that can inform a more equitable approach to SEL. Below we present several of these perspectives that shape current views on how equity can be explicitly and intentionally integrated into SEL programming and practice: 1) SEL through the lens of culturally sustaining pedagogies, 2) social justice-oriented SEL, 3) transformative SEL, and 4) trauma-sensitive SEL. We then identify general principles of equitable SEL that are common across the four approaches and propose a definition for equitable SEL.

Social Emotional Learning Through the Lens of Culturally Sustaining Pedagogies

High-profile SEL programs often prioritize skill development and minimize the exploration of students' cultural assets (Jagers, 2016; Simmons, 2017). Although many SEL programs touch upon the topics of diversity and inclusion, they often frame diversity as acceptance of differences rather than explicitly discussing diversity as an asset and few programs specifically discuss cultural diversity, focusing instead on surface level differences such as individual likes and dislikes. One way to counter this is to approach SEL through the lens of culturally sustaining pedagogies, which rely heavily on student, family, and community cultural assets to inform curricula and instructional strategies. Culturally sustaining pedagogies go beyond the acceptance or tolerance of students' cultural practices common

to many SEL programs and move toward explicitly supporting aspects of their languages, literacies, and cultural traditions that may have been damaged, unacknowledged, or erased in schools (Paris, 2012; Paris and Alim, 2017). Culturally sustaining pedagogy and related models, including culturally relevant (Ladson-Billings, 1995) and culturally responsive (Gay, 2010) teaching, focus on curricula and classroom practices that foster connection and reflection between academic content and students' cultural assets and cultural references (Jagers et al., 2019). In the field of SEL, this translates into fostering cultural well-being, racial and ethnic identity development, and safe and inclusive learning environments that explicitly connect SEL concepts to the lives of the students in the classroom (Hammond & Jackson, 2015; Darling-Hammond, 2017; Immordino-Yang et al., 2018; Cantor et al., 2019). SEL through the lens of culturally sustaining pedagogies is a more equitable approach to SEL because it purposefully celebrates and honors the diverse linguistic and cultural values and practices of communities as it builds SEL competencies like social awareness and self-awareness (Jagers et al., 2019).

Practices that support culturally sustaining SEL include 1) participatory norm-setting and inclusive norms, structures and routines; 2) cooperative and community-based learning; 3) restorative disciplinary practices; and 4) the use of multicultural and multimodal instructional materials, strategies, and content (e.g., storytelling and personal narratives, art, dance, and music) that incorporate students' histories, heritages, cultures, and experiences without stereotyping students or neglecting and oversimplifying their experiences (Gay, 2013; Brion-Meisels et al., 2019). Brion-Meisels et al. (2019) also point to the important role of adults in creating empowering and culturally sustaining learning environments for children. They recommend that schools and other educational settings form strong partnerships with families and communities to help identify culturally-salient skills, and support adults to understand SEL skills and the variety of ways in which they might be expressed across cultures and individual students. In addition, they identify three adult competencies that are central to facilitating culturally sustaining SEL in the classroom: 1) building critical self-awareness, which occurs when educators monitor their practices, behaviors, emotions and interactions through a self-reflective and critical lens; 2) building warm, demanding, and reciprocal relationships; and 3) shifting power to students by giving them a voice and choice in their learning. Although practitioners may have limited control over the content of SEL programs, building these competencies in educators empowers them to adapt lessons and learning environments in ways that are culturally sustaining, supportive, and transformative for students.

A Social Justice-Oriented Approach to Social Emotional Learning

Many SEL programs touch on concepts related to treating others with fairness and respect regardless of differences, celebrating diversity in the classroom, and contributing to positive change in the community but few explicitly discuss how these topics are related to issues of identity, power, and structural injustice. Some argue that SEL can only be positioned as equitable to the extent that it advances resistance to oppression and directly addresses systems of power and privilege (Jagers, 2016; Simmons, 2019). SEL programming can provide a good opportunity to address issues of inequity by helping students build skills related to both prejudice reduction and collective action, including critical thinking and conflict resolution skills, perspective-taking and empathy, and civic and ethical values (Learning for Justice, 2017). Social justice-oriented SEL builds on the principles of social justice education, which pay careful attention to the systems of power and privilege that give rise to social inequality and aim to help students develop a social and political consciousness, a sense of agency, and positive social identities (Gutstein, 2003; Dover, 2009).

Social justice-oriented SEL specifically seeks to foster children's social and emotional development using participatory and inclusive practices that focus on critical thinking, social justice advocacy, and positive identity development. This approach to SEL positions students as agents of change, with empathy for those who suffer from oppression and a commitment to improving local conditions (Ginwright and Cammarota, 2002; Banks, 2004; Cammarota and Romero, 2011). Practices that support socially just SEL include: 1) situating SEL lessons in and teaching about activism, power, and inequity in schools and society; 2) helping students understand and appreciate their own identities without devaluing others; 3) encouraging students to find the ways we are all connected and deserving of respect; 4) teaching students to recognize injustice, and showing them how to act against it; 5) maintaining high expectations for both students and adults; 6) acknowledging, valuing, and building upon students' existing knowledge and interests; and 7) recognizing and correcting biases in SEL assessment and curricula (Dover, 2009; Learning for Justice, 2018).

Transformative Social Emotional Learning

Currently, social emotional learning goals and developmental outcomes tend to focus on personally responsible citizenship, and while engaged citizens are important to the health of democratic societies, Jagers et al. (2019) argue that it is worth reframing the goal of SEL to prepare students for not only engaged but also critical citizenship. Transformative SEL, a concept introduced by Jagers, Rivas-Drake, and Borowski in 2018, incorporates aspects of both social justice education and culturally sustaining pedagogies into an approach that infuses all aspects of SEL practice with a robust focus on identity, agency, belonging, and engagement. In transformative SEL, respectful relationships between students and teachers form the groundwork for the critical examination of the causes of inequity, and collaborative problem-solving is championed as a means of acting on community and societal issues related to power and privilege, prejudice and discrimination, social justice and empowerment, and self-determination.

This approach to SEL seeks to connect SEL content and skills to students' existing knowledge and experiences, provides students with opportunities to learn about their own and other

cultures, and encourages students to reflect on their own lives and society, all in ways that are grounded in an understanding of current and historical power structures. Strategies that incorporate youth voice, participation, and collaborative problem-solving and decision-making into SEL efforts, such as project-based learning and youth participatory action research allow students to practice and build transformative SEL skills that encourage youth autonomy and leadership for social change (Jagers et al., 2018; Jagers et al., 2019).

A Trauma-Sensitive Approach to Social Emotional Learning

Trauma is an emotional or psychological response to one or more highly stressful experiences that undermine an individual's sense of safety, stability, and security—including living with the everyday effects of pervasive, systemic stressors like racism, discrimination, community violence, and multi-generational poverty (Center on the Developing Child, 2018). While children from all backgrounds can experience trauma, those growing up in poverty are at a higher risk, as are children with disabilities, children from racial/ethnic minority groups, children who identify as LGBTQ, and children who have immigrated from another country (Craig, 2008; Gerrity and Folcarelli, 2008; Santiago et al., 2018). For this reason, issues of trauma are closely linked to issues of equity, and many argue that for SEL to be truly equitable, it must also be trauma-informed.

Combining the principles of trauma-informed practice and high-quality SEL, trauma-sensitive SEL aims to establish safe spaces where students who have experienced adversities and trauma feel welcome and supported, can explore their identities, exercise choice and agency, build positive and healthy relationships with both peers and adults, and can access the mental health supports they need without risking re-traumatization (TransformEd, 2020). Trauma-sensitive SEL practices include: 1) creating predictable routines that help students adapt to transitions throughout the day; 2) building strong and supportive relationships; 3) developing student agency by ensuring students feel seen and heard, including not forcing them to participate in activities they find triggering, and providing opportunities for them to feel competent and confident; 4) supporting the development of student and adult self-regulation skills; and 5) engaging in individual and community identity development, including strengthening one's own identity and understanding the perspectives of others. It is also important to be thoughtful about the ways in which SEL content itself is delivered to children exposed to trauma by 1) educating staff on the signs and symptoms of trauma; 2) preparing them to effectively plan for and respond to the potentially intense emotions that might arise during SEL lessons; and 3) providing them with resources to monitor and maintain their own wellbeing (Jones et al., 2021).

Finally, it is essential to note the importance of responding to trauma in ways that are culturally relevant and sustaining. Schools and other educational settings should seek to 1) minimize and address trauma in ways that are consistent with the cultural norms and healing practices of children and their families; 2) leverage students' unique strengths and cultural assets; 3) provide opportunities for students to explore, celebrate, and develop their sociocultural identities; and 4) recognize and address issues that arise from historical trauma and societal oppression like stereotypes, bias, and educational practices and policies that disproportionately impact specific groups of students and add to traumatic stress (SAMHSA, 2014; TransformEd, 2020; Wolpow et al., 2016; NCTSN, 2017; Hebert et al., 2019).

Proposed Principles and Definition of Equitable Social Emotional Learning

Looking across the four approaches summarized above, common principles embodied by culturally-sustaining, social justice-oriented, transformative, and trauma-sensitive SEL include: 1) ensuring safe and inclusive learning environments that are respectful and affirming of diverse identities; 2) recognizing and incorporating student cultural values, practices, and assets; 3) fostering positive identity development; 4) promoting student agency and voice; and 5) explicitly addressing issues of bias, power, and inequality at multiple levels (classroom, school, systems) and working to disrupt them. Based on these principles, we define equitable SEL as an approach to SEL that incorporates the cultural knowledge, experiences, and assets of students from diverse families and communities, and acknowledges and addresses the social injustices, inequalities, prejudices, and exclusions that students face.

HOW DO PREK-5 SOCIAL EMOTIONAL LEARNING PROGRAMS CURRENTLY SUPPORT EQUITABLE SOCIAL EMOTIONAL LEARNING?

As the field of SEL grapples with how issues of educational equity can be integrated into SEL programming and practice, some programs and organizations are beginning to incorporate more equitable framing and practices into their work (e.g., Sanford Harmony, 4Rs, Girls on the Run, RULER, etc.). However, research suggests that in general, most SEL programs lack specificity and definition in their attempt to incorporate culture and diversity (Caldarella et al., 2009; Durlak et al., 2011) and that, despite diverse characteristics of the student population, SEL programming itself tends to remain static (Desai et al., 2014). Furthermore, while many SEL programs include concepts related to fairness, respect, diversity, and social responsibility, few explicitly address how these topics relate to issues of identity, power, and structural injustice.

We conducted a content analysis of 33 widely-used PreK-5 SEL programs to better understand the extent to which SEL programs are designed to promote equity (Jones et al., 2021). To begin, we developed an equity coding system that is based upon a review of the literature in asset-based pedagogies and critical theory and aligned with the developmental and prevention science literatures on social and emotional development The coding system allowed our team to capture the extent to

TABLE 1 | Descriptions of equity codes.

Equity code	Definition
Equitable Storytelling	Centers student knowledge, experiences, and personal narratives when introducing or discussing an SEL or related concept. Includes facilitating in-depth, extended discussion on personal or meaningful questions where all students are actively involved either through sharing or actively listening
Equitable Family/Community Representation	Draws upon family and community members' experience, knowledge, or perspective. Includes the use of photographs or images of students and/or families, family/community members participating in the class, and lessons that explicitly have students ask family/community members to share their ways of being and knowing
Equitable Emotional and Behavioral Regulation	Teaches and discusses regulating oneself, emotions, and behaviors as a means to empower students. Includes connecting regulation to self-care, self-preservation, and self-interest (including activism), understanding that resistance may look like noncompliance but is not evidence of poor self-regulation, and exploring why expectations might be different based on identity and setting
Equitable Critical Thinking/Problem Solving	Presents and discusses critical thinking skills as tools for recognizing injustice, prejudice, and discrimination, often in the service of social action. Includes discussing fairness and justice at the individual, institutional, and systemic levels, thinking critically about stereotypes, identifying local problems and making decisions on how to solve them, and building student capacities to understand and analyze their relationship to oppressive forces
Equitable Emotional Knowledge and Expression	Deconstructs expectations and cultural norms related to emotional expression and reaction. Includes recognizing that all feelings are okay, acknowledging that emotions are expressed and experienced differently for different people, and teaching a variety of ways to express feelings that reflect students' community and home life
Equitable Prosocial Behavior/Conflict Resolution	Acknowledges societal expectations of behavior and the cultural practice of students and their families, and builds conflict resolution skills that focus on inclusivity. Includes discussing how appropriate behavior may differ at school and home, focusing on standing up for others even when it comes at a personal cost, and effectively discussing conflicting positions on fraught moral issues
Equitable Empathy/Perspective-Taking	Builds students' capacity to feel empathy for and understand the perspectives, opinions, and feelings of those outside their own identity group/community, especially those from marginalized groups and communities. Includes understanding experiences and events of others through the lens of race, culture, and power and expressing empathy when people are mistreated because of preferences, beliefs, and identities such as race, ethnicity, gender, class, ability, and age
Equitable Ethical Values	Celebrates differences and frames them as assets rather than simply tolerating them. Includes discussing and describing differences and similarities *between* groups and *within* groups
Equitable Civic Values	Focuses on activism, fighting social injustice, and collective obligation. Includes highlighting activism skills, identifying and working towards solving community problems, presenting both traditional (e.g., voting) *and* non-traditional civic participation (e.g., civil disobedience, protests)
Equitable Self-Knowledge	Focuses on various aspects of students' identity development and explores how identity influences one's understanding and outlook of the world. Includes building awareness of multiple identities (such as gender, sexual orientation, religion, race, class, nationality, family structure, and body size), touching upon social and political contexts, helping students see themselves as part of a larger collective, and recognizing the importance of ancestry and heritage as a positive aspect of themselves without denying the value and dignity of other people
Equitable Purpose	Expands the definition of success and happiness to include the experiences and aspirations of students, families, and community members. Includes using examples of different role models from local communities, learning about various life paths and careers, and asking students to present their own examples of success and happiness rather than providing a definition
Equitable Self-Efficacy/Growth Mindset	Cultivates mindsets, beliefs, and values that help students develop a belief in their ability to improve and succeed regardless of societal expectations. Includes developing a sense of agency (a belief that one is capable of changing societal inequities), building a positive academic identity that diminishes longstanding stereotypes, and students teaching each other about issues, concepts, or topics they have learned about

which lessons incorporate equitable practices that promote transformative SEL skill-building across the 12 categories outlined in **Table 1**. These categories represent a variety of skills and practices that empower students to 1) think critically and strategically about their circumstances and the world in which they live; 2) develop their ethnic, racial, and social identities; and 3) build their self-efficacy and agency. In addition to this, we used a standardized process to collect and summarize information about high-level program features including guidance, tips, and resources SEL programs provide to ensure their materials and content are relevant to students of all backgrounds, cultures, and educational needs.

The following sections present the methods and findings from the content analysis. We first describe the development of the

equity coding system, the identification and selection of programs for coding, and the process for data collection and analysis at two levels, the lesson-level and program-level. Next, we discuss our findings, which provide a snapshot of how Pre-K SEL programs are currently addressing equity at the lesson-level and the program-level. We begin by highlighting resources outside of lessons that programs are providing to address equity and then share how equity appears in SEL lessons, calling out areas of success and opportunity and presenting examples of programs doing exemplary work. Next, we discuss what is typically missing from SEL programs, highlighting the codes that were found least commonly across SEL lessons. Finally, we discuss the limitations of the content analysis.

Content Analysis Methods

Development of Equity Coding System

The development of the equity codebook involved a hybrid approach of qualitative methods of content analysis whereby an existing coding system of common social and emotional skills (Jones et al., 2017b) was used to organize a review of the literature to begin, but where novel themes were also allowed to emerge during this initial review process and during the analyses itself (Fereday and Muir-Cochrare, 2006). Incorporating both inductive (Boyatzis, 1998) and deductive (Crabtree and Miller, 1992) approaches allowed us to better explore the overarching research question: How are existing SEL programs addressing issues of equity and what are areas of strength and opportunities for growth?

We began first by mapping the existing coding system of SEL skills onto relevant literature from the fields of culturally responsive pedagogy, anti-bias and multicultural education, liberatory education, and social justice education. Documents included frameworks such as the Social Justice Standards (Learning for Justice, 2017), the Five Pillars of Emancipatory Practice (El-Amin, 2015), the Six Elements of Social Justice (Picower, 2012), the Revised Radical Healing Framework (Ginwright, 2016), and the Principles of Teaching for Social Justice (Dover, 2009), as well as books about equity-related practice including *What if All the Kids Are White?* (Derman-Sparks et al., 2006)? and *Everyday Antiracism* (Pollock, 2008). Guidance documents which provided recommendations for social emotional learning through an equity lens were also reviewed, including the National Equity Project's Pitfalls and Recommendations (National Equity Project, 2018) and CASEL's Equity Elaborations (Jagers et al., 2018) among others (Watts et al., 2011; Gay, 2013). Through this mapping exercise, we were able to identify areas of alignment between the widely-recognized SEL skills domains found in the existing SEL coding system (e.g., Cognitive, Emotion, Social, Values, Perspectives, or Identity) and equity-oriented standards and domains highlighted in the literature (e.g., Identity, Diversity, Justice, Agency, and Culture). After identifying the equity-oriented skills and practices that spanned both the SEL coding system domains and the equity-oriented standards and domains from the literature review, 10 equity codes were developed. Two additional codes (Storytelling and Family/Community Representation) were then added based on equity-oriented educational skills and practices that were found in the literature and in SEL lessons, but not in the SEL skills coding system. Each equity code included an initial set of indicators and examples derived from the literature and our own knowledge of SEL programming. These were further updated and refined throughout the coding process based on coding team discussions and what was found in the lessons.

The equity coding system was initially piloted by two different coders and consequently revised before being introduced to the rest of the coding team. The final equity coding system was applied by six coders across 33 PreK-5 SEL programs over the course of seven months. During this time, the coding team met on a weekly basis to discuss how programs were addressing issues of equity within SEL lessons and, more specifically, how the equity codes were appearing in program lessons. Based on these conversations, examples of each code were continuously added to the coding system and indicators were refined and updated throughout to more accurately reflect what appeared in program lessons.

Program Sample

PreK-5 SEL programs were originally identified *via* several databases and reports (e.g., 2013 CASEL Guide, Blueprints for Healthy Youth Development, Child Trends What Works) or internal expertise, and 33 were ultimately selected for inclusion based on their relevance to the project, diversity of focus and approach, evidence of effectiveness, and accessibility and codability of program materials. Each program selected met a majority of the following inclusion criteria: 1) includes lessons and activities that fall within the PreK-5 age span; 2) has sufficient evidence to indicate impact on social and emotional skills, behavior, academic achievement, attendance, and/or relationships and climate, including results from randomized control trials and/or multiple research studies; 3) is a universal program that could be used in classrooms, afterschool programs, community centers, early childhood centers, and other educational settings; 4) has a primary focus on SEL or a related field (e.g., bullying, youth development, character education, mental health, etc.); 5) is well-aligned with the theory and practice of social and emotional learning, including a well-defined set of activities that directly build student SEL skills; and 6) has accessible and codable materials (e.g., lessons, strategies, and routines that directly build student SEL skills) and implementation information.

Data Collection and Analysis

A team of coders conducted a careful and detailed reading and coding of each program's curriculum to capture the extent to which lessons incorporated equitable skills and practices. We used quantitative methods to analyze the lesson level data, looking at the percentage of lessons (both within each program and across all programs) that received each code to explore the following question: On average, which equity codes appear most and least commonly across program lessons?

Information was also collected at the program level about the types of programmatic support for equitable and inclusive education offered outside of lessons (e.g., in trainings,

TABLE 2 | Examples of equitable SEL inside existing SEL programs.

Equity code	Sub-component	Example from SEL program
Equitable Critical Thinking/ Problem Solving	Students identify relevant personal, classroom, or community problems that are important to them and which they want to solve, and then decide how to best solve them, keeping in mind safety, resources, social norms, and ethics	SECURe (PreK-Grade 3) includes weekly class council meetings during which students might be prompted to reflect on challenges they encountered throughout the school day (e.g., sitting still the lunchroom, sharing toys on the playground, etc.) and identify something they can improve on as a class the following week
	Students recognize and reflect on discrimination, and unfair behaviors directed at themselves or others, and/or build their capacity to see and understand oppressive forces and analyze their relationship to current conditions	In the 4Rs program (PreK-Grade 5), 5th-graders listen to a story about a group of migrant workers facing discrimination and reflect on the effects of prejudice and discrimination on different groups of people. Students learn what prejudice and discrimination mean using examples of what they might look like in school (e.g., a girl wants to play basketball with a group of boys but the boys say, "No girls allowed. Go jump rope with the other girls."). They are asked to consider why the migrants in the story were being mistreated and reflect on the treatment of immigrants in the United States today
	Students think critically about misinformation, including stereotypes	In Sanford Harmony (K-Grade 5), a lesson about stereotypes and the pressures they place on different groups wraps up with a discussion of why this is problematic. Students are asked why using stereotypes, such as those about girls and boys, to guide your decisions about toys, activities, and games can be problematic. The lesson asks them to reflect on the importance of thinking for themselves rather than allowing stereotypes to guide their thoughts and decisions
Equitable Emotional Knowledge and Expression	Students understand that emotions are expressed and experienced differently for different people	In Lions Quest (PreK-Grade 5), 3rd-graders examine their classmates' thumbprints as the teacher explains that thumbprints are as different as the emotions that people feel every day and as unique as the experiences that might trigger those emotions In the Mutt-i-grees Curriculum (K-Grade 6), students create a "Mad Measure," writing down things that make them angry, proceeding from "a little mad" to "really, really mad." They are then asked to share their Mad Measures within small groups or with the entire class, noting the similarities and differences in what makes people mad
Equitable Storytelling	Students rely on their own knowledge and experiences to learn about a new SEL concept or extend their learning about an SEL concept	In the PATHS® Program (PreK-Grade 6), preschoolers and kindergarteners participate in whole group emotion-sharing sessions which give all children the opportunity to talk about their own experiences with whichever emotion is the topic of that lesson In Second Step (PreK-Grade 5), 5th-graders interview partners about times when they have felt a specific emotion (e.g., "Describe a time when you felt really angry. What did you do?" or "Describe a time when you've helped another person or shown empathy. How did that make you feel?")

implementation manuals, resources libraries, etc.), including 1) guidance, tips, and resources for ensuring program materials and content are relevant to students of all backgrounds, cultures, and educational needs; 2) resources that explicitly and intentionally support adults and students to create inclusive learning environments and challenge systemic oppression; and 3) activities, events, and recommendations for incorporating families in students' SEL development. We also summarize these findings below.

Content Analysis Findings

Program Level: What Resources are Programs Providing to Support Equity?

As the field of SEL focuses more of its attention on issues of equity, SEL programs are beginning to provide more resources to those looking for additional support on the topics of equity, inclusion, and cultural responsiveness. Our program level analysis found that many programs provide some form of guidance, tips, or resources for ensuring program materials and content are relevant to students of all backgrounds, cultures, and educational needs.

For example, some programs encourage teachers to examine the equity of their seating arrangements, provide them with sample language to use when reinforcing student behavior, provide guidelines for creating or adapting visual supports that will help all students access knowledge, and suggest ways to apply the concepts covered in lessons to real conflicts in the classroom. While less common, some programs also provide resources that explicitly and intentionally support adults' ability to reflect on their identity and teaching practice in ways that foster inclusive learning environments and challenge systemic oppression. For example, programs may offer teachers an opportunity to reflect on their

identities and that of their students, and consider how their personal biases and preconceptions can affect interactions with their students. Other programs provide less targeted resources including supplementary materials with information about anti-bias education, cultural dominance, guidance around how to adapt lessons to incorporate diversity and reflect the students in their class, and other general guidance that ensures lesson materials and content are culturally sustaining. Several programs also promote cultural diversity on a more basic level by using names and stories that are representative of a range of different backgrounds and cultures and images which include people of varying skin colors, ages, and sizes, as well as individuals with disabilities.

In terms of family engagement, some programs offer resources for incorporating families into SEL committees, provide resources for gathering data about parent perceptions of programs, invite families so share their experiences with the class, or share resources to help parents discuss SEL skills and experiences with their children at home (e.g., how they regulate their emotions).

Lesson Level: How Do Social Emotional Learning Lessons and Activities Address Equity?

Overall, our findings suggest that equitable SEL practices and skills rarely appear in program lessons and activities. Less than 4% of the lessons in our sample of 33 programs received an equity code. Within that 4% of lessons, we found that programs incorporated three equitable skills and practices more frequently than others: equitable critical thinking/problem solving, equitable emotional knowledge and expression, and equitable storytelling. While the overall low prevalence of equity codes suggests that more intensive efforts are needed to integrate equity into SEL programs, the above areas where SEL and equity tend to overlap may serve as a natural starting place to begin integrating equity into SEL lessons. Below we spotlight some common ways these areas appear in the programs we coded. Please see **Table 2** for specific examples from programs.

Equitable Critical Thinking/Problem Solving

Equitable critical thinking/problem solving appears relatively frequently in three programs (i.e., in 13–44% of lessons in the three programs). While this is a small portion of the overall sample, most other equity categories appear in less than 2% of lessons across the entire sample, suggesting that we may have something to learn from how these three programs are targeting and building equitable critical thinking/problem solving. When students build their equitable critical thinking and problem-solving capacities, they use critical thinking skills and tools to 1) identify discrimination and resist prejudice, 2) think critically about misinformation and stereotypes, 3) build their capacity to understand and analyze their relationship to oppressive forces in the world, and/or 4) identify local or other personally-relevant challenges (e.g., in the classroom, community, at home, etc.) and make decisions about how to best solve them.

In the three programs where this type of skill building most often takes place, regular class meetings may include a problem-solving or goal-setting component. During these gatherings, students have an opportunity to build equitable critical thinking/problem solving skills by setting a classroom goal or solving a classroom problem together that touches upon issues of fairness, justice, or related concerns about which they feel passionate. As students raise questions and concerns within the context of their classroom community, teachers may have them engage in planning, problem solving, and goal setting by following a number of steps in which they: 1) identify a class-wide problem area, 2) brainstorm possible solutions together, 3) collectively decide on a plan they will put into action or a goal they want to reach and, 4) track their progress moving forward. These types of activities have the potential to be transformative for children and youth because they allow students to identify and take action on issues that affect them and their communities directly, while the teacher's role remains that of a facilitator rather than instructor.

In other instances, skill building may take place after reading a story in which a character faces prejudice, injustice, or mistreatment. Using the story as an opportunity to reflect on issues related to discrimination and stereotypes, teachers can: 1) explain that discrimination happens when we treat others unfairly based on prejudice and ask students for examples of this happening in the story, 2) encourage students to think of examples from their own lives of people doing mean or unfair things to other people who are different, 3) ask the class to reflect on the negative effects discrimination can have on people, and 4) have students pair up to brainstorm ideas of actions they can take to stop mistreatment and injustice when they see it happening. Starting with a definition of these terms and providing relevant examples before connecting back to the characters in the story helps students to think about fairness and justice at individual level and begins to build their capacity to see and understand systemic or more widespread injustice.

While less common, some lessons may explicitly target this skill by facilitating exercises that illustrate the problems associated with stereotyped thinking. In activities or games that help students find commonalities with each other, students can be asked to think about the assumptions they made based on group identities (such as gender, race), and how this may prevent them from identifying their shared interests and learning from each other's differences. Asking questions like "What surprised you? Did you find things in common with people whom you did not expect to have things in common? Why did you have these expectations?" after the activity can help students reflect on their own biases and assumptions. These types of activities have the potential to be transformative because they help students deconstruct stereotypes about themselves and their peers and move them from "celebrating diversity" to an exploration of how diversity has differently impacted various groups of people, ultimately helping them recognize their responsibility to stand up to exclusion, prejudice, and injustice (Picower, 2012; Learning for Justice, 2017).

Equitable Emotional Knowledge and Expression

Equitable emotional knowledge and expression appears most commonly across the set of programs, showing up at least once in 20 of the 33 programs coded. When students build their equitable emotional knowledge and expression capacities, they 1) recognize that all feelings are okay, 2) understand that emotions are expressed and experienced differently by everyone, and/or 3) use a variety of words or gestures for expressing feelings

that reflect the language or vocabulary they use at home and in their community. This skill building typically occurs when a program is introducing emotions or during a lesson discussing emotion regulation or emotional triggers. During these kinds of activities, teachers can affirm that all feelings are valid or acceptable and that people have different levels of comfort with different emotions. For example, after an emotion is introduced, teachers can take the opportunity to remind students that: 1) in some ways we are alike and in some ways we are different, 2) we can have many different feelings about the same situation and express those feelings differently from one another, and 3) some feelings are comfortable and enjoyable to have, while other feelings are uncomfortable or difficult to have, but all feelings are okay. In some programs, teachers can expand further on this idea by having students also share what elicits a specific emotion in them, such as anger, then reflect on the differences and similarities in what makes people feel angry. These activities have the potential to be transformative because they help students deconstruct expectations and cultural norms around ways of expressing emotion and expand the definition of normative and appropriate reactions to include the experiences and cultures of all students (National Equity Project, 2018).

Equitable Storytelling

Equitable storytelling appears relatively frequently in three programs (i.e., in 18–31% of lessons) and at least once across most programs (i.e., 20 of the 33 programs). Lessons that include equitable storytelling practices encourage students to share their experiences and stories, and often explicitly and intentionally center student knowledge and make use of personal narrative in lessons. Activities that integrate storytelling practice, consider student experience foundational to building knowledge and teaching SEL concepts. While not all students are required to participate, equitable storytelling practices allow all students the opportunity to share their experiences or be an active listener to others who are sharing. Across the three programs, this practice often takes place when a new concept, like an emotion, is being introduced to students. Indeed, in several of the programs, one of the most important aspects related to teaching children about emotions involves helping children connect what they already know and have experienced in terms of feelings with the emotions they will be learning about.

Teachers can help students build equitable storytelling skills when an unfamiliar or new concept is being taught by 1) introducing the concept briefly, sharing little besides the name and some context if necessary; 2) asking students if they have heard of the concept before and can think of a story from their own lives that connects with or reminds them of the concept; 3) having students take a minute to think and then share their stories, thoughts, and experiences with a partner; and 4) having volunteers share out with the whole class and, if appropriate, writing the main ideas from the share out on the board before providing additional information about the concept. When introducing an unfamiliar emotion to younger students, teachers can also have them participate in sharing circles which provide all children the opportunity to share about their own experiences with the emotion. If teachers feel equipped to facilitate a more extended discussion and have previously established a safe space for students to share in the classroom, it can also be helpful for students to first share stories with the class about times they felt an uncomfortable emotion before learning about emotion regulation techniques associated with that emotion as this allows students to more easily connect the techniques they are learning with their individual circumstances. Although much less common in SEL lessons, open-ended activities that encourage students to share their experiences more generally such as sharing or healing circles, where members share their interests, fears, and hopes can be especially impactful (Ginwright, 2016). Equitable storytelling is transformative because it shows students that their experiences are valuable and worth sharing and creates a climate of respect for diversity as students learn to listen with kindness and empathy to the experiences of their peers (Picower, 2012; National Equity Project, 2018).

What is Missing?

Lessons and activities that incorporate equitable emotional and behavioral regulation, equitable self-knowledge, and equitable self-efficacy/growth mindset appeared least commonly across programs. Less than 1% of lessons (i.e., between 0.1 and 0.51% of lessons) across all programs touched upon these three categories. Overall, 29 of the 33 programs did not have any lessons that incorporated equitable self-efficacy/growth mindset or equitable emotional and behavioral regulation, and 25 of 33 programs did not have lessons that incorporated equitable self-knowledge. This may be in part because identity development and related constructs (such as self-knowledge and learner identity which relate closely to self-efficacy and growth-mindset) are often considered most important in adolescence (Tsang et al., 2012; Nagaoka et al., 2015) rather than during the preschool and elementary years. Nevertheless, this gap is significant to note and address in future work.

Although identity development plays a critical role in adolescence, the constructs of identity begin developing from birth and are molded during early and middle childhood as children learn about themselves in relation to opportunities and limitations in their social world (Derman-Sparks et al., 2006; Raburu, 2015; Reschke, 2019). In order for positive identity development to happen during adolescence, children need early experiences that promote healthy self-awareness and a sense of belonging and self-worth in childhood, including the formation of positive identity and self-efficacy, SEL skill areas which are not always focused on in elementary classrooms. Additional efforts are needed to include lessons that focus on building equitable self-knowledge and equitable self-efficacy/growth mindset capacities in pre-school and elementary school SEL programming because these skills help students explore their identity and positionality, and cultivate mindsets, beliefs, and practices that help students develop positive academic identities.

It is particularly troubling that few programs touched upon equitable emotional and behavioral regulation, which teaches regulation in a way that empowers students by connecting the purpose of self-regulation to students' own self-interest and helps students explore different expectations for self-regulation based on identity, context, and setting. The low prevalence of equity-oriented emotional and behavioral regulation in SEL programs is particularly problematic because SEL programs often place a large

focus on self-regulation, self-management, and related SEL concepts which are often misapplied and can further inequities. Research shows that the misbehavior of low-income students and students of color is often perceived as an inability to self-regulate and is responded to with punishment or demands for compliance (Green, 2018; Bailey et al., 2019). Framing emotional and behavioral skills as a way to practice self-care and self-preservation can be transformative for students because it moves self-management away from compliance and conformity to empowerment while at the same time allowing students to build the crucial navigational skills they need to manage behavior and express emotions in an unjust world (El-Amin, 2015; Simmons, 2019). Children need opportunities to regulate their feelings and behaviors and to understand self-regulation and self-management techniques as tools that they can use to their benefit in and out of school.

Content Analysis Limitations

Sampling Bias

The sample of programs used for coding purposes was limited to accessible, United States-based, English language SEL programs that include some direct form of student skill-building, typically *via* a scope and sequenced curriculum and/or through a set of activities, and routines designed to be integrated throughout the regular day. Although these programs typically fall under the category of comprehensive prevention and intervention programs that are one of the most widely used approaches and consequently have been the most rigorously studied (Jones et al., 2017a), it is important to note that there are many other valid and valuable types of SEL interventions that could not be coded using our coding system including interventions that 1) target adult skills, attitudes, and practices in ways that support high-quality teaching, learning, and social and emotional development, as well as those that seek to 2) transform the entire culture and climate of the learning environment *via* a system-wide approach that integrates norms and expectations.

Transferability

While the programs analyzed are considered universal programs, it is important to acknowledge that the programs were developed in the United States and are most widely-used and studied in United States contexts. Furthermore, the frameworks and other documents reviewed as part of the development of the equity coding system were largely written by United States-based scholars. For this reason it is not possible to conclude whether the equity coding system is applicable or relevant to settings outside of the United States. Future research could expand upon the current research and explore the applicability and transferability of the equity coding system to non-United States based SEL programs.

DISCUSSION

The equity coding system we developed captures a variety of skills and practices that empower students to 1) think critically and strategically about their circumstances and the world in which they live; 2) develop their ethnic, racial, and social identities; and 3) build their self-efficacy and agency. These skills and practices align with the comprehensive principles and proposed definition of equitable SEL described earlier in this paper: an approach to SEL that incorporates the cultural knowledge, experiences, and assets of students from diverse families and communities, and acknowledges and addresses the social injustices, inequalities, prejudices, and exclusions that students face. Findings from our content analysis are consistent with the claim that SEL programs, while promising vehicles for promoting equity because of the alignment between many of their principles, are not inherently equitable. As indicated above, very few PreK-5 SEL programs have a curricular focus on issues related to equity, justice, cultural competence, or cultural diversity and only a handful of the programs we analyzed seem to intentionally design their content to be equitable. Given that SEL programs are often described as mechanisms to improve educational outcomes and wellbeing for all children, particularly those in marginalized communities, this is an important finding and area for growth within the field. While some programs analyzed did provide guidance for educators to tailor the way they frame and deliver lessons, currently the responsibility falls on individual educators, facilitators, and trainers to make equitable SEL more intentional in the classroom. Indeed, the promise of SEL as a lever for increasing educational equity largely depends on whether educators have the tools needed to increase their own critical self-awareness; understand how racism and historic oppression are embedded in the context of our schools; and design or adapt SEL lessons that engage and value all students for the experiences they bring into the classroom (National Equity Project, 2018). Until SEL curricula is intentionally designed and written with equity in mind, schools, educational settings, and educators themselves carry the responsibility to interpret, frame, and deliver lessons to students in a manner that takes into consideration their cultural knowledge, experiences, and assets, and acknowledges and addresses the social injustices, inequalities, prejudices, and exclusions they face. The equity-oriented principles, skills, and practices highlighted in our equity coding system and outlined in our proposed definition of equitable SEL are a starting point for educators, schools, and other educational settings to familiarize themselves with equity-oriented SEL skill building at the classroom-level. Given that schools and other educational settings have limited control over what appears in SEL lesson content and similarly limited resources available for adapting lessons to diverse contexts, we offer the following recommendations that, when addressed purposefully, can be important levers for helping educators to approach SEL in a way that is consistent with the general principles of equitable SEL.

Recommendation 1: Invest in Adult Training

Invest in adult self-awareness, knowledge, and skills by providing training and resources that encourage adults to build their own SEL skills, examine and address implicit biases, and engage in culturally sustaining and equity-promoting practices. Strategies include critical reflective prompts and statements (McIntosh, 1990; Weigl, 2009; Simmons, 2017), loving kindness meditation and mindfulness training (Kang et al., 2014; Lueke

and Gibson, 2015; Suttie, 2017); and anti-bias and culturally sustaining SEL training (Brion-Meisels et al., 2019; Poddar et al., 2021).

Recommendation 2: Reflect Student Identities

Design and/or select SEL curricula that reflect and build upon student identities, cultures, and goals. To truly serve all students, SEL should ensure that messaging, skills, and goals reflect, incorporate, and sustain diverse student needs and perspectives and move away from curricula that reinforces white, Western, individualist culture without acknowledging and accepting other ways of being. Focus on skills that align with student needs and interests, provide opportunities for students to incorporate their own experiences and personal narratives into the curriculum, and promote transformational goals for youth that enable them to recognize and work against social injustice (Simmons, 2017; Jagers et al., 2018; National Equity Project, 2018).

Recommendation 3: Involve Students and Families

Be inclusive and intentional when selecting SEL programming by involving students, families, and staff. Students, families, and communities should be active participants in building SEL programs to ensure they reflect the values, beliefs, identities, interests, and needs that are important to them, ultimately increasing buy-in and impact. This might include soliciting student and family feedback *via* surveys, phone calls, and other strategies that establish ongoing feedback loops (Drwal, 2014; Simmons, 2017) or using asset-mapping strategies to identify and align community assets (e.g., cultural facilities and organizations, festivals and events, and artists networks) with student educational needs (Simmons, 2017).

Recommendation 4: Align Social Emotional Learning With Equitable School Practices

Accompany and align SEL programming with other mutually reinforcing equitable school practices and structures such as restorative disciplinary practices and trauma-sensitive systems. This includes restorative justice practices that emphasize repairing the harm done to individuals and the community through cooperative processes that focus on joint problem-solving and restitution, resolution, and reconciliation among the parties involved (Morrison and Vaandering, 2012; Simmons et al., 2018) and trauma-informed practices that acknowledge and address persistent environmental stressors such as racism, transphobia, homophobia, and classism that impact the social and emotional wellbeing of marginalized youth.

CONCLUSION

In closing, we hope the proposed definition for equitable SEL and the equity coding system are useful tools for researchers, practitioners, and program developers who seek to understand and more directly integrate issues of race, identity, and equity with traditional SEL programming in schools. By applying the equity coding system to PreK and Elementary SEL programs that are widely-used in the United States, we explored the extent to which current programs address issues of racial justice, identity, power, privilege, bias, and oppression. The results of our coding suggest that overall, very few programs explicitly discuss these issues in lessons or curricula. We found that three equitable practices were most common among the programs we coded: equitable critical thinking/problem solving, equitable emotional knowledge and expression, and equitable storytelling. These practices may be useful starting places for SEL programs that aim to include more equity-oriented practices. We note that our research is shaped largely by United States-based theory, programming, and educational practice. Future research should explore the applicability of our proposed definition for equitable SEL and the equity coding system to other contexts and non-United States based SEL programs.

AUTHOR CONTRIBUTIONS

TR conducted research and wrote the first draft of the manuscript; KB contributed to the conceptualization and design of the paper and wrote sections of the manuscript; NR conducted research and wrote sections of the manuscript; SMJ and RB contributed to the conception and design of the paper; and all authors contributed to manuscript revision, read, and approved the submitted version.

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Making Space for Social and Emotional Learning in Science Education

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Social-emotional learning (SEL) is known to improve student outcomes but is rarely combined with STEM. In this paper we present an action research study to examine the impact of a STEM + SEL curriculum intervention to address a real-world school conflict. One hundred sixth–eighth graders and four teachers participated in an in-person facilitation of a SEL Arthropod curriculum, DIFFERENT. After the intervention, students completed open-ended couplet statements about arthropod behavior, tarantulas, and humans designed to measure sentiment change. Answers were manually coded using inductive coding on a scale of negative (1) to positive (5). Statement sentiments significantly shifted from negative to neutral and negative to positive for all three questions. Neutral to positive shifts were only significant for the couplet statements about arthropod behavior. This study reports the first confirmed instance of successful use of arthropods for SEL within a curriculum that integrates students' social-emotional skills within a science classroom.

Keywords: social-emotional learning, arthropods, middle school, science education, integrated learning, interdisciplinary, entomology

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INTRODUCTION

In the Pacific Northwest, a suburban options-based middle school program (OBMP) focuses on environmental science through integration with other subjects. These students arrive very early in the day, and their school day ends earlier than normal. This program is housed inside a traditional middle school (TMS) whose hours begin and end later each day. In addition, the OBMP students leave the grounds once a week for environmental community service projects.

The TMS students see this as a fun weekly "field trip," and due to the segregated nature of the student populations between the two schools, misunderstandings about the nature of the OBMP program led to increased tensions, bullying, and emotional strife.

We were invited by the OBMP to lead their students through a science and social-emotional learning (SEL) curriculum called DIFFERENT, where students challenge their perception of themselves, others, and the natural world by learning about arthropods.

Given the situation at the school, we had two key questions:

1. Do arthropods provide the spark of engagement necessary to successfully integrate STEM content and SEL?
2. Can entomology be used to build empathy not only for arthropods, but also people with differing experiences?

The intent of this study was to pilot a curriculum to address conflict and build social-emotional competencies in a science education context.

Social-emotional learning (SEL) is defined in many ways in the research literature, and includes subfields of character or civic education, social skills, life skills, "soft" skills, and 21st century skills (Jones and Kahn, 2017). While SEL may be difficult to cleanly define, it is a useful concept that encapsulates a multifaceted assortment of non-academic knowledge, skills, and attitudes related to self-management, relationship building, and responsible decision making.

Teaching SEL is a proactive approach to dealing with classroom management issues. Rather than responding to students' negative emotions or antisocial behaviors after they become problematic, educators help develop students' SEL skills as life tools to thrive in school and beyond. SEL programs have been found to contribute to gains in social-emotional skills and attitudes about self, others, and school, improved grades and academic performance on standardized tests, and a reduction in negative student conduct behaviors such as school suspensions and drug use (Durlak et al., 2011; Taylor et al., 2017). In addition, the return on investment is impressive, with high quality SEL programs yielding an estimated 11:1 return on dollars invested (Belfield et al., 2015).

High-quality SEL programs include four recommended elements, known by the acronym SAFE: Sequenced, Active, Focused, and Explicit (Durlak et al., 2010; Durlak et al., 2011). Programs result in consistently positive outcomes when they:

1. use a sequenced step-by-step training approach
2. emphasize active learning in which youth practice new skills
3. focus specific time and attention on personal and social skill training
4. clearly define their goals in explicit rather than general terms.

Implementation is also key to success and requires training and on-going support for facilitators (CASEL, 2013; CASEL, 2015).

While SEL is clearly important in modern pedagogy, integration of SEL into STEM (Science, Technology, Engineering, and Mathematics) subjects may be viewed as incompatible. In this paper, we argue science and emotions are not irreconcilable, and should not be separated. In fact, we argue science and social-emotional learning are synergistic, and lead to greater understanding when combined.

Implementation of SEL into schools is often done as a separate class or section, rather than integrated into existing subject matter. While this does bring focus to SEL as an important topic, it does not support the reality that social emotional concepts are a part of every aspect of our lives (Zins, 2004). As Brown (2021) put it, we are not teaching *science*, we are teaching *people*.

To ask students to leave their emotions and social connections at the door and engage only rational thinking in the science classroom is not a reasonable expectation, nor should it be encouraged. As science educators we need to address emotions because (like it or not), emotions influence learning outcomes in the science education classroom (Pekrun and Stephens, 2012). Students are always experiencing emotions in STEM; discipline-specific emotions (Goetz et al., 2006), topic emotions (Broughton et al., 2013), or academic emotions related to classroom learning contexts (Pekrun et al., 2002; Pekrun and Stephens, 2012). Whether it is test anxiety or sadness when studying species extinction, emotions are always in the room.

Emotion plays a key role in decision making (Immordino-Yang and Damasio, 2007). Therefore, if we want to influence decision making, we must be willing to recognize and grapple with the role emotions play in our-and our students'-decision making processes. Ideally, we want school science to be relevant outside the walls of the classroom, and to support students in integrating scientific knowledge into their worldviews and identities (National Research Council, 2012).

While there are many ways to teach SEL in the K-12 classroom (CASEL, 2013; CASEL, 2015), embedding SEL within academic subjects can contribute to a systemic approach to teaching social-emotional skills. In addition, the integration of SEL with a required subject supports teachers and eases the burden of having to fit new content into an already packed academic schedule. Teachers can struggle to find the time and bandwidth to teach isolated SEL curriculum and it can feel less forced and inauthentic than when integrated into existing lessons.

Can you imagine bringing a tarantula or a large insect into a classroom and students NOT having an emotional response? Some K-12 educators see the value of using arthropods as model organisms in their science classrooms and acknowledge that student engagement increases due to students' strong emotional response to these animals (Ingram, 2019). The unexpected can activate a powerful range of emotions. Even if the emotion is "ick!," these feelings create an entry point to discuss empathy, respect for differences, thoughtful inquiry, and to model how to ask questions that are curiosity-based rather than judgement-based.

Standards-based science education ensures that instruction must include particular content, but does not prescribe how this content must be taught (National Research Council, 2012; NGSS Lead States, 2013). Many secondary science teachers report having the freedom to select instructional practices and curriculum materials that best suit their needs (Banilower et al., 2018). This includes the freedom to select from a plethora of available model organisms to teach about key science ideas such as evolution, natural selection, adaptations, and survival strategies.

By blending SEL with science content, students have the opportunity to challenge how they see themselves, others, and the natural world. One result of connecting students with nature is increased empathy for animals. This translates directly to a deeper empathy for people. Castano (2012) documents that youth who had previously acted indifferently or harmfully toward animals were better able to feel concern and empathy toward them, and subsequently toward their human peers, after an SEL-science unit in their school. Interacting with animals and nature has the potential to reduce aggressive behaviors (Katcher and Teumer, 2006).

TABLE 1 | Roadmap and phase descriptions of the DIFFERENT curriculum.

Curriculum phase	Description
Phase 1: Videos and Self-reflection questions	Ten videos about arthropod biology and survival strategies. After watching each video, student individually answer accompanying self-reflection questions. Videos can be viewed in any order or combination (all or only a few) before moving to Phase 2. This is where live animals could be used as a supplement.
Phase 2: Group discussion and connections	Facilitator/teacher led group discussion focusing on the self-reflection questions and arthropod connections. Teachers are provided with additional SEL materials to be used at their discretion in order to guide talks about deeper social-emotional constructs.
Phase 3: DIFFERENT action technology project	Multimedia technology project for small groups where students take direct action (empathy, tolerance, gratitude, etc.) that impacts their schools, families and communities positively based on what they learned in the videos and the discussions.
Phase 4: Student assessment	Students complete an assessment that tracks sentiment change over the course of the curriculum to determine growth and flexibility of mindset. The assessment is a mixture of short answer and a series of paired statements to complete (I used to think ... Now I think...).

MATERIALS AND METHODS

Research Design

To answer our research questions, we conducted action research (Creswell, 2012) to determine the impact that an arthropod-themed SEL + STEM curriculum intervention has on students' attitudes and perceptions not only of arthropods, but also themselves and others.

We predicted that this curriculum would result in positive emotional mindset shifts in students, while also encouraging engagement and interest in arthropods.

The DIFFERENT Curriculum

DIFFERENT: social-emotional learning using arthropods is a curriculum developed in 2019 by entomologists and educators Kristie Reddick and Jessica Honaker. It integrates arthropod biology, empathy, and self-reflection with emotional capacity building and self-management. A service-learning project that encourages students to showcase their creativity and communication skills is also included. DIFFERENT is designed to challenge students' perceptions of themselves, others and the natural world.

The curriculum is designed for grades 4–12 and is matched for each grade to the Next Generation Science Standards (NGSS) (NGSS Lead States, 2013) complete with further science investigations for each matched standard. It is also aligned with the social-emotional principles and objectives outlined by CASEL (Zins and Elias, 2007).

The curriculum consists of four phases (**Table 1**). By placing the initial focus squarely on arthropod survival strategies, these lessons are designed to relieve some of the pressures that students can feel in traditional SEL. Because the DIFFERENT curriculum is integrated with regular science instruction, it creates a space where students have the freedom to wonder about themselves and/or the entomological subjects.

Participants

From December 2019 to January 2020, a pilot study was completed with 100 students and four teachers in four classrooms at an options-based middle school program hosted inside a traditional middle school in a suburb of a city in the Pacific Northwest. Each class had a mix of sixth–eighth graders. The OBMP is open to students across the district through an application process. The school is populated partially through a lottery system.

The demographic makeup of the OBMP is reported with the TMS in which it is hosted. The student body is 40% Hispanic, 39% White, 5% Black/African American, 7% Asian, 1% Native Hawaiian/Pacific Islander, 7% Multiracial, and <0.5% American Indian/Alaskan Native. Fifty-nine percent of students at this school receive free or discounted lunches.

Procedures

During the pilot, four videos from the DIFFERENT curriculum and their corresponding Student Self-Reflection questions were chosen: *Feeling Fear, Misunderstood, What's in a Name, Mistaken Identity*. *Feeling Fear* explains how arthropods respond to negative stimuli when they feel threatened and follows the journey of a high school student who was terrified of bugs and overcame her fear during a week-long trip to the Amazon Rainforest. *Misunderstood* dives into various misconceptions of arthropods and how those mix-ups can be dangerous and unhelpful. *What's in a Name* explores the ways that names tell us how to feel about certain animals and the power of meaning, myth and fact. *Mistaken Identity* explores how mimicry can go far beyond color to help arthropods successfully maneuver through their habitats.

The curriculum developer/entomological facilitator spent one full day in each classroom. All students watched the four videos and answered the Student Self-Reflection questions before moving on to class-sized group discussions about the arthropod content and their individual experiences and feelings. The facilitator then engaged the students with live arthropods, ranging from beetles to tarantulas, and helped to facilitate the group discussion along with each of the four teachers. Students then split into small groups and created short technology projects based on what they learned about arthropods, themselves, and others from DIFFERENT.

Data Collection

Students were asked to complete a 12-item online assessment to determine sentiment change and possible change in behavior of students toward arthropods and people who are/think/look differently from them. The assessment consisted of five open-ended, fill-in-the-blank couplet statements, and seven short answer questions. The couplet questions are based on a style of rapid assessment used to measure change in attitude or thinking in a

TABLE 2 | Code matrix with keywords and example student answers.

Sentiment code and description	Keywords	Example phrases
1-Negative	• Gross • Disgusting • Killing • Biting • Scary • Stupid • Creepy • Startling • Freakish • Viscious (*sic*) • Annoying • Violent • Harmful • Satanic	• "i used to think that they wanted to bite us" • "Gross and disgusting" • "I hate them" • "i used to think they were absolutly (*sic*) terrifying" • "just trying to go against me"
2-Negative neutral	• Weird • Boring • Odd • Strange • Unpredictable • Normal and scary • Unamused • Not important	• "A little bit strange and can be difficult to be around" • "they are kind of weird because they had a different opinion." • "I just did not want to hold them" • "not as scared as I was" • "odd because they were very different than human" • "unpredictable and squirrely"
3-Neutral	• Unknown • Normal • Different • Unusual • Okay • Unexpected • Natural • Fine • Compound or contradictory statements • Fact-based statements	• "strange but I understood it was natural but had noo [*sic*] Idea why" • "just trying to find shade or just trying to find food." • "fairly normal (at least for them)" • "a necessity for the bugs" • "that they have there own way of solving things"
4-Neutral positive	• Compound statements of positive and more neutral to negative • Empathy statements ("trying to get away from us") • Conditional statements ("depending on the bug") • Comfortable	• "have different beliefs than I do and that is ok." • "Not experiencing the same things as me" • "I am fascinated by them and want to learn more about them. Maybe 1 day I'll get the courage to hold one." • "Kinda cool" • "now I know that they want to protect them selves (*sic*)"
5-Positive	• Interesting • Cool • Good • Awesome • Love • Nice • Cute • Want as pet • Fascinated • Proud • Negation of negative words (not scary, not as, etc.)	• "Are interesting and fun to learn about." • "really cool" • "I like them" • "I thought that tarantulas were amazing because I love spiders and I knew that these ones wouldn't hurt me unless I did something that made them feel that they had to protect themselves."

before/after mode called, "I used to think ... Now I think..." (Harvard Graduate School of Education - Project Zero, 2015).

For the purposes of this study, we chose a subset of three open-ended couplet statements for analysis:

1. I used to think arthropod (bug) behaviors were . . . Now I think arthropod (bug) behaviors are. . .
2. Before these lessons, this is how I felt about these animals (picture of a tarantula shown) ... After these lessons, this is how I feel about these animals (picture of same tarantula shown)...
3. I used to feel that people who think differently from me are . . . Now I feel that people who think differently from me are. . .

Data Analysis

Data Cleaning

All students completed the first two questions about arthropod behaviors and the tarantula photo (N = 100). The question about people who think differently had 98 responses, as two of the student responses were unable to be coded because they were incomplete. Student responses were analyzed using two different methods: traditional inductive coding and artificial intelligence (AI) aided analysis.

Manual Qualitative Coding

Using an inductive coding process (Thomas, 2006), data were qualitatively coded into one of five different categories ranging from Negative (1) to Positive (5). Responses were coded based on keywords in individual student responses (**Table 2**).

Inferential Statistical Analysis

Responses were condensed into three broad categories (negative, neutral, and positive). For each couplet tested, a two-dimensional matrix was created to show response frequencies across the three categorical variables (negative, neutral, and positive) for the

before (Harvard Graduate School of Education - Project Zero, 2015) and after (Now I think . . .) couplet statements.

Overall sentiment shift was analyzed using a chi-square statistical test (Dowdy et al., 2004) to identify if observed response frequencies differed from expected frequencies. A chi-square statistic was calculated for three types of sentiment shifts: Negative to Neutral, Negative to Positive, and Neutral to Positive.

Artificial Intelligence-Aided Coding

Our second method of analysis was using a prototype Artificial Intelligence program based on IBM Watson's Tonal Analysis Tool (IBM, 2021), driven by a Natural Language Processing database (Forshaw, 2019). The prototype allowed us to quantify the strength of various tones from each input statement: anger, fear, joy, sadness, analytical, confident, and tentative. By combining this with the before/after model, we measured the change (Δ or delta) in sentiment that students communicated as a result of their participation in the curriculum. Delta is defined between −1.0 and 1.0, where negative indicates a decrease in a particular tone or sentiment, and positive indicates an increase in a particular tone or sentiment.

Though our initial goal was to utilize IBM Watson's AI solutions to code our qualitative data, it quickly became apparent that current tonal analysis methods are neither robust nor flexible enough to deal with the nuances of our dataset.

The AI was able to detect some responses that illustrated positive changes. As an example, a student responded that before the curriculum they felt "scared" about tarantulas, and after the intervention they felt "interested." The tonal analysis returned a Fear of −0.91, where the negative indicates a decrease in the initial sentiment of fear.

Unfortunately, we found numerous anomalies in the quantitative tonal analysis that failed to reflect the actual sentiments of the students. Compound and/or contradictory statements in particular led to counterintuitive results. For example, a student reported that before the curriculum they felt "grossed out and a bit afraid" of tarantulas, and after they felt "less afraid more fasinated (sic)." However, the tonal analysis showed a Fear of −0.1 indicating an increase, rather than a decrease, of fear.

This could be the algorithm not picking up on the compound statement due to a lack of punctuation or the misspelling of the word 'fascinating.' It could also be because the word "more" is next to "afraid" even though the sentiment is very obviously a positive shift from the before statement. There are known racial and cultural biases of coding language with AI as well as an ageist "formal speak" bias that does not lend itself to youth vernacular, tone, and writing/typing styles (Gebru, 2020; Bender et al., 2021). Therefore, at this time, we cannot recommend using this method to determine sentiment change in students.

RESULTS

Response Frequencies

Frequencies of individual before and after responses within each category are shown in **Figure 1**. A frequency decrease in negative sentiment for all three couplet statements is clearly observed. The students' sentiments regarding arthropod behaviors changed from negative or neutral statements to more positive statements. This frequency shift suggests an increase in empathy towards something that some students initially perceived as a threat.

The highest number of negative student responses (N = 70) were recorded in response to how they remembered feeling about the tarantula before the curriculum; however, after the intervention there was a clear increase in positive sentiment. Student perceptions of arthropod behaviors tended to be more negative (N = 37) prior to intervention and skewed toward positive sentiment after.

Chi-Square Analysis

For simplicity, both negative and negative-neutral responses were pooled into a single category (Negative); and positive and positive-neutral responses were pooled into another single category (Positive). Neutral responses were categorized as such.

For the couplet "I used to think arthropod (bug) behaviors were _____, now I think bug behaviors are _____," responses were significantly different before and after exposure to the DIFFERENT curriculum. A greater proportion of students had a positive response for all categories of sentiment change: Negative to Positive: X^2 (1, N = 74) = 78.13, $p > 0.00001$, Negative to Neutral: X^2 (1, N = 88) = 23.1300, $p > 0.00001$; Neutral to Positive: X^2 (1, N = 38) = 17.00, $p > 0.000037$.

For the couplet "Before these lessons, this is how I felt about these animals (picture of a tarantula shown) ... After these lessons, this is how I feel about these animals (picture of same tarantula shown) ...," before and after responses to the DIFFERENT curriculum were significantly different for shifts from Negative to Positive: X^2 (1, N = 91) = 36.89, $p < 0.00001$ and Negative to Neutral: X^2 (1, N = 84) = 6.51, $p > 0.01707$. There was no significant difference in sentiment shift from Neutral to Positive: X^2 (1, N = 25) = 2.76, $p > 0.09686$. This lack of significance is likely because few students initially felt neutral about tarantulas (9 out of 100).

For the couplet "I used to feel that people who think differently from me are . . . Now I feel that people who think differently from me are . . . ", before and after responses were significantly different. A greater proportion of students shifted to a more positive response for two categories of sentiment change: Negative to Positive: X^2 (1, N = 64) = 45.58, $p < 0.00001$ and Negative to Neutral: X^2 (1, N = 74) = 29.50, $p < 0.00001$.

There was no significant difference in sentiment shift from Neutral to Positive: X^2 (1, N = 58) = 3.20, p 0.07369. Student responses were coded as neutral if they used the term "normal" or "different" (**Table 2**). Neutral before statements often parroted the question in their answer by using the word "different". For example, "I used to feel that people who think differently from me are different." If a student thinks it's normal that people are different, then a large shift in sentiment after the curriculum is unlikely.

DISCUSSION

Findings from this study suggest that the DIFFERENT curriculum coupled with in-person facilitation is effective at

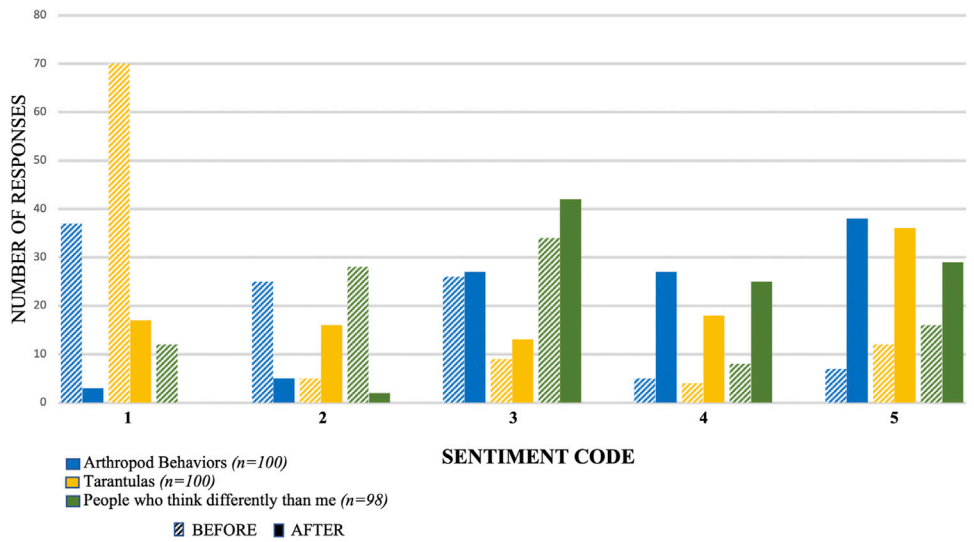

FIGURE 1 | Frequency of student responses for each sentiment category (1–5) for three statements before and after the DIFFERENT curriculum intervention. Response code categories are as follows: Negative, 1; Negative-Neutral, 2; Neutral, 3; Positive-Neutral, 4; Positive, 5.

shifting students' mindsets and beliefs. Our results provide valuable insights into how this curriculum can be used to successfully integrate SEL instruction in a science education context.

Our results are in alignment with previous studies that have acknowledged the role emotion can play in the science education classroom (Pekrun et al., 2002; Goetz et al., 2006; Pekrun and Stephens, 2012; Broughton et al., 2013). Unsurprisingly, we found that some arthropods elicit generally strong negative emotional responses; however, with explicit instructional guidance provided in the curriculum, students' sentiments shifted in a positive direction.

The shift we observed in students' sentiments about arthropods moving from generally negative to neutral or positive is noteworthy because previous studies have shown that fear can negatively impact students' ability to learn (Warr and Downing, 2000; Owens et al., 2012; Bledsoe and Baskin, 2014). On its own, this fact may discourage science teachers from presenting content such as arthropods which elicit a fear response in their students. We argue that those studies did not look at SEL integration with science programming. For the OBMP students who came into the lessons with a negative response, there was already an SEL plan in place to help transition the students from a place of fear to a more positive mindset.

Our results also suggest that arthropods are an effective vehicle for teaching SEL in a science education context. Using arthropods as model organisms in the science classroom is not a new concept (Davis, 2004). Our study advances this idea by suggesting that in much the same way that we use arthropods as a model organism to teach about science concepts such as genetics, we can also use arthropods to embed SEL in the science classroom.

Students' strong emotional responses to arthropods may be the very reason that entomology provides a successful model for integrating SEL with science content. Because of their inherent "otherness," arthropods reliably provoke some sort of emotional response in students. This provides access to feelings that are traditionally held apart or separate from scientific teaching. Though some students express disgust, this does not necessarily mean that they are not also intrigued or interested in learning more about them. It's up to the facilitator to see disgust or fear as a pathway for transforming fear into fascination and engaging in social and emotional skill building.

Traditional SEL makes humans the object of study and can cause students to feel like they are "the bug under the microscope", i.e., that their attitudes, perceptions, and worldviews are being scrutinized when they are asked to think introspectively about themselves. The DIFFERENT curriculum intentionally focuses student attention on arthropods first before exploring humans. By introducing the concept of "otherness" using arthropods, we can then help students reflect on their perceptions or attitudes about otherness in humans. We draw attention to similarities between arthropod and human behaviors to help guide students to see parallels between the arthropod experience and the human experience. Our results suggest that an intentionally integrated SEL approach can not only challenge students' perceptions of arthropods, but that it can also help students in successfully challenging their perceptions of people as well.

While our findings show positive results, we must acknowledge several limitations of our study. One clear limitation was that we were unable to enact the intervention with both the OBMP and TMS populations. In order to facilitate

problem solving, nurture empathy, and improve relations between the two groups of students, both groups would, ideally, be involved in the intervention. Unfortunately, almost immediately after completion of the program with the OBMP, the COVID-19 pandemic necessitated school closures and the researchers were unable to work with the TMS students. Our results indicate that our intervention had an impact on the OBMP students' emotions; however, we do not know if it had real-world implications for resolving conflict between the students in these two schools.

Another challenge for our study is the layered and multifaceted nature of emotions themselves. This led to several limitations in our analysis. First, we were unable to manually code student sentiment beyond negative, neutral, or positive. As entomologists who work in outreach and teaching, we understand that students may communicate disgust, but it is often combined with curiosity or intrigue. Unfortunately, we likely need more powerful tools of analysis to reliably parse these differences and reliably identify seemingly contradictory emotions in student responses.

In addition, while great strides are being made in using AI for tonal analysis and such tools may eventually allow for a more granular analysis of student sentiment, we were unable to leverage the technology in its current form to reliably or accurately code students' responses. When multiple emotions are felt simultaneously, it is understandably challenging to clearly or concisely express these sentiments, especially as a middle school student. We see evidence of this in students' responses showing subtle or nuanced language but also in the particular vernacular and syntax used by middle school students. Perhaps future advances in AI will produce the necessary algorithms to measure not only complex emotions, but also language as it is commonly used by diverse K-12 students.

We understand that many teachers may struggle to find the time and bandwidth to teach an isolated SEL curriculum. The integration of SEL with a required academic subject may ease the burden of attempting to fit new content into an already packed academic schedule. Given the positive results of this study which successfully integrated SEL into a science education context with the DIFFERENT curriculum and in-person facilitation, we recommend the following to teachers who are considering adopting an interdisciplinary approach to SEL instruction.

First, our results highlight the need for a quality curriculum and proper professional development and teacher mentorship when initializing an interdisciplinary approach to SEL. While some teachers come to an interdisciplinary approach to education organically, others may benefit from explicit guidance on how to integrate SEL with science and other subjects along with existing learning targets and standards in order to feel confident in the foundations of this type of pedagogy. In part, this guidance may come in the form of high-quality curricular materials. We echo the recommendation of previous studies that have called for the use of curriculums that include the recommended SAFE elements (Durlak et al., 2010; Durlak et al., 2011).

In addition, professional development including the modeling of techniques for engaging students in SEL content is essential. In this intervention, the facilitator (author Reddick) used a host of techniques that helped to engage students in the science and SEL material. Part of our strategy as entomological educators and teacher trainers is to model the strategy of integrating SEL and STEM with teachers in the classroom. The strategies have been successful for us in classrooms with students and during teacher professional development.

A key part of the intervention enacted for this study involved students experiencing, first-hand, several live arthropod species with an experienced entomological educator. Because we recognize that many teachers may also have emotions about arthropods, we conducted teacher training during the curriculum pilot in order to equip teachers to reflect and process their own emotions about arthropods. While the DIFFERENT curriculum does not explicitly require the presentation of live arthropods, we cannot discount the potential impact that their use may have had on students' emotional responses during this study. For others who would like to integrate SEL into academic disciplines, we recommend being intentional about selecting engagement tools (such as live arthropods) that allow students to feel and reflect on their emotional response and connect relevant disciplinary concepts to deeper self-reflection about self, others, and community.

In the future, we would like to compare how the phrasing of questions affects sentiment and emotional change. During this study, we found that how we phrased questions matters greatly. When we asked students what they think in a before/after set of questions, they often defaulted to "fact-based" thinking, e.g.,: "I used to think that tarantulas didn't have silk and now I think they do." In later tests of the curriculum, we shifted to "I used to feel.../ Now I feel..." statements, which guide student responses away from their tendency toward right/wrong answers and fact-based responses to more values/emotions-based answers.

We were surprised at how readily students shared the answers to their individual reflection questions to Phase 1 of the curriculum. They were excited to build on other students' responses in Phase 2 to find shared experience. The reflection questions served as a strong foundation for the group discussion pieces and gave students the opportunity to approach the experience from different points of view; at the same time, they were open and able to consider new points of view. They were realizing that different points of view/experiences exist and wanting to explore those differences in real time during the class discussions. In the future, we would like to find a way to capture that moment of discovery.

In future studies, we would like to explore the potential for this intervention to impact students' later decisions and behaviors. This may be accomplished by modifying the assessment items slightly from the couplet statement, "I used to feel.../Now I feel...," to a triplet statement which also includes the statement "because of this, I will...". This information along with an analysis of students' DIFFERENT Action Technology Projects from Phase 3 of the curriculum may provide evidence for a link between sentiment change and students' decisions and actions.

CONCLUSION

In this study, we found arthropods to be a useful engagement tool for successfully integrating science content and SEL in order to

build empathy not only for arthropods, but also for people with differing experiences. While this intervention was conducted in a science education context, we feel it is possible to tie SEL into many different academic disciplines. We never stop being people with emotions and individual experiences that make us who we are and influence our behaviors, so asking a student to "leave it at the door" when coming into a class isn't realistic.

While this intervention was conducted in a science education context, we feel it is possible to tie SEL into many different academic disciplines. For those who aren't interested in integrating SEL with science but are interested in other academic areas, we encourage using our experience as inspiration to blend SEL with other academic subjects. In working directly with students, teachers are in a unique position to identify content which engages students' emotions leading to a high level of engagement. This understanding will be essential to the development of future interdisciplinary SEL approaches.

DATA AVAILABILITY STATEMENT

The deidentified raw data supporting the conclusions of this article will be made available by the authors, without undue reservation. The deidentified raw data supporting the conclusions.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the participants' legal guardian/next of kin was not required to participate in this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

JH and KR conceived and designed the study; JH, KR, EI, and GP contributed equally to writing the manuscript; JH and KR collected, cleaned, and analyzed the data.

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Conflict of Interest: Solpugid Productions LLC (DBA The Bug Chicks) is a business owned by KR and JH. Solpugid Productions is the sole owner of the copyright to the DIFFERENT curriculum, which has been commercially available for purchase since 2019. The DIFFERENT curriculum was given to the school district in this study free of charge as part of a workshop series for students paired with a professional development experience for teachers.

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Social and Emotional Learning in Preschool Settings: A Systematic Map of Systematic Reviews

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The preschool years presents an important opportunity to support children's social and emotional development. Social and emotional learning (SEL) programs in early childhood education and care (ECEC) have gained an increased interest due to its potential to improve child health and educational outcomes. We aimed to identify existing systematic reviews on universal, curriculum-based SEL interventions in ECEC settings (children aged 0 to 7 years), assess their risk of bias, synthesize the findings and identify knowledge gaps. We undertook a systematic literature search in seven different databases. Reviews of studies without control groups were excluded. Each abstract and full text article was assessed independently, and disagreements were solved in consensus. Relevant reviews were assessed for bias using the ROBIS tool. Of 4912 records identified through database searches, two systematic reviews met the inclusion criteria. Both reviews were assessed as having a high risk of bias. The results were used to summarize existing knowledge and knowledge gaps. In conclusion, SEL interventions in preschool settings must be considered knowledge gaps. There is a need for more high-quality primary studies and further systematic reviews that adhere to strict scientific methods and address the overwhelming heterogeneity in field, in terms of interventions, settings and outcomes.

Keywords: SEL, preschool, interventions, systematic review, universal

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INTRODUCTION

Over the last decades, a vast amount of research has been accumulated worldwide regarding social and emotional skills development in children. The importance of these skills, sometimes referred to as non-cognitive skills, "soft" skills or character skills, to promote a healthy overall development is emphasized in numerous studies (e.g., Durlak et al., 2011; Jones et al., 2015; Bierman et al., 2016; Domitrovich et al., 2017; Eklund et al., 2018). Weissberg and colleagues (2015, p. 3) expressed a similar position when writing: "The past 20 years have witnessed an explosion of interest in social and emotional learning (SEL). Research reviews have documented the value of SEL programs and

schools, families, and communities are partnering to promote the positive development and academic success of children and youth across the globe."

Early childhood is a pivotal period for the development of social and emotional skills (Jones and Bouffard, 2012; McClelland et al., 2017). Starting at birth, or even during the prenatal period, developmental foundations of social-emotional competence are perhaps foremost laid during the early childhood years (Prado and Dewey, 2014; Spencer et al., 2017). Early experiences strongly influence how young children begin to understand themselves and the world that surrounds them (Yates et al., 2008). To support the development of social and emotional skills during early childhood, internal and external factors have to be taken into account. Internal factors refer to children's characteristics such as temperament or personality. On the other hand, it is vital to provide children with an environment, i.e., family, school, social and cultural contexts, where they feel safe and secure in order to contribute to the social and emotional development (Yates et al., 2008; McClelland et al., 2017).

During the pre-school years, dramatic transformations occur in children's social skills, social reasoning, emotional understanding, emotional regulation, self-awareness, and self-control (Bierman and Motamedi, 2015). Over the past two decades, compelling evidence from longitudinal studies has shown the critical role that early childhood social and emotional skills play in children's school adjustment and academic achievement (e.g., Bierman et al., 2009; Denham et al., 2012; Nakamichi et al., 2021), as well as in other long-term life outcomes such as mental health, substance use, and criminal behavior (e.g., Moffit et al., 2011; Jones et al., 2015). As a response, a considerable growth in research, aiming to inform the development of interventions and policies that facilitate the growth of these skills and maximize children's well-being, has taken place (e.g., Bierman and Motamedi, 2015; Domitrovich et al., 2017; Eklund et al., 2018).

Within the field of socio-emotional skills, practitioners and researchers use different constructs to organize, define, and describe the research area (Berg et al., 2019). Among these constructs, SEL has served as an umbrella for a range of approaches and appears to have the largest and most rigorously evaluated evidence base (Goldberg et al., 2019). SEL is usually described as the process by which children and adults learn to understand and manage emotions, maintain positive relationships, make responsible decisions, set and achieve positive goals, feel and show empathy for others, as well as improve their capacity to solve problems effectively (Weissberg et al., 2015; Cristóvão et al., 2017; O'Conner et al., 2017). However, a multitude of frameworks and terminology related to SEL can be found in the literature, sometimes conflicting as different disciplines may use different terms to define SEL skills (Jones et al., 2019). This has raised several concerns, such as the risk of misinterpreting or over-generalizing outcomes (Jones et al., 2016). In response to this challenge, and with the goal of helping researchers, practitioners, and policymakers make sense of frameworks and related terminology to define and describe SEL skills, the Taxonomy Project developed an online resource (Explore SEL; http://exploresel.gse.harvard.edu), which provides a scientifically grounded system to explore, compare, and connect different SEL frameworks.

Since children spend a large amount of time in formal education settings, including preschools, this can be one of the pivotal settings for implementing SEL and supporting children's development of social and emotional skills (e.g., Jones and Bouffard, 2012; Domitrovich et al., 2017; Mahoney et al., 2020). In fact, previous research indicates that SEL can be incorporated into routine educational practices and do not require outside personnel for their effective delivery (Durlak et al., 2011; Taylor et al., 2017). Therefore, formal education settings and teachers are encouraged to integrate the teaching and reinforcement of SEL skills into their daily interactions and practices with children for creating safe and supportive learning environments and promoting social and emotional skills (e.g., Weissberg et al., 2015; Bierman et al., 2016).

Considering the goal of improving all children's health and development, and while SEL skills are not seen as a core part of the educational system's agenda, several authors have emphasized the benefits of universal SEL interventions (Greenberg et al., 2017; Mahoney et al., 2020). An exclusive focus on children with higher levels of needs could entail risks of fragmentation and marginalization of SEL interventions in educational settings (e.g., Jones and Bouffard, 2012; Domitrovich et al., 2017; Mahoney et al., 2020; Murano et al., 2020). Compelling empirical evidence from research systematic reviews (e.g., Catalano et al., 2004) and meta-analysis (e.g., Durlak et al., 2011; Taylor et al., 2017) has documented the efficacy of high-quality, school-based, universal SEL programs, although most research has been conducted in the United States and with elementary and older grade students (Bierman and Motamedi, 2015; Gershon and Pellitteri, 2018).

In their landmark meta-analysis of quasi-experimental and experimental studies, Durlak and colleagues (2011) included 213 universal SEL programs implemented among kindergarten through high school students (27 outside the United States). They showed that SEL interventions seemed to have a significant positive impact on students' social and emotional skills and attitudes, as well as on behavior adjustment. Moreover, they found that students who participated in SEL programs improved their academic scores significantly, compared to control groups. More recently, Taylor and colleagues (2017), extended the findings of Durlak et al. (2011) by reviewing 82 universal school-based SEL programs (38 outside the United States), delivered within K-12 settings, with the main purpose of analyzing their long-term effects. Follow-up outcomes, collected up to 18 years after intervention, demonstrated significant enhancements in the participant groups on social-emotional skills, but also on academic performance, emotional distress and drug use, compared to controls. However, findings from school-based studies cannot be readily translated to ECEC settings given the key developmental tasks facing our youngest children (e.g., Bierman and Motamedi, 2015; Jones and Doolittle, 2017; Denham, 2018; Mahoney et al., 2020). As mentioned by

Bierman and Motamedi (2015), SEL interventions in preschool settings need special consideration regarding contents, instructional approaches as well as opportunities to practice skills. Denham (2018) also underlines that SEL programs for these ages must involve more play and be less group-oriented than those for older children.

Previous research underlines the importance of early and preschool years for human development (Council for Early Child Development, 2010; Alfonso and DuPaul, 2020), the sensitive period and window of opportunities at this age (Zeanah et al., 2011; OECD, 2017), and the premise of returned investments made in early and preschool years (Naudeau et al., 2011; Shonkoff, 2017; Heckman, 2021a; Heckman, 2021b). Despite the large number of primary studies and several systematic reviews on the effects of SEL interventions on school aged children, there seems to be a lack of conclusive knowledge on the effects of SEL intervention on younger children (i.e., the pre-school years) and just a few have focused exclusively on universal evidence-based programs. Considering the accumulated evidence on the importance of ECEC to incorporate such programs in their curricula and daily practices, our study aims to contribute to the field by mapping what is known about the effects of universal SEL interventions for children under seven years of age in ECEC settings.

This overview aims to: 1) identify existing systematic reviews on universal, curriculum-based SEL interventions in preschool settings, assess their risk of bias, describe their characteristics and 2) synthesize the findings of the reviews with high methodological quality, and 3) identify knowledge gaps in practice relevant questions in the SEL domain.

MATERIALS AND METHODS

Study Design

This is a systematic review of systematic reviews based on quantitative studies published in peer-reviewed journals.

Population, Interventions, Control, Outcomes

The following PICO criteria were used in the literature search:

- Population: children aged 0–7 years.
- Interventions: universal programs with explicit intent to teach SEL skills, conducted in typical ECEC settings, i.e., not in high-risk or special education settings
- Control: experimental or quasi-experimental design
- Outcomes: efficacy and effectiveness of intervention as measured by child outcome data

Search Strategy

The original literature search was made on March 12, 2020, in seven different databases: CINAHL Complete, PsychINFO, PubMed, SocINDEX, ERIC, embase, and Scopus. The electronic search was supplemented using "Snowball methods", screening key references for additional literature. There were no language restrictions, but only English search terms were used. An example of the search strategy is provided in **Supplementary Table 1** in the Supplement.

Data Sources, Studies Sections, and Data Extraction

Abstracts identified in the literature search according to the inclusion criteria were examined independently by two of the authors (DD and BH). Articles were included if at least one author found the abstract potentially relevant, and the full text was studied. The full texts were divided into four equally large groups and examined in relation to the inclusion criteria by the whole author group independently in pairs. Disagreements between coders were resolved through mediation. Reviews which did not meet the inclusion criteria were excluded. Data extraction was performed independently by DD and BH. Diverging results were discussed and resolved.

Data Analysis

The quality of the included reviews was assessed independently by two authors (DD and BH) using the ROBIS tool (Whiting et al., 2016) as an assessment of risk of bias. ROBIS covers four domains to detect bias in systematic reviews relating to: study eligibility criteria; identification and selection of studies; data collection and study appraisal; synthesis and findings. The risk of bias of the systematic reviews was described according to the ROBIS assessment as "high," "low," or "unclear." Here too, disagreement was resolved through discussion between the two reviewers.

RESULTS

As summarized in the flowchart below (**Figure 1**), only two of the 105 publications reviewed in full text were deemed fit in accordance to previously stated inclusion criteria. Most publications had multiple reasons for exclusion (e.g., studies without a control group and interventions without explicit SEL interventions). A fair number of studies didn't meet the population-criteria as they either focused on school-aged children or included both school-aged and younger children. A complete list of the publications reviewed in full text along with their reasons for inclusion and exclusion is detailed in **Supplementary Table 2** in the Supplement.

The two included reviews are presented in **Table 1**. Both reviews conducted a systematic review and meta-analysis regarding SEL-interventions in early childhood care and education. Specifically, Blewitt et al. (2018) defined the target population as children aged 2–6 years in ECEC settings, while Luo et al. (2020) specified that the average child age had to be between 36–60 months at the start of the intervention conducted in a typical preschool setting.

Search Strategy, Selection, Data Extraction and Analysis

The included reviews were similar in objective, scope, procedure, and conclusion. A corrected covered area (CCA) of 25.53% was

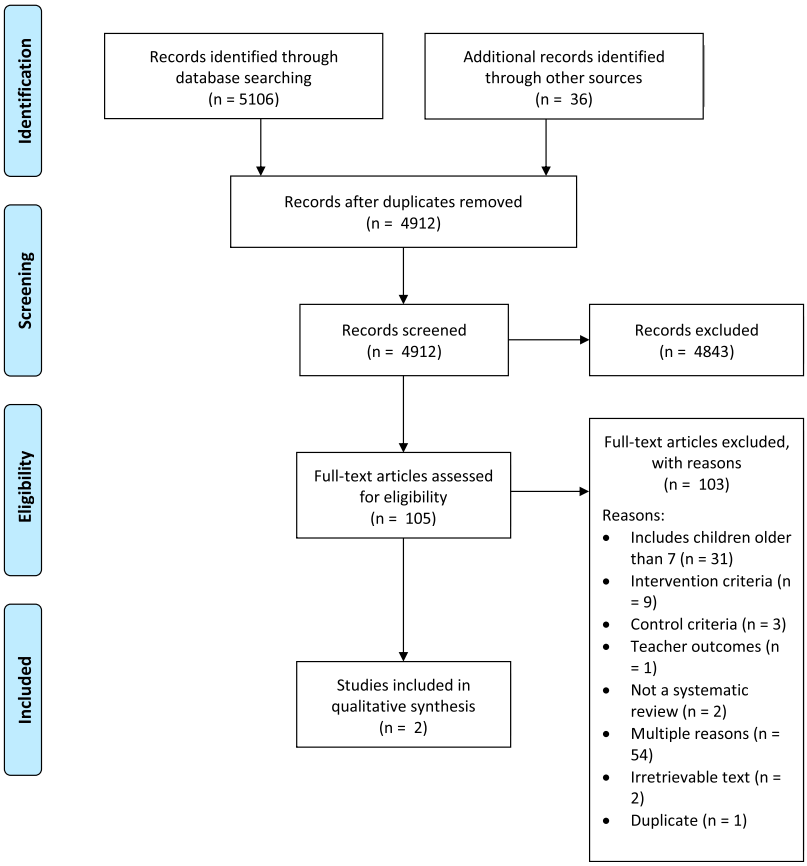

FIGURE 1 | PRISMA flow diagram.

found for the two reviews, which is considered very high (>15) according to guidelines offered by Pieper et al. (2014). A detailed citation matrix is presented in **Table 2**.

However, some differences emerged. Luo et al. (2020) identified and screened more than twice the number of records (n = 30 361) compared to Blewitt et al. (2018) (n = 13 035). The number of full-text articles assessed for eligibility were similar (Blewitt et al., 2018, n = 362 vs. Luo et al., 2020, n = 379) but in the final stage, Blewitt et al. (2018) included approximately twice the number of studies (n = 79) compared to Luo et al. (2020) (n = 39). The differences could be attributed to diverging choices of databases where Blewitt et al. (2018) included a database covering biomedical and health research (MEDLINE Complete), while Luo et al. (2020) chose to search the multidisciplinary Academic Search premier, which does not have a medical focus, and the Education Full Text database, which covers education and related fields of research. In terms of PICO, Blewitt et al. (2018) specified a slightly broader age range for inclusion. Twenty-four of the non-overlapping studies included by Blewitt et al. (2018) included children outside of the age range specified by Luo et al. (2020), 21 of these studies included children above the age range of Luo and colleagues. In addition, Blewitt et al. (2018) included gray literature, which also accounts for some of the non-overlapping articles. The rest of the non-overlapping articles are likely missed or assessed differently by either review in relation to their inclusion criteria.

Both reviews reported interventions primarily from North America. Blewitt et al. (2018) reports approximately 65%, while Luo et al. (2020) reports 72% of studies as being located in North America, respectively. Interventions were most often delivered by teachers, with 67% of studies reported by Blewitt et al. (2018) and 74% of studies reported by Luo et al. (2020), respectively, as containing teacher-directed interventions. Blewitt et al. (2018) reports that interventions typically occurred within the context of classroom activities using developmentally appropriate teaching methods. Luo et al. (2020) reports that 62% of primary studies did not specify the classroom activities in which the intervention was delivered. The rest were either delivered within whole group activities (26%) or embedded within daily activities/routines (15%). Reports regarding other intervention characteristics, such as core components, specific practices, and theoretical underpinnings, varied. Blewitt et al. (2018) summarizes a few common characteristics among included interventions, such as explicit and active instruction, modeling, opportunities for practice and reinforcement. The interventions vary in their application of these practices, underlying mechanisms of change and subsequent targeted skills. Luo et al. (2020) did not report a summary of corresponding intervention characteristics.

TABLE 1 | Study characteristics of included reviews.

Blewitt et al. (2018)	Luo et al. (2020)	Study References
(1) what social, emotional, behavioral, and early learning outcomes have been achieved by universal curriculum- based SEL interventions implemented in ECEC settings? (2) what program-level characteristics are associated with positive outcomes? (3) what are the methodologic limitations of research investigating the outcomes achieved by curriculum-based SEL interventions in ECEC settings?	Research question 1: What were the attributes of study participants and interventions involved in the review? Research question 2: Did classroom-wide social–emotional interventions yield statistically significant and noteworthy mean effects for preschool children's social, emotional, and behavioral outcomes? Research question 3: Did select study or intervention characteristics moderate obtained intervention effects?	Objectives
Years 1995–2017, no language limits, peer-reviewed literature search conducted in ERIC, MEDLINE complete and PsycINFO. Gray literature searched *via* proquest dissertations and theses global database	No filters/limits during electronic search conducted December 2015 (updated January 2018). Search conducted in academic search premier, ERIC, PsycINFO, academic full text	Search information
79 (63 in meta-analysis) 18 292 participants in 79 studies	39 (33 in meta-analysis) 10 646 participants in 39 studies	No. of studies included
Children aged 2–6 years/center-based ECEC setting	Children aged 3–5 years (36–60 months) on average at intervention-start, typical preschool setting	Population
Universal curriculum-based SEL program (ie, included explicit teaching of SEL skills). The primary stated purpose of the SEL program was to increase children's social-emotional skill development	Classroom-wide social–emotional intervention defined as a curriculum, multicomponent intervention, hierarchical intervention, or intervention package/program intended for use with a whole class or groups of children in a class and designed to provide universal supports for improving the social, emotional, and behavioral outcomes of preschool children. No comprehensive/multiple domain curriculum and no secondary/tertiary interventions	Intervention
Experimental or quasi-experimental design (i.e., studies that did not or were not able to randomly allocate participants to intervention and control groups) with a control group	Controlled group experimental design, specifically, a study design comparing the effects of the intervention between one group of participants who received the intervention to another group who did not experience the intervention, regardless of randomization	Control
Each study was assessed against the effective public health practice project quality assessment tool for quantitative studies (Thomas et al., 2004) with respect to selection bias, study design, confounders, blinding, data collection methods, withdrawals, dropouts, intervention integrity, and analyses	Cochrane's risk of bias tool (Higgins and Altman, 2008) with considerations for non-randomized studies (Reeves et al., 2013). Nine domains of risk of bias were examined: Sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, selective outcome reporting, protection against contamination, baseline measurements, and procedural fidelity. Each domain was coded as low (*low risk of bias*), high (*high risk of bias*), or unclear (*unclear risk of bias*)	Risk of bias tool used
Analysis of 1. the mean effect size across all studies and across each outcome category (cohen d). Heterogeneity of effect sizes was assessed using the intraclass correlation (ICC), Q-statistic and I^2 and $\tau 2$ tests. 2. a meta-regression was performed when ICC values were greater than 0.25 to examine the moderation effect of study-level characteristics	Analysis of 1. the mean effect sizes with a correction for small sample bias (Hedges´g). Heterogeneity was estimated using the Q-statistic and I^2. 2. Moderator analyses were conducted using a method analogous to the one-way analysis of variance for categorical variables and meta-regression for continuous variables. Examined the influence of one covariate at a time by conducting a univariate meta- regression analysis analogous to a simple regression for continuous variables	Methods of analysis
Overall d = 0.38 (95% CI = 0.24, 0.51; $p < 0.001$). Social competence d = 0.30 (95% CI = 0.18, 0.42; $p < 0.001$). Emotional competence d = 0.54 (95% CI = 0.22, 0.86; $p < 0.001$). Behavioral and emotional difficulties d = 0.19 (95% CI = 0.11, 0.28; $p < 0.001$). Self-regulation d = 0.28 (95% CI = 0.11, 0.46; $p < 0.001$). Early learning outcomes d = 0.18 (95% CI = 0.02, 0.33; $p = 0.03$)	Social competence g = 0.42 (95% CI = 0.28, 0.56; $p < 0.001$). Emotional competence g = 0.33 (95% CI = 0.10, 0.56; $p = 0.004$). Challenging behavior g = −0.31 (95% CI = −0.43, −0.19; $p < 0.001$)	Outcome
SEL programs administered at a relatively low intensity may be an effective way to increase social competence, emotional competence, behavioral self-regulation, and early learning outcomes and reduce behavioral and emotional difficulties in children aged 2–6 years. The SEL interventions appear to be particularly successful at increasing emotional knowledge, understanding, and regulation	Classroom-wide social–emotional interventions produce positive effects on the social, emotional, and behavioral outcomes of preschool children. Our findings suggest that these universal interventions are more efficacious when parents also are supported to implement universal strategies in the home settings	Conclusion

In Blewitt et al. (2018) only 16% of the primary studies were rated as high quality (44% moderate and 40% poor quality) and much of the downgrading was attributed to lack of blinding. Luo et al. (2020) did not report overall scores for quality assessments but detailed several areas where a substantial number of studies had a high or unclear risk of bias. They reported that no studies had managed to design a study were personnel and participants were blinded to the assigned condition. Most studies did not blind the outcome assessment either. They also assessed most studies as having an unclear risk of bias regarding sequence generation, i.e., the method by which participants were assigned. Furthermore, most primary studies did not report data on procedural fidelity. Additionally, they report that nearly half of the included primary studies were rated as unclear risk for incomplete outcome data (attrition bias) and protection against contamination (performance bias).

TABLE 2 | Overlap of primary studies in included reviews.

First author (year)	Blewitt (2018)	Luo (2020)
Allen (2009)	x	x
Amesty (2009)	x	—
Anliak (2010)	x	—
Anticich (2013)	x	—
Aram (2008)	x	—
Arda (2012)	x	—
Ashdown (2011)	x	—
Barnett (2008)	x	—
Bassett (2008)	x	—
Benitez (2011)	x	x
Bierman (2008)	x	—
Boyle (2008)	x	—
Brigman (1999)	x	—
Brigman (2003)	x	—
Carpenter (2002)	x	—
Conner (2011)	x	x
Deacon (2012)	x	—
Denham (1996)	x	x
Dereli (2009)	x	—
Dereli-Iman (2014)	x	—
Dobrin (2013)	x	—
Domitrovich (2007)	x	x
Dubas (1998)	x	x
Fishbein (2016)	x	—
Flook (2015)	x	x
Garrison (2017)	x	—
Gavazzi (2011)	x	—
Giménez-Dasí (2015)	x	—
Gunter (2012)	x	x
Hall (2008)	x	—
Hamre (2012)	x	x
Han (2005)	x	x
Hughes (2015)	x	x
Izard (2004)	x	x
Izard (2008)	x	x
Jack (2009)	x	—
Jakob (2005)	x	—
Justicia-Arráez (2015)	x	—
King (2001)	x	—
Koglin (2011)	x	—
Landry (2014)	x	—
Larmar (2006)	x	—
Lewis (2012)	x	—
Lonigan (2015)	x	—
Lösel (2006)	x	—
Lynch (2004) (Michigan study)	x	x
McKinney (1998)	x	—
Mishara (2006)	x	—
Moisan (2014)	x	—
Morris (2014)	x	—
O'Connor (2014)	x	—
Opre (2013)	x	—
Ornaghi (2017)	x	—
Ornaghi (2015)	x	—
Ostrov (2015)	x	—
Pahl (2010)	x	x
Petermann (2008)	x	—
Pickens (2009)	x	x
Poehlmann-Tynan (2016)	x	—
Randall (2011)	x	—
Reid (2007)	x	—
Rodker (2013)	x	—
Saltali (2010)	x	—
Sandy (2000)	x	x
Schell (2015)	x	—
Schmitt (2014)	x	—
Schmitt (2017)	x	—
Serna (2000)	x	x
Serna (2003)	x	x
Seyhan (2017)	x	x
Starnes (2017)	x	—
Stefan (2013)	x	x
Stephenson (2009)	x	—
Tominey (2011)	x	—
Ulutaş (2007)	x	—
Upshur (2017)	x	x
Upshur (2013)	x	x
Vestal (2001/2004)	x	x
Webster-Stratton (2008)	x	—
Webster-Stratton (2001)	—	x
Baker-Henningham (2009)	—	x
Feil (2009)	—	x
Feis (1985)	—	x
Finlon (2015)	—	x
Fossum (2017)	—	x
Giménez-Dasí (2017)	—	x
Hemmeter (2016)	—	x
Hutchings (2013)	—	x
Kayılı (2016)	—	x
Lynch (2004) (Virginia study)	—	x
Morris (2013)	—	x
Ostrov (2009)	—	x
Shure (1982)	—	x
Ştefan (2008)	—	x
Corrected covered area (CCA)	25,53%	Very high (>15)

There were separate outcomes for social competence and emotional competence in both reviews. They both also included an overall outcome for externalizing and internalizing problem behavior called "behavioral and emotional difficulties" and "challenging behavior", respectively. Beyond this, Blewitt et al. (2018) calculates effect sizes for early learning outcomes and behavioral self-regulation, which Luo et al. (2020) does not. It is unclear to what degree the two reviews overlap in what measurements comprise the aggregated outcomes, since Blewitt et al. (2018) does not report what subscales are used (in applicable cases). Note that direct comparisons between the effect sizes should be avoided. While both reviews report aggregated standardized mean differences between posttest scores, there are differences in the meta-analytical procedures. Blewitt et al. (2018) calculated effect sizes using Cohen's *d* while Luo et al. (2020) opted for Hedges' *g*. Blewitt et al. (2018) also reports a procedure for factoring in baseline differences. There is also a mention and citation in regard to taking nesting and nonindependence of multiple measures into account, though the exact procedure is not specified. Luo et al. (2020) reports a procedure in choosing one measurement when facing multiple choices in order to adhere to the assumption of statistical independence. Thus, there are differences, both accounted for and unaccounted, in the included primary studies (e.g., different interventions, population and outcomes) and meta-analytical procedures that make direct comparison of outcomes uncertain and likely inaccurate.

Overall Outcome of SEL Interventions

Only one review (Blewitt et al., 2018) reported the overall outcome of program participation. The overall mean effect size for 391 included effects was Cohen d = 0.38 (95% CI, 0.24–0.51; $p < 0.001$).

Outcome in Social Competence

From 34 effects, Luo and colleagues (2020) reported a small to medium mean effect size of the interventions, using Hedges'g, on the social competence of preschool children [g = 0.42 (CI, 0.28–0.56); $p < 0.001$]. Blewitt and colleagues reported a similar mean (based on 115 effects) effect size in the social competence category [Cohen d = 0.30 (CI, 0.18–0.42); $p < 0.001$].

Outcome in Emotional Competence

A medium to large mean effect size [Cohens d = 0.54 (CI, 0.22–0.86); $p < 0.001$] was seen in Blewitt et al. (2018) on measures of emotional competence (based on 54 effects). Luo et al. (2020) found a somewhat lower mean effects size (14 comparisons) on emotional competence [g = 0.33 (CI, 0.10–0.56); $p = 0.004$].

Other Outcomes

In the review by Luo and colleagues (2020) there was a significant reduction of what they named "challenging behavior" [g = −0.31 (CI, −0.43–0.19); $p < 0.001$] based on 28 comparisons. Blewitt and colleagues (2018) reported small but significant effects in a domain (170 effects) called "behavioral and emotional difficulties" [d = 0.19 (CI, 0.11–0.28); $p < 0.001$] and a similar mean effect size (based on 16 effects) in an area called "self-regulation" [d = 0.28 (CI, 0.11–0.46); $p < 0.001$]. Finally, Blewitt and colleagues (2018) also reported an outcome called "early learning outcome" where 36 comparisons had a mean effect size of 0.18 (CI, 0.02–0.33); $p = 0.03$).

Risk of Bias

Using ROBIS, we found no systematic review with a low risk of bias. The two included systematic reviews were both judged to have high risk of bias. Both reviews used predefined protocols and we found few risks related to their specification of study eligibility criteria. The selection process and collection of data were less transparent and thorough in Blewitt and colleagues (2018) compared to Luo et al. (2020), which entails a risk of bias. Concerning the methods used to synthesize results, both reviews had a high risk of bias. Major risks were found in both reviews concerning the synthesizing of results. There is a lack of analysis and inference of how attrition might affect the results and despite considerable issues with high between-study variation (heterogeneity) in the primary studies and problems with robustness this is not included in the overall conclusion of the reviews. A more detailed outlining of the ROBIS-assessment is provided in **Supplementary Table 3** in the Supplement.

DISCUSSION

The purpose of this mapping survey was to identify, assess and synthesize existing systematic reviews on universal pre-school interventions for increasing the social and emotional skills of children aged seven or younger. We also aimed to identify knowledge gaps in the SEL area relevant for ECEC practice. After screening nearly 5,000 records, only two reviews were found eligible for inclusion. Together, these reviews analyzed the findings from more than 90 primary studies, the vast majority studying at least one unique intervention.

Among the records initially screened for inclusion many were excluded due to the age criteria. SEL interventions in schools are well studied. However, generalizing effects from school to ECEC could be problematic due to developmental and organizational differences between the two contexts, which call for unique or adapted pre-school SEL-interventions. The relative scarcity of well-designed studies on SEL in preschool settings is somewhat surprising. Schools prioritize learning outcomes (e.g., literacy) and might face more difficulties in scheduling and implementing SEL-interventions within the academic curricula, compared to ECEC contexts where a balance between activities focusing on play, pre-academic skills and self-regulation could be appropriate (Slot et al., 2016). While curricula and organizational goals may vary among preschools (OECD, 2017), there are no obvious reasons why preschools should not be able to implement, and study, early and wide-reaching prevention-programming through high-quality SEL. Though it is beyond the scope of this review to analyze the reasons behind this lack of research, future studies should for example explore the importance of intervention design, meeting the needs of the broad range of developmental levels present in preschool children, in relation to other obstacles to implementation and growth of an evidence-based practice in this area. While some childhood interventions have demonstrated long-term effects, despite being provided in a limited timeframe (e.g., Bierman et al., 2020), the potential of a continuous prevention, throughout all stages of childhood, is depending on this challenge.

The two included systematic reviews were largely similar in their research questions and how they sought to answer them. There were, however, a few noteworthy differences. Most prominently, the number of included primary studies in each review differed considerably. Most of these non-overlapping studies could possibly be attributed to Blewitt et al. (2018) including a broader age range and gray literature as opposed to Luo et al. (2020). In addition, Blewitt et al. (2018) also searched a more medicine-oriented database which could potentially yield more relevant intervention studies. On the other hand, Luo et al. (2020) had a considerably greater initial yield following their search strategy. Considering the similarities in PICOs between the two reviews, the reasons for many non-overlapping studies remain unaccounted for, possibly attributable to differences on a more detailed level regarding search strategy, review process and inclusion criteria (Hennessy and Johnson, 2020). While the CCA is at a very high level, sharing more than a quarter of the primary studies, the reviews are similar enough and conducted in such close temporal proximity, that there is reason to wonder why the overlap wasn't on an even higher level.

This discrepancy illustrates a potentially larger issue, reflected in the risk of bias assessment. Both reviews were judged to have an overall high risk of bias. This is partly due to the broad and

somewhat ill-defined nature of the field itself where there is a lack of agreement of what defines social and emotional learning, i.e., what interventions and outcomes comprise the construct of SEL. This is likely to impact any attempt to identify and synthesize primary studies regarding SEL, e.g., the formulation of search criteria, the assessment of eligibility and the categorization of outcomes. Though both reviews reported which measurement scales were included in which aggregated outcome, the outcomes themselves lacked pre-defined specificity. For example, Blewitt et al. (2018) used an outcome called "Behavioral and emotional difficulties", and Luo et al. (2020) constructed an outcome called "Challenging behavior". Both these constructs combined various scales measuring both internalizing and externalizing problem behavior. Incompatibilities such as these induces additional risks of bias. The choice of appropriate and meaningful outcomes when studying SEL-interventions is another related issue which also remains subject to interpretation. For example, only Blewitt et al. (2018) included behavioral self-regulation as an aggregated outcome. While there could be several reasons behind this disparity, conceptual clarity could further any prospective attempts to synthesize SEL-interventions and their effects. This echoes previous calls for increased precision in defining SEL-constructs in research (e.g., Jones et al., 2016).

The included reviews also carried some individual strengths and weaknesses regarding risks of bias. While Luo et al. (2020) utilized multiple independent assessors for assessing eligibility, conducting data extraction, and assessing risk of bias, Blewitt et al. (2018) did not utilize this strategy consistently. While not always a notable risk, human error and different interpretations are still possible and remain important in as broad a field as SEL. Multiple independent assessors with methods for resolving discrepancies is one way of potentially reducing the inherent risks, though it carries the drawback of increased costs. Additionally, there were some differences in how the reviews detailed the inclusion criteria. Luo et al. (2020) reported examples and non-examples of interventions in relation to universal supports and at-risk children, in addition to specifying and constraining the setting to typical preschools. Blewitt et al. (2018) did not provide a similarly detailed description of their inclusion criteria. This is important since the level of needs of the participants and the type of educational setting where the intervention is delivered, have a potentially large influence on the effect sizes.

In addition to the considerable heterogeneity regarding interventions and outcomes, the risk of bias in primary studies is also an outstanding issue when synthesizing studies about SEL. While Luo et al. (2020) assessed the risk of bias in several domains for the included studies, these results were not utilized further in the synthesis. This could induce risk in several ways. An expanded analysis (e.g., sensitivity analysis or moderator analysis) and discussion regarding risk of bias in primary studies could potentially lead to different conclusions. For instance, Luo et al. (2020) rated the majority of primary studies as unclear risk regarding baseline measurements in the allocation process (i.e., unclear whether the groups are comparable or not), meaning that it is unclear to what degree intervention effects could be attributable to inherent group differences. Blewitt et al. (2018) on the other hand, utilized their risk of bias assessment as a moderator. While this analysis wasn't statistically significant in the final model, the low proportion of high-quality studies still needs to be discussed. Otherwise, there is a risk of overemphasizing non-significance when there is a chance that different ratings, models of meta-regression or sensitivity analyses could show different results. Overall, the issue could stand to be discussed further, seeing as it could affect several aspects of the synthesis beyond the final aggregated outcomes. Another issue in the synthesis was taking differences in baseline measurements into account. Blewitt et al. (2018) reports taking baseline differences into account, but Luo et al. (2020) only reports calculating effect sizes using the standardized mean difference between posttests. Significant baseline differences between the groups that are not considered could potentially affect the final calculations of effect sizes. In sum, considerable heterogeneity in study design, interventions, outcomes, risk of bias, effect sizes are reasons to look at alternative methods of quantitative synthesis, or even refraining from it altogether (Achana et al., 2014).

Looking at the included reviews, some additional common themes emerged. Most of the primary studies and subsequent interventions were located in North America, primarily the US. This raises questions concerning the generalizability of effects of SEL-programs when transferred to other geographical and cultural contexts. Future research should investigate, more thoroughly, how translation and adaptation of programs effects the outcomes. Both reviews also emphasized that in most included primary studies, the teacher was the designated intervention agent. This supports previous statements (Durlak et al., 2011; Taylor et al., 2017) that it is possible to integrate SEL-programming into educational curricula, with teachers playing a key role in its delivery. Regarding the interventions themselves, neither of the reviews presented clear descriptions of the contents of the activities, their theoretical underpinnings and which components of the intervention were responsible for the effect. If future primary studies used standardized protocols to support these analyses, it would be of major help to the scientific field of SEL.

A final remark is that Blewitt et al. (2018) and Luo et al. (2020) both reported positive results for all measured outcomes in favor of universal SEL-interventions in preschool. However, the high risks of bias found in both reviews would call upon a much more tentative interpretation of the effects of universal SEL-interventions in preschool.

Summary of Main Findings

The main finding of this study is that very few systematic reviews has been published with a focus on the effects of universal SEL interventions on the social and emotional competence of young children in ECEC settings. The two identified reviews and their primary studies suffer from a number of scientific weaknesses and risks of bias leading us to the conclusion that the area must be considered a knowledge gap.

Key Topics

- The two included reviews had similar objectives and PICOs, with their searches conducted in close temporal proximity.

This a likely explanation for the very high overlap in primary studies, still the reasons for a notable amount of the nonoverlapping primary studies remain unaccounted for.
- Most of the primary studies and interventions were conducted in North America. Teachers were most often the intervention agent. No clear themes emerged regarding what activities the interventions consisted of and what theoretical underpinnings they were based on.
- Both reviews were assessed to carry a high risk of bias. Most prominently due to their synthesis of heterogenous primary studies, with a considerable variation in areas such as: interventions, outcomes, study design, risk of bias, and effect sizes. In addition, synthesis is likely also made difficult due to the broad and abstract terms used to describe and operationalize SEL.
- Future research in the field of SEL may opt for greater precision and clarity in choosing and operationalizing constructs. Systematic reviews need to consider various forms of heterogeneity in synthesizing primary studies. There is a need for more high-quality primary studies.

Limitations

While measures were taken to formulate a PICO that was specific, but still congruent with the broad nature of the field, problems were still evident in assessing the eligibility of studies. In large, the issues mentioned previously regarding specificity and precision in SEL-related constructs apply here as well. We used generous search terms to minimize the risk of excluding important studies but there is still a risk that potentially interesting reviews have not been identified.

A potential limitation is the use of ROBIS as a tool for assessing the risk of bias in included systematic reviews. ROBIS offers a comprehensive, thorough, and structured way of assessing risk of bias, but while its application has been studied in the field of public health and biomedicine (e.g., Gates et al., 2018), studies regarding its applicability in social sciences remains limited.

Conclusion and Future Directions

We have described a knowledge gap in the area of universal SEL-interventions in preschool settings. Researchers conducting primary studies and systematic reviews in this area are advised to increase precision in constructs and reduce the risk of bias to facilitate reliable conclusions. There is still a lack of well-designed, high-quality primary studies evaluating SEL-interventions for our youngest children. Future studies looking to aggregate outcomes through meta-analytic procedures could look at different options of reducing heterogeneity. One way is to streamline the PICO to look at more precise and possibly compartmentalized aspects of SEL, both in terms of interventions and outcomes. Continued research in SEL would be much facilitated by more precise constructs. The Taxonomy project (Explore SEL; http://exploresel.gse.harvard.edu), mentioned previously, is an example of a promising attempt to promote precision in SEL.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

AUTHOR CONTRIBUTIONS

DD, NK, AD, AM, CP, VC, MA, EK, FM, and BH assessed the relevance of full text articles, analyzed and interpreted the results, and participated in writing the manuscript. DD and BH designed the PICO and research questions, assessed the relevance of abstracts, conducted quality assessments with ROBIS and extracted data.

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SUPPLEMENTARY MATERIAL

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To Score or Not to Score? A Simulation Study on the Performance of Test Scores, Plausible Values, and SEM, in Regression With Socio-Emotional Skill or Personality Scales as Predictors

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This article addresses a fundamental question in the study of socio-emotional skills, personality traits, and related constructs: "To score or not to score?" When researchers use test scores or scale scores (i.e., fallible point estimates of a skill or trait) as predictors in multiple regression, measurement error in these scores tends to attenuate regression coefficients for the skill and inflate those of the covariates. Unlike for cognitive assessments, it is not fully established how severe this bias can be in socio-emotional skill assessments, that is, how well test scores recover the true regression coefficients — compared with methods designed to account for measurement error: structural equation modeling (SEM) and plausible values (PV). The different types of scores considered in this study are standardized mean scores (SMS), regression factor scores (RFS), empirical Bayes modal (EBM) score, weighted maximum likelihood estimates (WLE), and expected a posteriori (EAP) estimates. We present a simulation study in which we compared these approaches under conditions typical of socio-emotional skill and personality assessments. We examined the performance of five types of test scores, PV, and SEM with regard to two outcomes: (1) percent bias in regression coefficient of the skill in predicting an outcome; and (2) percent bias in the regression coefficient of a covariate. We varied the number of items, factor loadings/item discriminations, sample size, and relative strength of the relationship of the skill with the outcome. Results revealed that whereas different types of test scores were highly correlated with each other, the ensuing bias in regression coefficients varied considerably. The magnitude of bias was highest for WLE with short scales of low reliability. Bias when using SMS or WLE test scores was sometimes large enough to lead to erroneous research conclusions with potentially adverse implications for policy and practice (up to 55% for the regression coefficient of the skill and 20% for that of the covariate). EAP, EBM, and RFS performed better, producing only small bias

in some conditions. Additional analyses showed that the performance of test scores also depended on whether standardized or unstandardized scores were used. Only PV and SEM performed well in all scenarios and emerged as the clearly superior options. We recommend that researchers use SEM, and preferably PV, in studies on the (incremental) predictive power of socio-emotional skills.

Keywords: socio-emotional skills, non-cognitive skills, large-scale assessments, plausible values, simulation study, scoring, personality assessments

1. INTRODUCTION

Assessing socio-emotional skills (also known as "non-cognitive skills," "twenty-first century skills." "character strengths," or "soft skills")[1] is becoming increasingly common in large-scale assessment surveys (LSAS) and beyond (Abrahams et al., 2019; Lechner et al., 2019). For example, the OECD has recently devoted an entire study on this issue—the Study on Social and Emotional Skills (SSES; e.g., Kankaraš and Suarez-Alvarez, 2019). Most LSAS now contain selected socio-emotional skills, personality traits, and related constructs in addition to *cognitive* skills, which traditionally have been the focus of LSAS. This surge in research interest is accompanied by a growing interest in socio-emotional skills from policymakers and practitioners and is further fueled by findings suggesting that socio-emotional skills are increasingly in demand in the labor market (Deming, 2017; Allen et al., 2020).

Pertinent studies often examine socio-emotional skills as *predictors* of outcomes such as school achievement, career success, participation in further education, or health (e.g., Roberts et al., 2007; Lechner et al., 2017; Rammstedt et al., 2017; Laible et al., 2020). Moreover, akin to many other research areas (Aiken and West, 1991; Westfall and Yarkoni, 2016; Sengewald et al., 2018), it is routinely of importance to examine whether socio-emotional skills incrementally predict an outcome above and beyond covariates such as cognitive skills, socioeconomic status, or other established predictors of that outcome (e.g., Roberts et al., 2007; Rammstedt et al., 2017; Bergner, 2020; Harzer, 2020; Wagner et al., 2020). That is, such studies are intent on demonstrating the (incremental) predictive validity of socio-emotional skills for consequential life outcomes, which is then taken as evidence for the relevance of socio-emotional skills.

A problem shared by studies on the (incremental) predictive validity of socio-emotional skills is that the skills and traits in question are unobserved (latent) variables that can only be measured indirectly through a set of observed indicators[2]. As a result, the true skill of each individual test taker is, by definition, unknown. Any individual point estimates of that skill—conventionally known as "test scores" or "scale scores"—are but estimates and invariably contain measurement error (see Lechner et al., 2021, for an overview). The most common (though not the only possible) consequence of measurement error is that the regression coefficient of that skill will be attenuated (i.e., biased downward; Fuller, 2006)[3]. Conversely, regression coefficients for covariates are typically overestimated (i.e., biased upward) if measurement error in the skill is unaccounted for (see Westfall and Yarkoni, 2016). Measurement error in the skill estimates can also bias the regression coefficient of the covariates such that the attenuation bias increases as the reliability of the skill decreases (Aiken and West, 1991; Sengewald et al., 2018). The biases in regression coefficients from using fallible test scores can be large enough to lead researchers to erroneous conclusions regarding the predictive power of the skill or its incremental predictive power over a covariate.

Although these problems are generally recognized (at least among methodologists), it is not fully clear just how serious and consequential such bias in regression coefficients from using fallilble test scores may be in studies on the predictive power of socio-emotional skills. In turn, it is not fully clear whether using one of the two theoretically superior options that account for measurement error and eliminate attenuation bias—structural equation modeling (SEM) and plausible values (PV)—are worth the extra effort. Relatively little is known about the performance of different types of test scores, SEM, and PV specifically in relation to socio-emotional skill or personality assessments. This is because most psychometric research has taken place in the context of cognitive assessments that differ in several important regards from socio-emotional skill assessments.

[1]These umbrella terms are used rather loosely in literature, and the distinction between socio-emotional skills and personality traits is not always clear-cut. Increasingly, the Big Five domains are emerging as the dominant framework for organizing socio-emotional skill domains and for locating both new and existing scales in an established construct space. In the following, we will mostly use the term "socio-emotional skills" for simplicity yet we note that our study applies equally to personality traits and related constructs assessed through rating scales. and related constructs such as personality traits and motivation.

[2]Although conceiving of skills and traits as reflective latent variables in order to control for measurement error is common practice in psychology and neighboring disciplines, it is important to note that this practice is not without its pitfalls (e.g., Rhemthulla et al., 2020). Moreover, please note that using latent variables is not the only option for including skills or traits as predictors in regression. Researchers may also consider methods that use all single test items as predictors, such as LASSO regression or multilevel models with partial pooling (e.g., Gelman et al., 2012).

[3]The same applies to the zero-order correlation between the skill and the outcome. By contrast, the unstandardized regression coefficient (though not the standardized regression coefficient) is unbiased when the skill is an outcome instead of a predictor, even if the skill contains measurement error (Hyslop and Imbens, 2001).

In this study, we present a comprehensive simulation study in which we compare the performance of five different types of test scores, SEM, and PV in scenarios where the focus is on the predictive power of socio-emotional skills in a regression. We designed our simulation study to closely mimic the properties of real socio-emotional skill assessments. In the following, we briefly explain the three main approaches to analyzing skill measures and review prior simulations comparing their performance. We then present our own simulation study and draw on its results to derive recommendations for researchers involved in the study of socio-emotional skills.

2. THREE APPROACHES TO ANALYZING DATA FROM SKILL ASSESSMENTS

There are three principal options for analyzing data from multi-item scales[4] designed to measure socio-emotional skills and related constructs: Computing test scores (or using pre-computed test scores) and incorporating these test scores in analyses—in the same way as any other observed variable is incorporated; using SEM to model the relationship among the skill and its outcomes or predictors; and incorporating the skill in the form of plausible values (PV) in the regression. As shown in **Table 1**, these three options differ fundamentally with regard to accounting for measurement error in the skill (*fallibility*); their ease of use (*usability*); and the extent to which analysis results can change depending on factors such as the variables included in the analysis, the subsample used, or the estimator chosen (*immutability*). Next, we briefly review these approaches. For a more in-depth treatment, we refer the reader to Lechner et al. (2021).

2.1. Test Scores

Test scores (or, equivalently, scale scores) are familiar to researchers working with multi-item tests or scales. There are many different types of test scores that range from simple sum or mean scores—by far the most frequently used type of score—to more complex Bayesian scoring techniques. Test scores are what would be reported back to individual test-takers in assessments that serve practical purposes (e.g., selection or placement). By contrast, in research, the interest is usually not in individual test-takers but in population quantities such as the mean and variance of the skill or the skill's relation to an outcome (Braun and von Davier, 2017). In this regard, all types of test scores share one important limitation that is often overlooked and that renders them a sub-optimal choice for research into skills: Test scores are only *estimates* of an individual's true score; as such, they are fallible (i.e., contain measurement error). This applies to both simple and more complex scoring techniques.

[4]The first step in analyzing such multi-item skill scales almost always consists of fitting a latent measurement model, such as a confirmatory factor analysis (CFA) or graded response model (GRM). For simplicity, we assume throughout this article that this measurement model is unidimensional and correctly specified. Further, we also do not consider complications introduced by missing data that stems from respondents not completing or refusing to answer some test items.

The error variance that tarnishes test scores is likely to lead to attenuation bias when using them as predictors in multiple regression (Fuller, 2006; Schofield, 2015; Braun and von Davier, 2017; Lechner et al., 2021)—a scenario that is ubiquitous in current studies (e.g., Roberts et al., 2007; Bergner, 2020; Harzer, 2020; Wagner et al., 2020). Moreover, it may lead to false positive or false negative conclusions about incremental validity (e.g., Westfall and Yarkoni, 2016; Sengewald et al., 2018). When measurement error in a variable is unaccounted for, the regression coefficients for another variable can be inflated compared with their true population values. Depending on whether the variable is the focal predictor (i.e., a variable whose incremental validity over another is in question) or the covariate (i.e., a variable against which the incremental validity of the focal predictor is being tested), this can lead to false positive or false negative conclusions about incremental validity. Simulation studies have demonstrated that even small amounts of measurement error in the predictor variables can have deleterious effect on parameter estimates, leading to incorrect incremental validity claims (e.g., Westfall and Yarkoni, 2016; Sengewald et al., 2018). Despite this important drawback, test scores are the most widely used method of analyzing data from multi-item tests or scales (for additional drawbacks, see von Davier, 2010; Beauducel and Leue, 2013; McNeish and Wolf, 2020).

2.2. Structural Equation Modeling (SEM)

SEM is the traditional solution for the problem of measurement error. Instead of computing fallible point estimates of ability from a measurement model, SEM combines a measurement model—typically a classical test theory (CTT) model such as the tau-congeneric model—with a structural model. The measurement model represents the skill as a latent variable that is free from measurement error, and the structural model relates this error-free latent variable to predictors, outcomes, or covariates through regression or correlation paths. This is diagrammatically represented in **Figure 1**. Notably, respondents' test scores do not appear anywhere in SEM, which can in theory be estimated based on a variance—covariance matrix alone. Hybrid approaches that combine an item response theory (IRT) type measurement model with SEM and mixed effects structural equations (MESE) models have been proposed (Lu et al., 2005; Junker and Schofield, 2012) to allow conditioning the latent variable on covariates in the structural model to reflect extraneous influences on the latent skill. Moreover, item factor analysis (IFA) models, a hybrid approach that uses weighted least squares (WLS) estimator are gaining in popularity (Wirth and Edwards, 2007).

The use of SEM for socio-emotional skills and similar constructs has been propagated in educational and psychological research, especially for the purpose of testing (incremental) predictive power (Westfall and Yarkoni, 2016; Sengewald et al., 2018). Even so, SEM is far from universally used, and researchers outside these fields are typically unfamiliar with this methodology. Moreover, as noted in **Table 1**, accurate implementation of SEM requires specialized software and psychometric expertise which further limits its usability.

TABLE 1 | Evaluation of three main approaches to analyzing skill data.

Method	Variants	Fallibility	Usability	Immutability
Test Scores	▪ Sum scores (weighted, unweighted) ▪ CTT factor scores (Bartlett, Regression) ▪ IRT ability estimates (WLE, MLE, EAP, and MAP)	▪ ME not (fully) controlled (–) ▪ Biased standard errors of the latent variable in regressions (–) ▪ Biased variance estimates (e.g., underestimation for EAP, overestimation for WLE) (–) ▪ Factor score indeterminacy (–)	▪ Sum scores: Very easy to compute (+) ▪ Computation requires knowledge of psychometric models but is fairly easy (+) ▪ Very easy to use in analysis (+)	▪ Sum scores: Immutable across sub-samples, analyses, and analysts (+) ▪ Factor scores/ability estimates: Immutable if estimates are included with LSAS data (+) ▪ Factor scores/ability estimates: Not immutable if estimates are user generated (–)
Structural Equation Modeling (SEM)	▪ Regular SEM ▪ IRT-SEM ▪ MESE	▪ ME controlled (+) ▪ Unbiased estimates of correlations, means etc. of the latent variable (+) ▪ Measurement model sensitive to model (mis-) specification (–)	▪ Requires specialized statistical software (–) ▪ Requires additional psychometric expertise (–)	▪ Immutable with fixed measurement model parameters (+) ▪ Not immutable with free measurement model parameters across sub-samples, analyses, and analysts (–)
Plausible Values (PV)		▪ ME controlled (+) ▪ Approximately unbiased estimates of correlations, means etc. of the latent variable (+)	▪ User-generated PV require statistical and programming and expertise (–) ▪ Using PV in secondary analysis requires basic knowledge of multiple imputation methodology (–)	▪ Immutable if PV are included with LSAS data (+) ▪ Not immutable if PV are user generated (–)

Note: ME, measurement error.

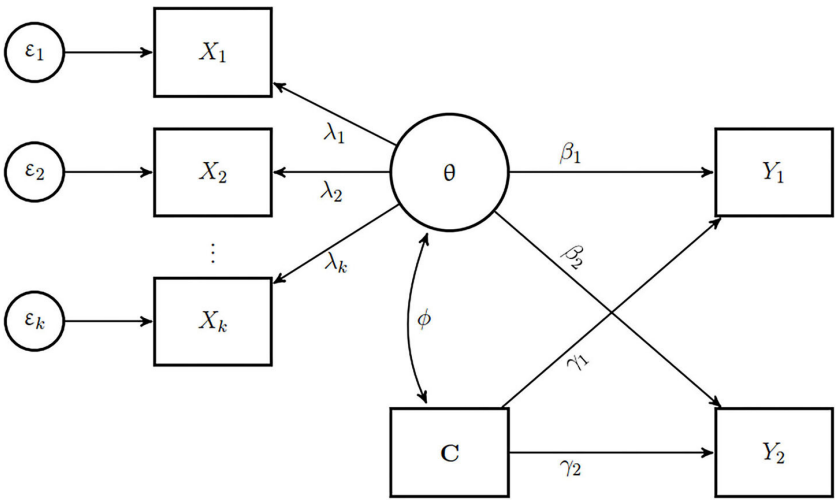

FIGURE 1 | Example of a model used for generating data for the simulation study. The latent skill θ is measured by k manifest items $X_1, \ldots, X_k$. The different factor loadings $\lambda_1, \ldots, \lambda_k$ and measurement error terms $\varepsilon_1, \ldots, \varepsilon_k$ reflect different degrees to which each item reflects the latent ability. C is a covariate that has a correlation of ϕ with the skill. Both θ and C are predictors of two outcomes Y_1 and Y_2. β_1 and β_2 are regression coefficients of θ and γ_1 and γ_2 are the regression coefficients of C for Y_1 and Y_2 respectively.

2.3. Plausible Values (PV)

Originally developed in the context of cognitive assessments (Mislevy, 1991), PV methodology takes a fundamentally different approach. The basic idea is to treat the latent skill variable as what it inherently is: a missing data problem. Instead of estimating a single test score per respondent, multiple imputations of respondents' unobserved true ability are generated based on a measurement model, the response pattern, and often a set of additional variables that predict the latent skill θ. The possibility to incorporate information from a range of "background" or "conditioning" variables in estimating the PV makes this methodology particularly well-suited for LSAS that use incomplete block designs (also called "planned missingness designs") in which respondents answer only a subset of the test items for the skill. A set of PV (typically, 5 or 10 per respondent) are then generated by drawing from the posterior distribution of the skills. These PV must not be confused with test scores or the latent variable-they are "best guesses" about the individual's true skill based on a model and are not the skill itself. The variation across the different PV adequately reflects the uncertainty about the respondent's true ability (Braun and von Davier, 2017). The resulting PV are incorporated in the analysis using standard multiple imputation methodology (see Little and Rubin, 2002; Enders, 2010). In this way, PV methodology provides unbiased estimates of population means and variance of the skill, as well as of regression coefficient when the skill is a predictor (Wu, 2005; Braun and von Davier, 2017)[5]. For introductions to PV methodology, see Wu (2005), von Davier et al. (2009), Braun and von Davier (2017), and Lechner et al. (2021). We provide further computational details about PV in the section 5.

PV are ideally suited for LSAS, where the interest is in population quantities (e.g., mean-level differences of the skill across gender), not in individual test-takers. PV are increasingly becoming standard in cognitive LSAS (Braun and von Davier, 2017; Laukaityte and Wiberg, 2018). However, they are seldom used for analyzing personality or socio-emotional skills data, likely because researchers are unaware of the problems of test/scale scores and because both generating and working with PV requires expertise in IRT and missing data analysis.

3. WHAT DO WE KNOW ABOUT THE PERFORMANCE OF THE THREE APPROACHES IN STUDIES ON SOCIO-EMOTIONAL SKILLS?

Methodological research on the three methods for analyzing skill scales has almost entirely been motivated by, and taken place in the context of, *cognitive skill* assessments such as TIMMS, PISA, NAEP (Mislevy et al., 1992). However, socio-emotional skill assessments differ in three main ways from traditional cognitive assessments (outlined below). Previous simulation studies have rarely investigated scenarios that are typical of socio-emotional skill assessments (refer **Table 2**). Moreover, they have mostly focused on only one or two specific approaches (e.g., PV vs. WLE) but have not provided comprehensive

[5]A potential downside of PV is that standard errors increase compared to test scores because of the additional uncertainty introduced by the imputation. However, with large sample sizes and a large number of PV, this is unlikely to be a major problem. In our view, unbiasedness is arguably more important than precision in the present context.

TABLE 2 | A brief summary of simulation study articles comparing different approaches to analyzing skills data in the context of cognitive assessments.

Article	Methods compared	Number of items	Conditions	Sample size	Replications
Wu (2005)	WLE, MLE, EAP, PV (1, 2, 3, 4, 5)	3, 20	Varying item difficulty, item descrimination, and ability	2,000	100
Lu et al. (2005)	IRT-SEM, EAP, Standardized NR Scores	10, 20, 30	Varying coefficients of determination in measurement models	300, 500, 800, 2,000	1,000
Monseur and Adams (2009)	MLE, Corrected MLE, WLE, EAP, EAP with conditioning, PV (1, 5), single estimate of PV	3, 5, 20, 50, 100	Varying item difficulty and item descrimination	2,000	Chosen so SE = 0.005
von Davier et al. (2009)	PV (5), Average of all PV, EAP, WLE	8, 16, 24	2 background variables	4,000	Not reported
Estabrook and Neale (2013)	approx. factor score, Bartlett score, Full ML, Unweighted ML	3, 5, 10, 20	Varying factor loadings, missing data conditions	100, 200, 500	10
Aßmann et al. (2014)	EAP and PV	10	Varying item difficulty, item descrimination, and ability. 3 background variables	2,000	200
Borgatto et al. (2015)	WLE, EAP, MAP	15, 30, 45, 60	Varying item difficulty, item descrimination, and ability	1,000	Not reported
Laukaityte and Wiberg (2017)	PV (1, 5, 7, 10, 20, 40, 100), WLE, MLE, EAP	20, 40	Varying mean proficieny and item parameters	4,000, 8,000	30 and 100
Bibby (2020)	PV (3, 5, 10, 15, 20)	10, 20, 40, 60, 80	Varying regression coefficients, population ditribution, and Latent means. Inclusion and exclusion of background variables.	200; 2,000; 10,000	1,000

comparison of the different approaches to analyzing skill data. As a consequence, it is unclear whether common guidelines and best practices for analyzing skill measures and incorporating them as predictors in regression that were originally derived for cognitive assessments equally apply to socio-emotional skills, personality, and related constructed.

3.1. Socio-Emotional Skill Assessments Differ From Cognitive Skill Assessments

3.1.1. Response Format

With few exceptions, socio-emotional skill and personality items use rating scales in which there are no "correct" responses but different degrees of agreement, intensity, or frequency. To illustrate, the Big Five Inventory-2 (BFI-2; Soto and John, 2017) uses a fully labeled five-point scale (1 = *disagree strongly*; 5 = *agree strongly*). Cognitive assessments, by contrast, often use dichotomous test items (correct/incorrect) or multiple choice items that are then often dichotomized.

Different response formats, of course, entail different levels of measurement (e.g., dichotomous vs. ordered-categorical or "polytomous") and distributions of the response variables (e.g., binomial vs. multinomial or normal). They also require different modeling approaches (e.g., Rasch models for dichotomous items vs. confirmatory factor analysis or graded response models for rating scales).

3.1.2. Number of Items

Socio-emotional skill and personality scales almost invariably comprise of fewer items than cognitive skill scales. As researchers working with such scales can attest, it is challenging to create unidimensional scales with more than 6 or 8 items. Although additional items increase scale reliability, adding items can also introduce additional sources of (co-)variance that compromise unidimensionality. For example, statements such as "I am good at controlling my emotions" contain more than one source of (co-)variation, such that adding more items often introduces (residual) covariances or secondary factors (merely because some items use the same keyword or grammatical construction). Moreover, many short scales achieve reliabilities and predictive validities that rival those of longer scales (Thalmayer et al., 2011; Rammstedt et al., 2021), tempering the need for (theoretically advantageous) longer scales.

Therefore, socio-emotional skill scales typically use between 4 and 8 items per skill or facet. Longer scales are rare. For example, the BFI-2 (Soto and John, 2017) comprises 15 facets, each measured with 4 items. When aggregated to the Big Five, each dimension comprises 12 items (Soto and John, 2017). OECD's recent SSES (Kankaraš and Suarez-Alvarez, 2019) uses 8 items per facet/skill, the Values in Action Inventory (VIA; du Plessis and de Bruin, 2015) has 7–14 items per skill, and the new behavioral, social, and emotional skills inventory (BESSI; Soto et al., 2021) has 6 items for each of 32 skills.

By contrast, cognitive assessments tend to have more than 20 items per unidimensional contructs (TIMMS, PIRLS, PIAAC, NAEP). As **Table 2** shows, most (but not all) of the previous simulation studies on scoring approaches have focused on larger number of items that are typical of cognitive assessments. These studies have also shown

that the performance of some of the scoring methods typically improves as the number of items increases. It is not fully clear how the approaches perform when applied to the short scales typical for socio-emotional or personality assessments.

3.1.3. Relation Between Indicators and Latent Constructs

Socio-emotional skill scales rarely follow a tau-equivalent or 1-PL IRT measurement model in which all items have identical factor loadings (in CTT logic) or item discriminations (in IRT logic), respectively. Instead, the size of the factor loadings or item discriminations typically differs between items on the same scale. Generally, for such scales, the items on a unidimensional scale tend to have mixed factor loadings with most items having moderate, few items having high, and some items having low factor loadings. Higher factor loadings can be expected if the scales are widely used and well validated, and if their content is more homogeneous. Loadings can also vary when the scale is applied in different subpopulations that interpret some of the items differently. In contrast, items in cognitive assessments developed using IRT tend to have higher and more similar item discriminations.

The size and homogeneity of loadings/discriminations is an important consideration for scoring because it determines the scale's reliability (in CTT) and the standard error of the test score (in IRT). Put simply, lower reliability implies a higher amount of measurement error in test scores, which in turn determines (typically impairs) how well the test score performs as a predictor in regression. Some of the previous simulation studies on the topic have varied item discrimination or factor loadings to examine how doing so affects the relative performance of scoring approaches (**Table 2**).

3.2. Previous Simulation Studies Rarely Compared All Three Approaches

Many of the guidelines or recommendations for analyzing cognitive assessments were informed from simulation studies comparing contemporary methods with newer methods such as PV. **Table 2** presents a brief description of simulation studies that have compared different approaches of utilizing items from cognitive assessments. We can see that there is rich literature on comparing IRT based methods of scoring with PV. However, none of the studies have compared across both IRT and CTT based scoring methodologies and contrasted them with the most widely used method of scoring — mean scores. Some of the earlier simulation studies have considered smaller number of items per scales, yet most of the studies have focused on larger number of items per scale that far exceed the typical number of items for socio-emotional skill scales. As expected, most of the studies have varied the item difficulty, item discrimination, and ability levels. Moreover, most of the studies have compared the different methods for large sample sizes.

Table 3 provides a brief summary of the results of the previous simulation studies. When PV were compared with other methods, PV performed the best in terms of lower bias in variance estimation and standard error. Some of the studies mentioned that EAP and other methods performed well and their performance were comparable to each other in certain cases. Most of the studies indicated that the bias of the test scores reduced with increase in test length (number of items). Sample size seemed to have little bearing on the results. Some of the studies found that the performance of WLE improved drastically with increase in number of items.

Hence, despite the important insights offered by previous simulation studies, it is evident from **Table 2** that there are some gaps in the current literature on analyzing cognitive assessments, and extant findings cannot be safely generalized to personality or socio-emotional skills assessments. There is a dearth of simulation studies comparing popularly used mean scores, other CTT and IRT based test scores to SEM and PV for scenarios that are typical for socio-emotional skill and personality assessments: small number of items especially with greater variability in factor loadings (or item discrimination) in both small and large sample settings. There are hardly any simulation studies that discuss the performance of different types of test scores in the context of regression analyses in which the skills are used as predictors. Although it may well be the case that the recommendations derived for cognitive skill assessments hold true for socio-emotional skill assessments as well, the distinctions in the nature of the scales and items, and the gaps in the literature, highlights the need for a comprehensive and rigorous examination of the performance of the different approaches specifically in the context of socio-emotional skill assessments.

4. AIMS AND RESEARCH QUESTIONS OF THE PRESENT STUDY

In this study, we present a comprehensive simulation study in which we assess the performance of the three principal approaches to analyzing skills as predictors in multiple regression (different types of test scores, SEM, and PV) under conditions that are typical for socio-emotional skill and personality assessments. We compare the performance of these approaches with regard to two outcomes. The first is the bias in the regression coefficient of the skill when the skill is used to predict an outcome. The second is the bias in the regression coefficient of a covariate in the same model, which relates to questions about the incremental validity of the skill over the covariate (or vice versa). We chose the conditions in our simulation (e.g., number of items, factor loadings, relative strength of the relationship of the skill with the outcome, sample size) to mimic realistic analysis scenarios for socio-emotional skill assessments as closely as possible (for details, see section 5). We address the following research questions:

- How well do the three different approaches (i.e., different types of test scores, SEM, PV) recover the true population values of the regression coefficients of the skill and a covariate? In particular, how large is the bias that may ensue from using fallible test scores?

TABLE 3 | Results of simulation studies conducted by articles considered in **Table 2**.

Article	Methods compared	Results
Wu (2005)	WLE, MLE, EAP, PV (1, 2, 3, 4, 5)	PV performed better than WLE, MLE and EAP estimates, in recovering population parameters such as the mean, variance, and percentiles, even with very short tests. The bias in WLE and MLE variance estimates increased as test length decreased.
Lu et al. (2005)	IRT-SEM, EAP, Standardized NR Scores	IRT-SEM generated consistent regression parameter estimates for larger sample sizes. EAP and standardized NR scores required > 30 test items to attain acceptable finite item bias. Performance of NR and EAP scores were highly comparable regardless of test length and measurement model precision.
Monseur and Adams (2009)	MLE, Corrected MLE, WLE, EAP, EAP with conditioning, PV (1, 5), single estimate of PV	PV was most appropriate while MLE and WLE provided poor variance estimates. EAP with conditioning provided better estimates of variance. Bias in WLE reduced for more than 20 items. Single estimates of PV performed similar to EAP.
von Davier et al. (2009)	PV (5), Average of all PV, EAP, WLE	All methods were similarly close to true value for means. For standard deviation, PV with correct usage was the only consistent method, especially as the number of items on the test decreased. WLE was biased toward more extreme values, while EAP was biased toward the mean.
Estabrook and Neale (2013)	approx. factor score, Bartlett score, Full ML, Unweighted ML	The four scores had negligible differences in case of complete data. Full ML method outperformed other methods in case of missing data.
Aßmann et al. (2014)	EAP and PV	EAP and PV performed well with the MCMC approach with respect to the error and coverage rate, for partially observed background variables even with a relatively large amount of missing values.
Borgatto et al. (2015)	WLE, EAP, MAP	EAP with a uniform prior distribution and WLE method had best performance. WLE performed well especially in scale region where test provided little information.
Laukaityte and Wiberg (2017)	PV (1, 5, 7, 10, 20, 40, 100), WLE, MLE, EAP	PV-based estimates had better recovery of population parameteres than any point estimators. More stable and reliable estimates were obtained at 10 or more PV. Diffferences among the methods were quite small.
Bibby (2020)	PV (3, 5, 10, 15, 20)	Bias in parameters estimates and SE reduced with longer test length and increased sample size. No significant effect on the bias in parameter estimates were observed due to the increase in number of PV.

- How do differences in factor loadings (or item discriminations), the number of items, relative strength of the relationship of the skill with the outcome, and sample size, affect the magnitude of bias in the regression coefficients of the skill and a covariate?

By addressing these questions, we aim to close the aforementioned gap in the methodological literature and advance socio-emotional skill assessments with regard to scoring practices. This issue is timely because scoring is an area where socio-emotional skill assessments—and indeed the assessment of any construct based on rating scales—are still lagging behind the methodological standards and best practices of cognitive skill assessments. Our ultimate goal is to help researchers as well as data producers to make informed choices about how to score, or perhaps *whether or not* to score, socio-emotional skill measures.

5. METHODS

5.1. Design of the Simulation Study

We considered four factors in the design of the simulation study: Number of items, factor loadings of the item on the latent skill θ, relative strength of the relationship of the skill with the outcome, and sample size. We chose the levels of these factors to closely match typical socio-emotional skill and personality scales (see section 3). **Table 4** details the factors that were manipulated in the simulation study.

5.1.1. Number of Items

Socio-emotional skills and personality scales use 4 to 8 items per dimension, whereas longer scale are rare (e.g., du Plessis and de Bruin, 2015; Soto and John, 2017; Soto et al., 2021). Hence, we considered 4, 8, and 12 number of items per scale to represent short, medium, and long unidimensional scales, respectively.

5.1.2. Factor Loadings of the Item

We considered scales with high, mixed, and low factor loadings in our simulation study. In a scale with high factor loadings, all the items have factor loadings of either 0.7 or 0.8. In case of scale with mixed factor loadings, the items have factor loadings ranging from 0.4 to 0.9. In a scale with low factor loadings, all the items have factor loadings of either 0.4 or 0.5. **Table 5** presents the scale reliability in terms of ω (McDonald, 1999; Hayes and Coutts, 2020) implied by the different combinations of number of items and factor loadings used in our study. The scale reliability ranges from 0.5 to 0.94 under different conditions.

TABLE 4 | Design of the simulation study.

Factors	Levels	Total number of levels
Number of items	4, 8, 12	3
Factor loadings	All high, mixed, all low	3
Sample size	300 (small), 1,000 (large)	2
Relative strength of the relationship between the skill and the outcome	Greater than the covariate, lesser than the covariate	2
Approaches	MS, EBM, RFS, WLE, EAP, PV, and SEM	7

TABLE 5 | Scale reliabilities, ω, of the unidimensional skills considered in the simulation study for different number of items and the strength of the factor loadings.

Number of items	Factor Loadings		
	High	Mixed	Low
4	0.84	0.76	0.50
8	0.91	0.86	0.67
12	0.94	0.90	0.75

5.1.3. Relative Strength of the Relationship of the Skill With the Outcome

Because incremental validity questions are so common in research on socio-emotional skills and personality, in this study we compare the efficacy of different approaches of analyzing SES items in recovering regression parameter not only of a skill but also that of a covariate. Thus, in addition to assessing bias in the regression coefficient of a skill, we also assess bias in the regression coefficient of a covariate that results when using different approaches to analyzing the skill (i.e., test scores, PV, SEM). We consider two cases: (1) the skill is more strongly correlated with the outcome variable than the covariate, and (2) the covariate is more correlated with the outcome variable than the skill.

5.1.4. Sample Size

Previous studies on analyzing skills from large scale cognitive studies have mostly concentrated on large sample sizes that are typical of LSAS (see **Table 2**). Large samples are advantageous in that they ensure stable estimates and sufficient statistical power for most types of analysis. However, much—and probably most—research on SES or personality is based on smaller samples and are not representative or large like LSAS samples. An analysis of sample sizes in six well-regarded journals in personality psychology found that the median sample size was only 104 and hardly increased over the years (Fraley and Vazire, 2014), although it should be noted that this included both experimental designs and correlational designs (e.g., surveys); the latter typically have much larger sample sizes, and samples of 300 to 500 respondents are easy to acquire nowadays through online surveys. Certain approaches of analyzing SES items (e.g., item factor analysis with weighted least-squares [WLS] estimators) require larger samples to produce reliable and stable estimates. Hence, in this study, we will explore the effect of two levels of sample sizes: 300 and 1,000 to represent small and large samples, respectively.

5.2. Model Specification

As described in **Figure 1**, we generated data for the simulation study such that for a particular sample size, a number of items $X_1, \ldots, X_k$ were observed measures of the latent variable θ representing the skill, with factor loadings $\lambda_1, \ldots, \lambda_k$ depending on the different levels of the factor loading design factor. Each item had zero mean and unit variance, and the items followed a multivariate normal distribution with unidimensional confirmatory factor analytic model implied covariance. We then categorized the initially continuous items into 5 ordinal response categories, such that the resulting responses form a symmetric bell-shaped histogram.

The skill θ was correlated with a single covariate, denoted C. We fixed the correlation between them, ϕ, at ($\varphi = 0.30$) for all conditions. The covariate also had a zero mean and unit variance. Furthermore, there were two continuous outcome variables, Y_1 and Y_2. Both θ and the covariate C were predictors of both these outcomes. For outcome Y_1, we fixed the regression coefficients such that $\beta_1 > \gamma_1$, indicating that the skill was more strongly correlated with the outcome than the covariate. For outcome Y_2, we fixed the regression coefficients such that $\beta_2 < \gamma_2$, indicating that the covariate was more strongly correlated with the outcome than the skill.

In all, we generated data for 36 conditions (refer **Table 4**) and compared the performance of different approaches of analyzing the skill as a predictor in multiple regression. We replicated each condition 500 times. For each condition the same starting seed was used as a variance reducing method (Boomsma, 2013). R Studio (R Core Team, 2020) with *lavaan* (Rosseel, 2012) and *TAM* (Robitzsch et al., 2020) packages were used for data generation and data analyses.

5.3. Computing Test Scores

For each simulation condition, we computed five types of test scores that are widely used in applied research and/or discussed in the methodological literature: Standardized mean scores (SMS), regression factor scores (RFS), empirical Bayes modal (EBM) scores, weighted maximum likelihood estimates (WLE), and expected a posteriori (EAP) estimates. Below we describe the computational details of each.

5.3.1. Standardized Mean Scores (SMS)

Mean scores are the simplest and most widely used type of test scores for constructs that are measured with multi-item scales that use a rating scale format (McNeish and Wolf, 2020; Lechner et al., 2021). As in much of applied research, here we will consider standardized mean scores[6]. Consider x_{ij} to be the response of

[6]In practical applications, standardization has both advantages (e.g., standard deviations are a readily interpretable metric) and disadvantages (e.g., the original metric of the response scale is lost). For our present study, the standardized mean score was the method of choice because it allowed us to interpret the scores in the

respondent i (i = 1, …, n) on item j (j = 1, …, m). SMS is computed as

$$\hat{\theta}_i^{MS} = \frac{1}{m}\sum_{j=1}^{m} x_{ij}; \qquad i = 1, \ldots, n$$

$$\hat{\theta}_i^{SMS} = \frac{\hat{\theta}_i^{MS} - \bar{\theta}^{MS}}{\sigma_{\hat{\theta}^{MS}}}$$

where $\bar{\theta}^{MS}$ is mean and $\sigma_{\hat{\theta}^{MS}}$ is the standard deviation of the mean scores.

Different from the other four types of test scores described below, SMS can be calculated directly from the item responses. More complex method require a two-step process (Rdz-Navarro, 2019): In the first step, an appropriate measurement model is estimated. In the second step, the scores are estimated for each response pattern using the model parameters from the first step. However, it is important to realize that SMS is in fact, based on rather strong assumptions about the underlying measurement model (e.g., von Davier, 2010; Beauducel and Leue, 2013; McNeish and Wolf, 2020): SMS implicitly assumes a model of "parallel tests"—a rather unrealistic assumption for socio-emotional skills and personality scales in which items almost invariably have different loadings, intercepts, and residual variances.

5.3.2. Regression Factor Scores (RFS)

Another type of widely used test scores are RFS computed from classical test theory (CTT) measurement models such as confirmatory factor analysis. Skrondal and Laake (2001) noted that for explanatory variables, RFS, extracted from a factor model, tend to produce consistent estimators for all parameters. Consider the following factor model:

$$X = \Lambda_X \xi + \delta$$

where X is a response matrix with entries X_{ij} indicating the response of respondent i (i = 1, …, n) on item j (j = 1, …, m). Λ_X is the matrix of factor loadings, ξ is the vector of latent variables, and δ is the vector of errors. RFS can then be computed by regressing

$$\hat{\theta}^{RFS} = \Phi \Lambda_X^T \Sigma_X^{-1}$$

where $\hat{\theta}^{RFS}$ is the matrix of RFS for all respondents. Φ is the covariance matrix of ξ and Σ_X is the model implied covariance matrix. In this study, we used robust maximum likelihood (MLR) estimation for the parameters of the confirmatory factor analysis (CFA) model.

5.3.3. Weighted Maximum Likelihood Estimator (WLE) Scores

WLE is a popular choice for computing test scores when item response theory (IRT) models such as the 2-PL model are used. WLE corrects for the bias in the asymptotic variance of the maximum likelihood estimator (MLE) (Warm, 1989). Consider m polytomous items j = 1, …, m. Let each of these items have r response categories k = 1, …, r. Let θ_i be the trait level of respondent i (i = 1, …, n) and $P(x_{jk}|\theta_i)$ be the probability of respondent with trait θ_i selecting category k on item j. The likelihood function is given as

$$L(x|\theta) = \prod_{i=1}^{n}\prod_{j=1}^{m}\prod_{k=1}^{r}[P(x_{jk}|\theta_i)]^{x_{jk}} \tag{1}$$

Warm's likelihood function is defined as

$$L^*(x|\theta) = f(\theta)L(x|\theta)$$

where $f(\theta)$ is the square root of the test information.

$$\hat{\theta}^{WLE} = \arg\max_{\theta} L^*(x|\theta)$$

While the asymptotic variance of WLE continues to be biased, its bias is smaller than that of MLE. As MLE is theoretically unbiased, so are WLE (Rdz-Navarro, 2019). In this study, we used a 2-PL generalized partial credit model (GPCM) for the responses. We estimated the parameters using maximum likelihood estimation with Gaussian quadrature approximation.

5.3.4. Expected a Posteriori (EAP) Scores

Akin to WLE, EAP is widely used for computing test scores in cognitive assessments. However, unlike WLE, EAP requires a prior distribution of θ. EAP estimate is the mean of the posterior distribution of θ, which combines information about response patterns and model parameters with a prior distribution. Shrinkage toward the population mean can be reduced by including background information in the prior distribution of θ. For a given prior distribution $g(\theta)$ of the respondent's ability, the posterior distribution is defined as -

$$P(\theta|x) = \frac{L(x|\theta)g(\theta)}{P(x)}; \qquad P(x) = \int L(x|\theta)g(\theta)d\theta$$

$$\hat{\theta}^{EAP} = E(\theta|x) = \int \theta P(\theta|x)d\theta$$

Similar to WLE scores, we used a 2-PL GPCM with Gaussian priors for the responses in this study. We estimated the parameters using maximum likelihood with Gaussian quadrature approximation.

5.3.5. Empirical Bayes Modal (EBM) Scores

In empirical Bayes estimation of θ, posterior mean of θ is obtained with the parameter estimates plugged in. EBM estimates make use of posterior mode instead of posterior mean. Posterior mode minimizes the posterior expectation of the zero-one loss function thereby reducing the misclassifications (Rabe-Hesketh et al., 2004). This makes EBM especially well suited for categorical data. Similar to EAP, background information or covariates can be included in the prior distribution to obtain better

population metrics that we assigned to the skill in our simulations (i.e., zero mean and unit variance; see section 5). This will also aid in fair comparison with other approaches that follow the same metric.

EBM estimates. Consider $P(\theta|x;\hat{\theta})$, the conditional posterior distribution of θ given the estimated parameters

$$\hat{\theta}^{EBM} = \max_{\theta} \arg P(\theta|x;\hat{\theta})$$

In this study, we used weighted least square mean and variance (WLSMV) adjusted estimators with Gaussian priors.

5.4. Generating Plausible Values

For each simulated dataset, we estimated a set of 10 PV per hypothetical respondent. For item response matrix x and ability θ, $P(x|\theta)$ represents the item response or the measurement model. Further, the prior distribution $g(\theta)$ is typically assumed to follow normal distribution given c, a vector of background or conditioning variables (Wu, 2005):

$$g(\theta|c) \sim N(\mu + \beta c, \sigma^2)$$

In the PV literature and in LSAS, $g(\theta|c)$ is referred to as the "background model" or "conditioning model".

PV are, then, generated as m random draws drawn from the posterior distribution $P(\theta|x,c)$, i.e. $\hat{\theta}_l^{PV} \sim P(\theta|x,c)$. Subsequent analyses is performed for each $\hat{\theta}_l^{PV}$ and the final estimate if obtained by pooling all m estimates using missing value imputation methodology (Wu, 2005; von Davier et al., 2009).

For generating PV, we used a 2-PL generalized partial credit model (GPCM) as response model with marginal maximum likelihood (MML) estimation using quasi Monte Carlo integration for each condition. The covariate, C and the two outcome variables—Y_1 and Y_2 (from **Figure 1**) were used as background variables in the population model for PV. We used the *TAM* package (Robitzsch et al., 2020) to generate PV and the *miceadds* package (Robitzsch and Grund, 2021) to pool the results of the regressions with PV as predictor.

5.5. Structural Equation Model (SEM)

We fit a SEM with a CFA measurement model (as shown in **Figure 1**) to each simulated dataset. We fixed the variance of the latent skill θ to unity and freely estimated the factor loadings of all items. We included the correlation between the skill and the covariate in the structural model. To estimate the SEM, we used the R package *lavaan* (Rosseel, 2012) with a robust maximum likelihood (MLR) estimator.

5.6. Estimating Bias in Regression Coefficients

The main goal of this study was to examine how the different approaches of analyzing socio-emotional skills (the five types of test scores, SEM, and PV) recover regression coefficients of both the skill and the covariate in multiple regression. Hence, the outcomes of interest in this simulation study are: (1) the percent bias in the regression coefficient of the skill, and (2) the percent bias in the regression coefficient of the covariate. We calculate percent bias in the regression coefficients of both the skill and the covariate for each replication under each condition as:

$$\%\,Bias = 100 \times \frac{\hat{\beta} - \beta}{\beta}$$

where β is the population value and $\hat{\beta}$ is the estimated value of the regression coefficient.

There is no universal answer as to what amount of bias is acceptable, mild or severe. In previous simulations, percent absolute relative bias in regression coefficient was often deemed acceptable if it was below 10% (Hoogland, 1999; Poon and Wang, 2010; Leite, 2017). However, this is merely a rule of thumb. Depending on the research context, even an absolute relative bias of less than 10% can be problematic, especially in cases involving high-stakes decisions. In other cases such as exploratory low-stakes research, absolute relative bias up to 15% might sometimes be deemed acceptable. As a rough and tentative guideline based on prior work, we interpreted bias of less than 5% as "ignorable," bias of between 5 and 10% as "likely unproblematic," and bias of more than 10% as "likely problematic."

We also obtained correlations among the 5 types of test scores and the two outcome variables for each replication under each condition. We then pooled these correlations across the 500 replications for each condition and then further pooled them across all conditions to obtain a single estimate for each correlation.

6. RESULTS

6.1. Correlations Between Skill Scores

Figure 2 presents the correlation between the five types of test scores (SMS, EBM, RFS, WLE, and EAP). The correlations were extremely high, approaching unity. The correlations of these test

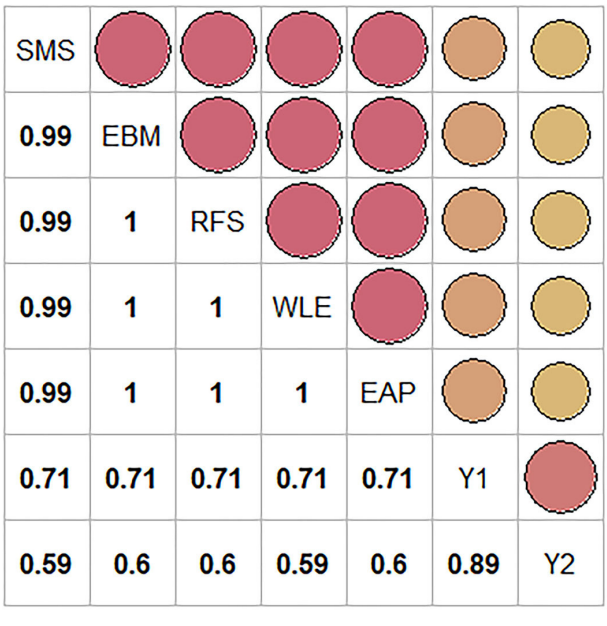

FIGURE 2 | Correlation plot of the five types of test scores-SMS, EBM, RFS, WLE, and EAP, and the two outcomes - Y_1 and Y_2. The size and color of the dots in the plot represent the strength of the correlation. Bigger the dots, higher the correlation.

scores with the two outcomes were almost identical across the different types of test scores.

These correlations would seem to suggest that all types of test scores yield highly similar results. However, this does not necessarily imply that the scoring methods are created equal or that they can be used interchangeably when it comes to bias in regression coefficients, because the regression coefficient also depends on the ratio of the standard deviation of the outcome to the standard deviation of the scores. As this ratio is different for different scores, the regression coefficients are bound to be different for the different types of test scores.

6.2. Bias in the Regression Coefficient of the Skill

6.2.1. Performance of the Different Approaches With Regard to Percentage Bias

Figure 3 and **Table 6** show the performance of the different approaches in terms of percentage bias. SEM performed the best in terms of recovering the regression coefficient of the skill. SEM had the lowest mean percent bias ($<$ 1%) across all conditions, meaning that it almost perfectly recovered the population regression coefficients. Mean percent bias of PV across all conditions was $<$ 3%. Hence, PV performed almost as well as SEM.

As expected, all 5 types of test scores produced higher bias than SEM and PV. Importantly, despite their strong intercorrelations, the performance of the different test scores varied markedly across the conditions. EBM, RFS, and EAP performed equivalently and relatively well with mean percent bias $<$10% across all conditions. However, their performance was clearly worse than that of PV and SEM. SMS performed poorly with mean percent bias ranging from 5% to up to 35% under different conditions. WLE had the worst performance of all approaches with the mean percent bias ranging from 8 – 55% for different conditions.

6.2.2. Effects of Experimental Factors on Percentage Bias

Next, we probed how the different factors in our simulation affected the amount of bias in the regression coefficient. For all the different approaches, percent bias decreased when the scale comprised a larger number of items. This trend held for all levels of factor loadings, relative strength of the relationship of the skill with outcome, and the sample size.

Percent bias was also lower for all methods when the factor loadings were high (i.e., when scale reliability was higher; see **Table 5**). Percentage bias was slightly higher for mixed factor loadings and the highest for low factor loadings. This trend was evident across the different levels of number of items, relative strength of the relationship of the skill with outcome, and the sample size.

As evident from and **Figure 3**, the relative strength of the relationship between the skill and the outcome did not affect the bias in the regression coefficients of the skill. This was true for all approaches under all conditions. Similarly, sample size did not alter the performance of different approaches under different conditions. However, variability in the percentage bias of the approaches was larger for small sample size compared with that of the large sample size for all conditions.

6.3. Bias in the Regression Coefficient of the Covariate

6.3.1. Performance of the Different Approaches With Regard to Percentage Bias

How does the way in which the different approaches account (or fail to account) for measurement error in the skill affect the bias in the regression coefficient of a covariate? From **Figure 4**, it is clear that SEM performed best in terms of recovering the regression coefficient of the covariate across all conditions. PV performed on par with SEM, with a mean percent bias $<$3% for all conditions (see **Table 7**).

All types of test scores performed worse than PV and SEM, but were similar to each other, with their mean percent bias ranging from 2–20% under different conditions. It is interesting to note that SMS performed no worse than more sophisticated types of test scores in recovering the regression coefficient of the covariate.

6.3.2. Effects of Experimental Factors on Percentage Bias

Similar to the recovery of the regression coefficient of the skills, the percent bias in the regression coefficient of the covariate was smaller when the scale comprised a larger number of items. This trend was evident for all the approaches—regardless of the level of factor loadings, relative strength of the relationship of the skills with outcome, and the sample size.

Percent bias was also lower for all approaches when the factor loadings were all high (i.e., when scale reliability was high; see **Table 5**). It was only slightly higher when factor loadings were mixed and the highest when the factor loadings were low. We also observed that the variability in the percentage bias increased as the strength of the factor loadings decreased. This trend was observed across the different levels of number of items, relative strength of the relationship of the skills with outcome, and the sample size.

As evident from **Figure 4**, the percent bias of a given approach in case where the relative strength of the relationship of the skill with the outcome is higher than the covariate, was comparable to that where the relative strength is weaker. This was true for all approaches under all conditions. The only notable exception to this pattern was the bias in the various types of test scores in the condition with low factor loadings; this bias was smaller when the relative strength of the relationship of the skill with the outcome was lower (**Figure 4B**) compare to when it was higher (**Figure 4A**).

Again, sample size did not seem to affect the performance of different approaches under different conditions. However, as seen earlier, variability in percent bias of the methods was larger for small sample size across all conditions.

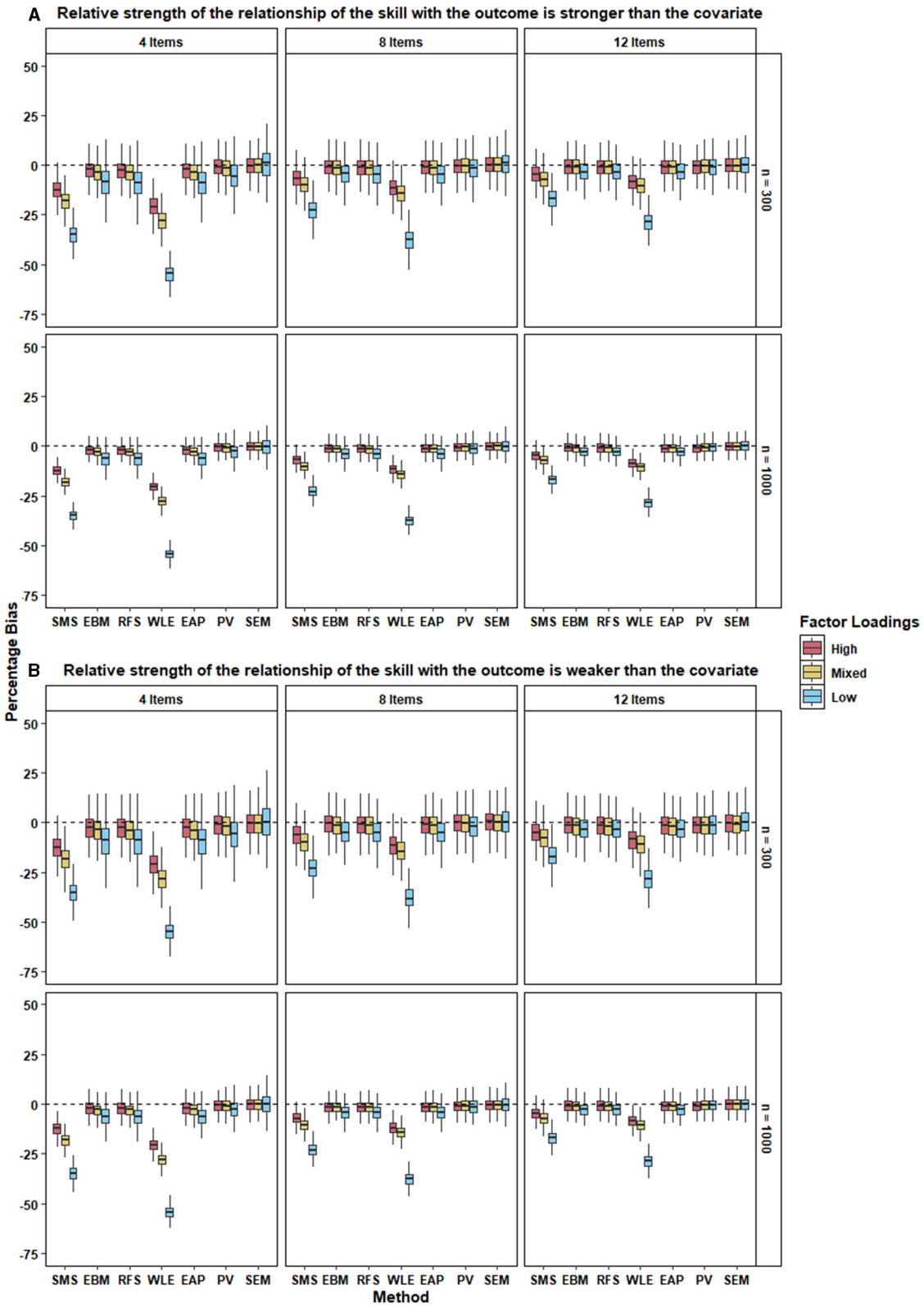

FIGURE 3 | The two panels, **(A,B)**, present the boxplot of percentage bias in the regression coefficient of the skill for the different approaches under each condition when the relative strength of the relationship between the skill with the outcome is stronger and weaker respectively, than the covariate. 500 replications of each condition were used to create the boxplot.

TABLE 6 | Mean percentage bias of regression coefficient of the skill for different approaches for each condition.

RSRO	SS	FL	Items	SMS	EBM	RFS	WLE	EAP	PV	SEM
Stronger than the covariate	300	High	4	–12.28	–2.33	–2.49	–20.62	–2.43	–0.74	–0.17
			8	–6.53	–1.10	–1.25	–11.59	–1.18	–0.46	0.02
			12	–4.61	–0.90	–1.03	–8.37	–1.14	–0.87	–0.20
		Mixed	4	–18.11	–3.53	–3.69	–28.02	–3.66	–1.47	–0.24
			8	–9.96	–1.33	–1.49	–14.12	–1.41	–0.41	0.10
			12	–7.23	–1.13	–1.26	–10.44	–1.18	–0.66	–0.17
		Low	4	–34.97	–8.76	–9.04	–54.61	–9.04	–5.36	0.85
			8	–22.72	–4.66	–4.83	–37.67	–4.84	–1.66	0.39
			12	–16.75	–3.31	–3.44	–28.57	–3.44	–1.03	0.24
	1,000	High	4	–12.27	–2.07	–2.12	–20.43	–2.04	–0.54	–0.09
			8	–6.74	–1.19	–1.23	–11.67	–1.17	–0.60	–0.14
			12	–4.68	–0.86	–0.90	-8.49	–1.12	–0.93	–0.15
		Mixed	4	–18.12	–2.85	–2.89	–27.77	–2.85	–0.74	–0.09
			8	–10.23	–1.40	–1.44	–14.16	–1.35	–0.52	–0.12
			12	–7.22	–1.05	–1.09	–10.45	–1.06	–0.61	–0.12
		Low	4	–34.99	–6.31	–6.37	–54.43	–6.37	–2.57	–0.07
			8	–22.80	–3.84	–3.88	–37.56	–3.88	–0.98	–0.01
			12	–16.88	–2.68	–2.71	–28.63	–2.71	–0.42	0.19
Weaker than the covariate	300	High	4	–12.49	–2.57	–2.73	-20.82	–2.67	–1.04	–0.41
			8	–6.30	–0.84	–0.98	–11.35	–0.91	–0.18	0.28
			12	–4.79	–1.08	–1.21	–8.53	–1.31	–1.06	–0.38
		Mixed	4	–18.22	–3.67	–3.83	–28.13	–3.81	–1.68	–0.40
			8	–9.71	–1.08	–1.24	–13.90	–1.16	–0.15	0.35
			12	–7.59	–1.54	–1.68	–10.82	–1.60	–1.10	–0.59
		Low	4	–35.06	–8.99	–9.27	–54.74	–9.28	–5.61	0.74
			8	–22.75	–4.69	–4.86	–37.69	–4.86	–1.69	0.37
			12	–16.64	–3.10	–3.23	-28.41	–3.23	–0.81	0.43
	1,000	High	4	–12.34	–2.17	–2.22	–20.50	–2.13	–0.65	–0.19
			8	–6.92	–1.37	–1.41	–11.86	–1.37	–0.80	–0.33
			12	–4.66	–0.84	–0.88	–8.47	–1.10	–0.90	–0.12
		Mixed	4	–18.16	–2.94	–2.99	–27.83	–2.94	–0.85	–0.19
			8	–10.42	–1.59	–1.64	–14.35	–1.55	–0.74	–0.32
			12	–7.16	–1.00	-1.04	–10.42	–1.02	–0.57	–0.07
		Low	4	–34.87	–6.14	–6.20	–54.35	–6.20	–2.39	0.11
			8	–23.00	–4.08	–4.13	–37.73	–4.13	–1.24	–0.27
			12	–17.00	–2.83	–2.86	–28.73	–2.86	–0.58	0.05

The mean percentage bias was calculated by aggregating percentage bias across 500 replications for each condition.
Note: RSRO: Relative strength of the skill with the outcome, SS: Sample size, FL: Factor loadings.

6.4. Additional Analyses: Bias in Standardized Regression Coefficient

As mentioned earlier, we used the standardized mean score in the regression to ensure that the mean score was meaningful with regard to the population metric of the skill (i.e., zero mean and unit variance) and to allow for meaningful comparisons with other approaches. We did not standardize the other test scores (or PV) because they are already in the population metric of the skill that we specified in the simulation (i.e., zero mean and unit variance).

As it is a common practice in studies on socio-emotional skills or personality to report standardized regression coefficients in order to interpret relationships with educational or life outcomes (Richards, 1982; Courville and Thompson, 2001), we

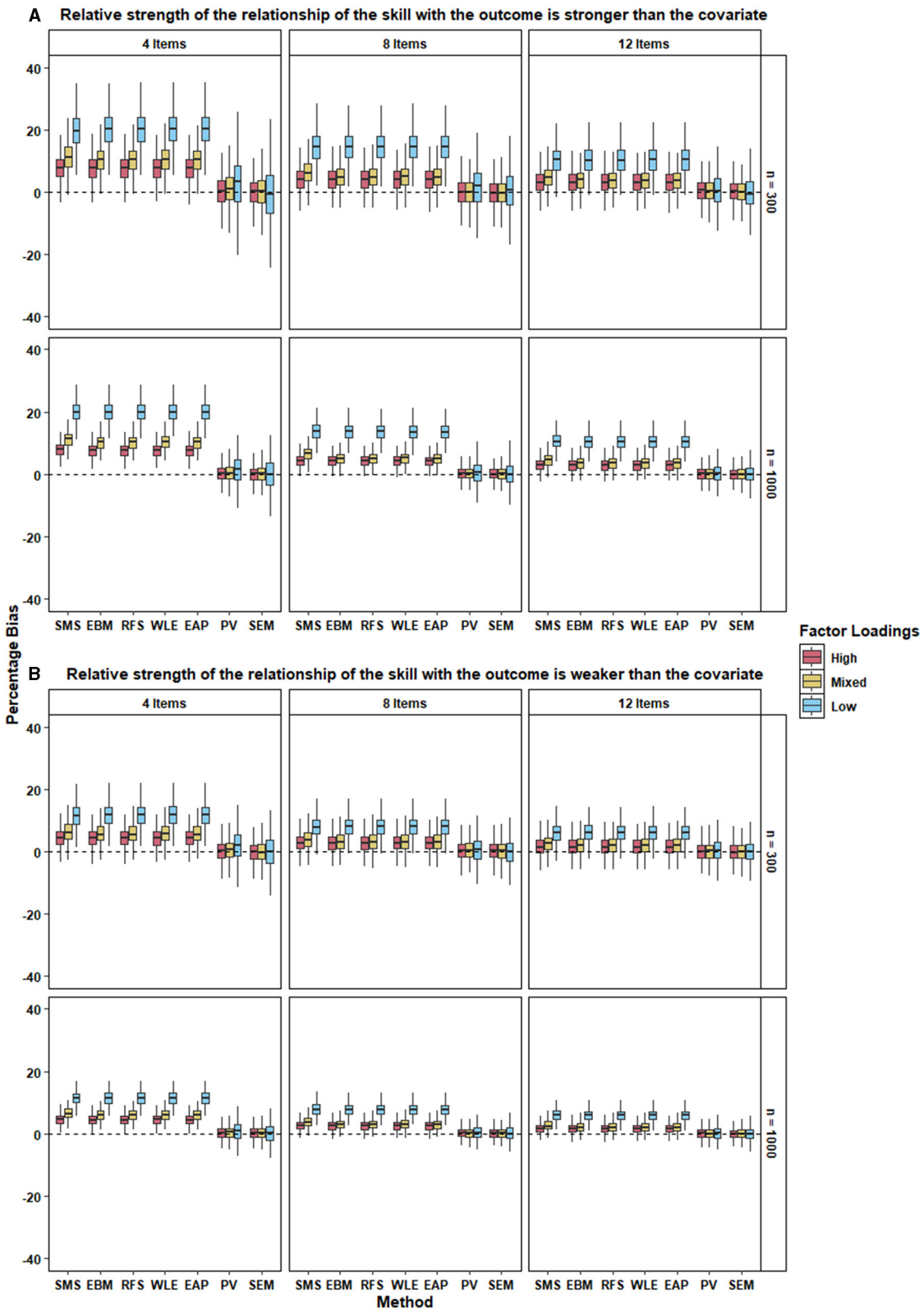

FIGURE 4 | The two panels, **(A,B)**, present the boxplot of percentage bias in the regression coefficient of the covariate for the different approaches under each condition when the relative strength of the relationship between the skill with the outcome is stronger and weaker respectively, than the covariate. 500 replications of each condition were used to create the boxplot.

TABLE 7 | Mean percentage bias of regression coefficient of the covariate for different approaches for each condition.

RSRO	SS	FL	Items	SMS	EBM	RFS	WLE	EAP	PV	SEM
Stronger than the covariate	300	High	4	7.68	7.57	7.57	7.64	7.56	0.35	–0.01
			8	4.07	3.99	3.99	4.02	3.97	–0.08	–0.30
			12	3.21	3.17	3.17	3.17	3.17	0.52	0.27
		Mixed	4	11.19	10.40	10.40	10.53	10.40	1.12	0.28
			8	6.25	4.88	4.88	4.98	4.86	0.04	–0.28
			12	4.79	3.78	3.79	3.80	3.75	0.34	0.08
		Low	4	19.69	20.12	20.14	20.17	20.15	2.74	–1.14
			8	14.40	14.55	14.56	14.57	14.56	1.62	0.35
			12	10.33	10.41	10.41	10.42	10.41	0.60	–0.29
	1,000	High	4	7.84	7.60	7.60	7.65	7.58	0.22	0.06
			8	4.33	4.19	4.19	4.23	4.17	0.21	0.05
			12	2.97	2.88	2.88	2.88	2.86	0.16	0.00
		Mixed	4	11.27	10.16	10.16	10.28	10.16	0.33	0.04
			8	6.55	5.00	5.00	5.15	4.99	0.21	0.04
			12	4.55	3.62	3.62	3.66	3.59	0.11	–0.03
		Low	4	20.01	19.96	19.97	20.00	19.97	1.31	–0.08
			8	13.79	13.69	13.69	13.70	13.69	0.51	0.03
			12	10.61	10.50	10.50	10.50	10.50	0.33	0.03
Weaker than the covariate	300	High	4	4.24	4.18	4.18	4.22	4.18	0.10	–0.11
			8	2.73	2.68	2.68	2.70	2.67	0.36	0.24
			12	1.62	1.59	1.59	1.59	1.59	0.09	–0.05
		Mixed	4	6.17	5.72	5.72	5.80	5.72	0.47	–0.02
			8	3.91	3.13	3.14	3.19	3.12	0.38	0.20
			12	2.62	2.06	2.06	2.07	2.04	0.11	–0.04
		Low	4	11.45	11.71	11.72	11.73	11.72	1.85	–0.40
			8	7.79	7.88	7.89	7.89	7.89	0.54	–0.19
			12	6.01	6.04	6.04	6.05	6.04	0.45	–0.04
	1,000	High	4	4.58	4.44	4.44	4.47	4.43	0.26	0.16
			8	2.53	2.45	2.45	2.47	2.44	0.19	0.10
			12	1.69	1.64	1.64	1.64	1.63	0.09	0.00
		Mixed	4	6.55	5.93	5.93	6.00	5.93	0.36	0.19
			8	3.82	2.94	2.94	3.03	2.93	0.23	0.13
			12	2.57	2.05	2.05	2.07	2.03	0.05	–0.03
		Low	4	11.44	11.41	11.41	11.43	11.42	0.80	0.01
			8	7.86	7.80	7.80	7.81	7.80	0.34	0.06
			12	5.99	5.92	5.92	5.93	5.92	0.16	–0.02

The mean percentage bias was calculated by aggregating percentage bias across 500 replications for each condition.
Note: RSRO: Relative strength of the skill with the outcome, SS: Sample size, FL: Factor loadings.

also obtained standardized regression coefficients for both the skill and the covariate for the remaining test scores (EBM, RFS, WLE, EAP). We provide tables with the mean percent bias in the standardized regression coefficients of skill and covariate in the **Tables A1**, **A2** in Appendix, respectively.

These additional analyses showed that the performance of EBM, RFS, and EAP, though comparable with each other, worsened in terms of percent bias when using standardized instead of unstandardized regression coefficients. The mean percent bias for these three test scores ranged from 5 – 37%. Contrariwise, standardization of WLE scores drastically improved their performance compared with its unstandardized regression coefficient (compare **Table 6** with **Table A1** in Appendix). Performance of the four test scores—EBM, RFS,

WLE, and EAP—was similar across all conditions. Furthermore, standardization of the test scores did not change the percent bias in the regression coefficient of the covariate (**Table A2** in Appendix). It is identical to bias in case of unstandardized regression coefficients of the four test scores (**Table 7**).

7. DISCUSSION

In this simulation study, we compared the performance of three principal approaches (test or scale scores, SEM, and PV) for analyzing socio-emotional skills scales in regression analyses where the skill is a predictor. Although our study was motivated by the growing number of studies on socio-emotional skills, our findings apply equally to measures of personality traits, motivation, goals, attitudes—indeed any multi-item scale that seeks to measure a unidimensional latent construct with relatively few (i.e., 4–12) items using a polytomous (rating scale) response format.

In terms of recovering the regression coefficient of the skill, some test scores (EBM, EAP, and RFS) mostly performed adequately even for scales with fewer items and mixed or low factor loadings. These test scores produced only mild bias in the regression coefficient for the skills that is likely to be inconsequential for research findings. By contrast, the two other types of test scores (SMS and the WLE) often performed poorly, resulting in bias that far exceeds the threshold of what is commonly seen as ignorable or acceptable. Notably, the very high correlations among different types of test scores did not translate into similar magnitudes of percentage bias in the regression coefficients of the skill. Different types of test scores cannot and should not be used interchangeably, even though they may be highly correlated. Moreover, as additional analyses showed, the performance of test scores varies widely depending on whether unstandardized scores (as in our main analyses) or standardized scores (as in our additional analyses) are used. The superior performance of SEM and PV was noteworthy under all conditions: Both methods yielded bias that was small enough to be safely ignored in most applied research scenarios.

In terms of recovering the regression coefficient of a covariate, test scores did not perform satisfactorily. Especially for scales with fewer items and mixed or low factor loadings, bias often reached levels that are likely problematic. This indicates that whereas using test scores such as RFS, EAP, and EBM results in negligible bias in recovery of regression coefficient of the skill, using test scores can still entail considerable bias in recovering the regression coefficient of covariates, potentially leading to erroneous research findings. Contrariwise, the performance of PV and SEM was excellent under all conditions. As one would expect, both methods almost completely eliminated bias in the regression coefficient of the covariate under all conditions.

Our results expand previous simulation studies on scoring, SEM, and PV. As previous studies mostly hail from the realm of cognitive assessments and mirror the conditions that are typical of those assessments (see **Table 2**), it is instructive to compare the findings of these studies with our own. Similar to previous simulations (see **Table 3**), we found that PV performed exceptionally well and under most conditions comparable to SEM. We also saw that some of the test scores (RFS, EBM, and EAP) performed similar to each other in most cases. Increase in number of items improved the performance of all approaches. Similar to these earlier studies, sample size had no bearing on the differences in the percent bias for the different methods in our simulation. Distinct from some previous simulations, PV performed well even for small sample sizes and low factor loadings. Even though the some of the test scores such as RFS, EBM, and EAP had higher bias than PV, this bias was negligible for most conditions in terms of recovery of regression coefficient of the skill. Although WLE performed better with increase in the number of items, its bias was still likely problematic and in certain conditions it was worse than SMS. In sum, our results partly align with those of prior simulation studies, especially in highlighting PV and SEM as effective in removing bias from regression coefficients, but partly deviate from them and are more nuanced. Moreover, none of the previous simulation compared different types of test scores to SEM and PV, as we did in our study.

7.1. Limitations and Directions for Future Research

Like all simulation studies, our study has limitations in the form of generalizability. Even though we designed our simulations to closely match the real data scenarios in studies on socio-emotional skills, there are several issues that we could not cover here: missing data, which complicates usage of test scores but not SEM or PV (von Davier et al., 2009; Braun and von Davier, 2017), small sample size issues, and non-classical measurement error, which determines the form of bias (attenuation or inflation; Fuller, 2006; Schofield, 2015). We also did not investigate different response formats and multidimensional skills. Often in socio-emotional or personality skills assessments, it is common for the skills to be correlated with each other, and skills are analyzed simultaneously as multi-dimensional inventories (e.g., Soto and John, 2017; Soto et al., 2021). Future research can focus on examining the performance of the three approaches in the case of missing data, non-classical measurement error, and multi-dimensional scales.

7.2. Practical Implications and Recommendations

Findings from our simulation beg the question: "To score or not to score?." We demonstrate that using test scores (fallible point estimates of individuals' skills) can result in considerable bias in both the regression coefficient for the skill that is modeled as a predictor (which is typically underestimated) and in the regression coefficient for a covariate (which is typically overestimated). This bias occurs in many conditions typical of socio-emotional skill assessments. Moreover, it occurs especially with simple (i.e., SMS) but also with more advanced (e.g., WLE) types of test scores.

The situation is thus reminiscent of cognitive skill assessments, where the use of test scores has now been discouraged in favor of PV methodology (Wu, 2005; von Davier

et al., 2009; Laukaityte and Wiberg, 2018). Given how crucial scale reliability turned out for the magnitude of bias in our simulations, it can be argued that recommendations against using test scores apply with even greater force to socio-emotional skill assessments. This is because these assessments often involve shorter scales (e.g., 4–6 items) with comparatively lower reliabilities, resulting in greater bias in regression coefficients of both the skill and the covariates.

In view of this, our recommendations are threefold. First, applied researchers who analyze data from socio-emotional skill assessments should employ SEM or PV instead of using fallible test scores. This is because SEM explicitly models measurement error and PV implicitly corrects for the uncertainty about the true skill score of each respondent. Both approaches will keep bias in regression coefficient within acceptable range in most circumstances, provided that the measurement model is correctly specified.

Second, if using test scores is unavoidable, researchers should choose the type of test scores consciously and exert caution in interpreting results. There may be cases in which computing test scores is necessary. For example, if the secondary analyst intends to conduct analyses that are difficult to implement through SEM or PV framework, such as using complex survey weights (e.g., replicate weights) in analyses, fitting generalized additive models, or LOESS curve estimation, then test scores may be needed. In such cases, researchers should refrain from using the mean scores. Although mean or sum scores are still the most widely used scale scores, easy to understand, and readily interpreted, they perform sub-optimally as predictors in regression models, and worse than most of the IRT/CFA model-based scores. As we saw, high correlations among different test scores does not imply that they can be used interchangeably. Hence, researchers should prefer EBM and EAP, which lead to smaller bias. Although this is rarely implemented, EBM and EAP also allow for inclusion of covariates in the prior distribution, which improves precision (Monseur and Adams, 2009; Laukaityte and Wiberg, 2018). EAP also deals reasonably well with missing data, regardless of whether the missingness was planned or unplanned (Sengewald et al., 2018). Even when using EBM or EAP, researchers should be cautious while drawing inferences from regression analyses in which these test scores have been used in lieu of latent skills. In cases where test scores are to be reported back to respondents, SEM and PV methodologies cannot be used and researchers should provide EAP or EBM scores.

Third, data-producing organizations that curate socio-emotional skill assessments should enable secondary users of the data to use both of the approaches that account for measurement error. That is, the disseminated data should ideally include a set of PV estimated from an extensive background model that will achieve congeniality across many analysis scenarios, as is typical for cognitive assessments. Moreover, the data should include all item-level data, such that secondary analysts can estimate SEM on the original data. For data-producing organizations, PV and SEM have another advantage: In contrast to simple test scores, they can be readily applied to data from planned missingness (or "incomplete block") designs in which each respondent answers only a subset of the total set of assessment items.

In our view, currently, PV stand out as the best option as they account for measurement error (and can incorporate information from background variables) but do not require knowledge of SEM or specialized software. Instead, all that is required is a basic understanding and implementation of multiple imputation methodology. Otherwise, the workflow for PV-based analyses is much the same as that of any other analysis with observed variables. Moreover, in contrast to SEM, PV-based analyses fulfill what Lechner et al. (2021) termed the immutability criterion—once estimated, PV do not change depending on the subsample chosen, variables included in the model, or the estimator used by the secondary analyst. This is advantageous as it will lead to higher comparability across different analyses setups and analysts, facilitating cumulative evidence on the predictive power of socio-emotional skills for life outcomes.

In sum, we hope that our findings will encourage researchers and data producers engaged in the study of socio-emotional skills, personality traits, and related constructs to embrace SEM and especially PV methodology going forward. We submit that PV should not be reserved only for cognitive assessments in LSAS. Instead, they should also be applied to socio-emotional and personality assessments. This will help minimize bias in findings on the (incremental) predictive power of such constructs for life outcomes.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

AUTHOR CONTRIBUTIONS

NB: conceptualization, methodology, formal analysis, visualization, writing—original draft, and writing—revision. CL: funding acquisition, conceptualization, methodology, supervision, writing—original draft, and writing—revision. Both authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

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APPENDIX

TABLE A1 | Mean percentage bias of regression coefficient of the skill for standardized test scores apart from SMS.

RSRO	SS	FL	Items	Std. EBM	Std. RFS	Std. WLE	Std. EAP
Stronger than the covariate	300	High	4	-12.08	-12.07	-12.19	-12.06
			8	-6.39	-6.39	-6.44	-6.36
			12	-4.50	-4.50	-4.53	-4.50
		Mixed	4	-16.59	-16.59	-16.82	-16.58
			8	-7.67	-7.67	-7.90	-7.65
			12	-5.73	-5.72	-5.81	-5.69
		Low	4	-35.87	-35.91	-35.98	-35.92
			8	-22.95	-22.96	-22.98	-22.96
			12	-16.85	-16.86	-16.88	-16.87
	1,000	High	4	-11.90	-11.90	-12.00	-11.88
			8	-6.53	-6.53	-6.56	-6.49
			12	-4.53	-4.53	-4.54	-4.51
		Mixed	4	-16.23	-16.23	-16.42	-16.22
			8	-7.80	-7.80	-7.99	-7.76
			12	-5.72	-5.72	-5.78	-5.68
		Low	4	-34.89	-34.89	-34.95	-34.89
			8	-22.58	-22.58	-22.60	-22.58
			12	-16.68	-16.68	-16.69	-16.68
Weaker than the covariate	300	High	4	-12.29	-12.28	-12.40	-12.27
			8	-6.14	-6.14	-6.19	-6.11
			12	-4.68	-4.68	-4.70	-4.66
		Mixed	4	-16.71	-16.71	-16.95	-16.71
			8	-7.44	-7.44	-7.67	-7.41
			12	-6.12	-6.12	-6.21	-6.09
		Low	4	-36.04	-36.09	-36.15	-36.09
			8	-22.97	-22.98	-23.00	-22.98
			12	-16.67	-16.68	-16.70	-16.68
	1,000	High	4	-11.99	-11.99	-12.07	-11.97
			8	-6.70	-6.70	-6.76	-6.67
			12	-4.51	-4.51	-4.52	-4.49
		Mixed	4	-16.31	-16.31	-16.49	-16.30
			8	-7.98	-7.98	-8.19	-7.94
			12	-5.67	-5.67	-5.74	-5.63
		Low	4	-34.76	-34.77	-34.83	-34.77
			8	-22.78	-22.78	-22.80	-22.78
			12	-16.80	-16.80	-16.81	-16.80

The mean percentage bias was calculated by aggregating percentage bias across 500 replications for each condition.
Note: RSRO: Relative strength of the skill with the outcome, SS: Sample size, FL: Factor loadings.

TABLE A2 | Mean percentage bias of regression coefficient of the covariate for standardized test scores apart from SMS.

RSRO	SS	FL	Items	Std. EBM	Std. RFS	Std. WLE	Std. EAP
Stronger than the covariate	300	High	4	7.57	7.57	7.64	7.56
			8	3.99	3.99	4.02	3.97
			12	3.17	3.17	3.17	3.17
		Mixed	4	10.40	10.40	10.53	10.40
			8	4.88	4.88	4.98	4.86
			12	3.78	3.79	3.80	3.75
		Low	4	20.12	20.14	20.17	20.15
			8	14.55	14.56	14.57	14.56
			12	10.41	10.41	10.42	10.41
	1,000	High	4	7.60	7.60	7.65	7.58
			8	4.19	4.19	4.23	4.17
			12	2.88	2.88	2.88	2.86
		Mixed	4	10.16	10.16	10.28	10.16
			8	5.00	5.00	5.15	4.99
			12	3.62	3.62	3.66	3.59
		Low	4	19.96	19.97	20.00	19.97
			8	13.69	13.69	13.70	13.69
			12	10.50	10.50	10.50	10.50
Weaker than the covariate	300	High	4	4.18	4.18	4.22	4.18
			8	2.68	2.68	2.70	2.67
			12	1.59	1.59	1.59	1.59
		Mixed	4	5.72	5.72	5.80	5.72
			8	3.13	3.14	3.19	3.12
			12	2.06	2.06	2.07	2.04
		Low	4	11.71	11.72	11.73	11.72
			8	7.88	7.89	7.89	7.89
			12	6.04	6.04	6.05	6.04
	1,000	High	4	4.44	4.44	4.47	4.43
			8	2.45	2.45	2.47	2.44
			12	1.64	1.64	1.64	1.63
		Mixed	4	5.93	5.93	6.00	5.93
			8	2.94	2.94	3.03	2.93
			12	2.05	2.05	2.07	2.03
		Low	4	11.41	11.41	11.43	11.42
			8	7.80	7.80	7.81	7.80
			12	5.92	5.92	5.93	5.92

The mean percentage bias was calculated by aggregating percentage bias across 500 replications for each condition.
Note: RSRO: Relative strength of the skill with the outcome, SS: Sample size, FL: Factor loadings.

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REVIEW
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Toward a Model of Personality Competencies Underlying Social and Emotional Skills: Insight From the Circumplex of Personality Metatraits

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In recent years, there has been a growing interest in social and emotional skills (SES) both in the scientific literature and in social practice. The paper presents an overview of the ways of understanding what SES are and the catalogs thereof. There are some attempts in the literature to organize these catalogs within the Big Five traits that for a long time was claimed to be the most sound model of basic orthogonal dimensions of personality. However, further research on personality structure revealed that two metatraits can be found above the Big Five traits. These two metatraits form the basis of the Two Factor Model of personality, which was later developed into the Circumplex of Personality Metatraits. It turned out that in certain aspects models based on metatraits have a greater theoretical potential than those based on the Big Five traits. The paper presents a proposal for describing SES from the perspective of the Circumplex of Personality Metatraits rather than the Big Five. In this framework, we distinguish the concept of personality competences that underlie and organize many specific SES and identify the core personality competencies on the basis of the Circumplex of Personality Metatraits model.

Keywords: social and emotional skills, personality competence, Circumplex of Personality Metatraits, Self-motivation, Impulse control, Social responsibility, Assertiveness

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INTRODUCTION

Social and emotional skills (SES) have, in recent years, been attracting growing attention from academics and practitioners. Such a shared interest in this topic among people from the worlds of science and practice, including education, economics, and politics, is an opportunity to gain scientific and practical benefits, especially a synergy effect in the understanding of the phenomenon and in transferring psychological knowledge to practice. At the same time, however, the diversity of approaches specific to each of these worlds generates many risks, including using the same concepts with different meanings or using different concepts with the same meaning, which may not only significantly reduce this potential synergy effect, but also reduce the chances of any progress in understanding the phenomenon and effectively transferring scientific knowledge to practice. The theoretical considerations and proposals presented in this paper aim to enhance the chance for these benefits and reduce the hazards.

The current state of knowledge on SES emerging at the intersection of science and practice can be described as follows. The concept of skills (and/or competencies) has been present in psychology for some time, particularly in the psychology of individual differences and educational psychology, but the ongoing intense growth of interest in this construct has not been due to the natural development of some theoretical models created as part of basic scientific research. This large increase in attention in the construct of skills was initiated outside academia – a demand was formulated in the fields of education, economics, and politics, to which academic psychology had to respond. In particular, the rapidly changing economic and social reality has led to a growing number of questions about the purpose of education. In a world of constant change and scientific or technological development, education can no longer mean equipping people with knowledge, because the increase in knowledge is so huge that it becomes outdated very quickly. As a result, both in psychological and pedagogical reflection and in official documents, the category of skills or competencies as desired outcomes of education began to appear. Moreover, education is no longer confined to the formal frame of school for children and youth, but extends throughout life in the paradigm of lifelong learning. In such a situation, various lists of these skills as desirable characteristics began to be formulated in a number of areas outside academia and it turned out that a large part of them concerns broadly understood social and emotional functioning. Academic psychology was thus faced with the challenge of scientifically elaborating both the construct of SES itself as well as a list of these skills that would be consistent with current knowledge in the field of psychology of personality and individual differences. The first answers from psychology have already been given in the literature and were as one would expect. Namely, the focus was put on the taxonomy of SES in the Big Five framework (Goldberg, 1990; McCrae and Costa, 2003), where the richness of many personality traits is organized in five main orthogonal personality dimensions (neuroticism/emotional stability, extraversion, openness to experience/intellect, agreeableness, conscientiousness), and in some models in the Big Five framework, each of these dimensions is composed of several facets. Using the Big Five to describe SES was understandable and, one might say, quite obvious. After all, if in psychology there is a set of personality variables that need to be organized, the Big Five usually seems to be the natural approach or at least the point of departure. And so, it was the case this time. The richness of many SES differentiated in several models has been sorted into five domains corresponding to five personality traits as we describe in detail in the subsequent part of the paper.

We argue, however, that such an approach to SES, although natural and convincing at first glance, is nevertheless nonoptimal, because, apart from a simple classification, it in fact does not offer any significant insight into the nature of SES and, therefore, does not allow for the optimization of their formation in education. Moreover, we do not conclude our contribution with such a critical part. Quite the contrary – we suggest an alternative view. Its essence is: (1) adoption of the framework of the Two Factor Model of personality (TFM; review in Cieciuch and Strus, 2017), extended to the Circumplex of Personality Metatraits (CPM; Strus et al., 2014) – as the basis for understanding and classification of SES in place of the previously adopted Big Five framework, and (2) introduction of the concept of *personality competence*, distinguished from SES and being a basis for organizing and developing many specific skills.

More specifically, in this paper, we formulate and justify, based on a thorough literature review, the following claims:

1. Many approaches to skills agree on defining skills as (1) malleable and (2) positive (desirable) characteristics of a person.
2. Skills should be differentiated from traits and abilities, and we propose a way to do it.
3. The models that appear in the literature aimed at integrating skills (usually based on the Big Five) have some limitations.
4. Switching the foundations of SES models from the Big Five to CPM enables the identified problems with SES models to be resolved.
5. Specific social, emotional, and motivational skills (SEMS) are shaped on the basis of four personality competencies, differentiated in CPM.
6. The way in which we propose organizing SES can, in the future, also be expanded to the cognitive domain that can lead to a complex model of all psychological skills and competencies.

DEFINING SKILLS

Common Characteristics of Skills

The concept of skills usually emerges while responding to the question of which human features are responsible for one's effective coping with life and well-being. This general question is made more specific with respect to different contexts concerning both individuals and society. Regarding individuals, these contexts include, for example: a school context (what makes students successfully cope with learning), a vocational context (what makes people successful in the labor market), an interpersonal context (what makes people function well in various types of interpersonal interactions), or a general personal development context (what accounts for a person's self-realization and happiness). In relation to the functioning of societies, this can be, for example, a civic context (what psychological characteristics account for the good functioning of society) or an economic context (what psychological characteristics account for sustainable economic development). Thus, the concept of skills emerges when scientific psychological knowledge is applied to improve the quality of life of people and societies.

When used in this way, the concept flickers with the meanings originating from various contexts and fields of use. At the same time, however, there are two characteristics of skills that are invariant across contexts and seem to apply to all of them.

Firstly, skills are associated with positive valence. Thus, they are desirable characteristics, which are better to have than not

to have. The search for positive human characteristics is especially underlined in the positive psychology framework. Instead of a focus on deficiencies and pathologies of functioning, positive psychology has made calls to focus on positive characteristics and ways to enhance them (Eccles and Gootman, 2002; Peterson and Seligman, 2004; Bowers et al., 2015). Skills are assessed positively because they are associated with a variety of positive outcomes. Sometimes, these are outcomes related to a particular area of life, such as work, and sometimes to well-being in general, as the most universal and most positive outcome (reviews of the association of skills with positive outcomes in: Borghans et al., 2008a; Kautz et al., 2014; Kankaraš, 2017; Chernyshenko et al., 2018).

Secondly, skills are understood as being malleable, that is, they can be shaped in the process of various interactions and education – formal, informal, lifelong education, self-education, etc. It is worth noting that considering skills as malleable is one of the defining features reflecting the origins of interest in this construct. Generally, in psychology, the question of whether a given characteristic is stable or can be changed and shaped is an important one. Answers to this question are ultimately provided in the course of long-term empirical research. Moreover, these answers are not usually conclusive in the zero-one sense. However, since much of the interest in the construct of skills is the result of demand from the world of practice focused on the improvement of people's and society's quality of life, this malleability has from the beginning been expressed explicitly or assumed implicitly. After all, if skills are to be the goal of education, they must be malleable.

What Are Social and Emotional Skills and What Are They Not?

Psychological variables that determine career and life success have been identified in the literature and then usually divided into two types of skills: cognitive and noncognitive. The first studies on this topic appeared in economics, and the subject of interest was the relationship between professional success (usually measured by earnings) and education (Becker, 1964; Ben-Porath, 1967). These first papers introduced the construct of *cognitive ability*. In contemporary psychology, abilities are usually distinguished from skills in such a sense that abilities are just a potential, while skills are acquired and developed intentionally through experience and practice (Riggio, 2017). In the past, this differentiation was, however, not always made clear enough and the same cognitive variables measured by various intelligence or achievement tests were sometimes labeled as *abilities* (Kuncel et al., 2004) and sometimes as *skills* (Burks et al., 2009). After decades of research, they have become a generally accepted predictor of successful vocational functioning.

Once the role of cognitive skills in achieving life success was established in the literature, research began to emerge demonstrating the significance of other skills than the cognitive ones in achieving this goal. They were usually labeled as *noncognitive skills* (Heckman and Rubinstein, 2001; Heckman et al., 2006; Thiel and Thomsen, 2013; Kautz et al., 2014) and referred to broadly understood personality characteristics, including personality traits (Borghans et al., 2008b; Almlund et al., 2011; Becker et al., 2012). In this context, other terms also appear: the term *soft skills* (Heckman and Kautz, 2012; Balcar, 2014; Koch et al., 2015; Lippman et al., 2015) and more and more often, especially in psychological literature – the term *socio-emotional skills* (Koch et al., 2015; Kankaraš, 2017). Noncognitive skills have typically been considered as comprising a larger number of constructs with a less well-described structure than cognitive skills (Heckman and Rubinstein, 2001).

The distinction between cognitive and noncognitive skills, while intuitively understandable, is nonetheless quite problematic from the psychology of personality point of view (Duckworth and Yeager, 2015). The concept of noncognitive skills has in fact been criticized in psychology for as long as it has been in use (Messick, 1979). Of course, one can identify prototypical skills for both domains (e.g., patience as a noncognitive skill and reading speed as a cognitive skill). However, the disadvantage of such a distinction is the problematic exclusion of cognitive aspects from given noncognitive skills. And yet, in fact, most or maybe even all skills possess an aspect of some processing of information, which is exactly the cognitive aspect (Duckworth and Yeager, 2015). On the other side, it also seems to be impossible to separate cognitive skills from noncognitive elements. Interestingly, even Wechsler himself wrote in 1943 regarding intelligence: "in addition to intellective there are also definite nonintellective factors which determine intelligent behavior" (Wechsler, 1943, p. 103). Today, the impact of noncognitive skills on the results of tests measuring cognitive skills is quite obvious (Borghans et al., 2011).

Whereas the distinction between cognitive skills and noncognitive skills is difficult to carry out systematically and, in general, lacks important practical consequences, the distinction between skills and traits is essential from both a theoretical and practical point of view (Soto et al., 2020). According to Soto et al. (2020), in the personality domain, the difference between skills (or, more precisely, SES) and traits (or, more precisely, the Big Five personality traits) can be described using the pair of concepts of capacity vs. tendency. SES relate to a domain-specific *capacity* for doing something, while personality traits relate to a cross-situational *tendency* for doing something. This relatively precise distinction allowed Soto et al. (2020) to use knowledge accumulated in the Big Five research tradition to group and describe SES. While it is a step in the right direction, this proposal does raise some problems, which will be discussed in the following paragraphs of this paper. Still, the distinction between skill-like and trait-like constructs is itself valuable and worth applying to the cognitive domain as well. It can help to differentiate between cognitive skills (skill-like construct) and abilities (trait-like construct). However, there are also two important differences between trait-like constructs from the personality domain and cognitive domain. The first is that trait-like constructs in the personality domain are a tendency, while in the cognitive domain, they are an ability. The second is that the trait-like constructs from the personality domain are usually bipolar, that is, both poles of a given aspect

have their own psychological characteristics; one pole is not merely the absence of the characteristics of the other pole (e.g., introversion is not merely the absence of extraversion). In contrast, the trait-like constructs from the cognitive domain are unipolar, that is, one pole is defined and the other pole represents the lack of a given characteristic (e.g., low intelligence means only a lack of high intelligence).

The above differentiations are summarized in **Table 1**. In this view, the constructs that differ the most are intelligence (cognitive ability) and SES (noncognitive capacity). From the point of view of personality psychology, it is also crucial to distinguish between a skill and a trait, since the former is a possible object of intervention and education, while the latter is not or only to a small extent (depending on how the traits are defined). In other words, skills are malleable, while traits are rather stable. Regarding the distinction between cognitive and noncognitive skills, it can be assumed after Messick (1979) that cognitive means not only cognitive, and noncognitive does not imply the absence of cognitive. While at the level of trait-like constructs, this differentiation can still be clearly maintained; at the level of skills, the boundaries become blurred. This is because in the case of skills, it is rather a distinction between cognitive and noncognitive *aspects* of a given skill. Of course, for some skills, the cognitive or noncognitive aspect may be rather small and can be omitted. In this paper, we focus on the SES in which the cognitive aspect is not very significant. However, after presenting our proposal, we show the usefulness of expanding it to the cognitive domain.

CATALOGS OF SOCIAL AND EMOTIONAL SKILLS OR SKILLS WITH SOCIAL AND EMOTIONAL CONTENT

In the literature, there are many catalogs of skills, sometimes referred to by different names (reviewed in: Berg et al., 2017), and they can be generally divided into three types, based on whether they originate from the basic scientific research or the world of practice. One type is generated by researchers within academia to describe individual differences relevant from a theoretical point of view. The second type is generated by practitioners, policymakers, or stakeholders, and its essence is to identify skills relevant from the perspective of the demand from the changing world, economy, and new social challenges. The third type of catalog is generated in collaboration between academics and practitioners, that is, the skills desired from a practical point of view are identified, but at the same time, they are subjected to intensive scientific research. Finally, there are some attempts to integrate the distinguished catalogs of skills. It should be borne in mind that, in all cases, there are also catalogs that are not called catalogs of skills by their authors, but the characteristics of the distinguished constructs meet the definitional criteria of skills. The following paragraphs will discuss the best-known representatives of each type and then present our model, located in the third (synthesizing) type but overcoming the problems of current proposals.

TABLE 1 | Different types of characteristics fostering success and well-being.

Characteristic	Cognitive	Noncognitive
Trait-like	*Ability*	*Tendency*
	e.g., Intelligence	e.g., The Big Five traits
Skill-like	*Capacity*	
	Cognitive skills	Social and emotional skills

Catalogs Developed Within Basic Research

Examples of the first type of catalog are proposals that use terms other than skills, but which are *de facto* lists of skills in the sense presented above. These are: character strengths catalog of Peterson and Seligman (2004) and emotional competencies catalog of Saarni (2000). List of character strengths of Peterson and Seligman (2004) appears in various reviews of SES (Berg et al., 2017; Soto et al., 2020) because character strengths possess both of the properties of skills identified above: They are positive and malleable (Peterson and Seligman, 2004). Peterson and Seligman (2004), through their concept of character strengths, draw the attention of psychologists to those aspects of human functioning that enable a person to develop, grow, and to have a good, happy life, or in another words – the aspects leading to, constituting, and explaining eudaimonistically understood well-being. They look for these attributes not only in the scientific psychological literature, but also in the classical philosophical and religious literature as well. As a result, they built a list of qualities that have been valued by moral philosophers, religious thinkers, and lay people over the centuries. The list consists of 24 character strengths assigned to six virtues: (1) Wisdom (creativity, curiosity, open-mindedness, love of learning, and perspective), (2) Courage (bravery, persistence, integrity, and vitality), (3) Humanity (love, kindness, and social intelligence), (4) Justice (citizenship, fairness, and leadership), (5) Temperance (forgiveness, humility, prudence, and self-regulation), and (6) Transcendence (appreciation of beauty, gratitude, hope, humor, and spirituality). However, based on empirical research, these 24 character strengths are usually grouped into five domains corresponding to the Big Five traits (review in Najderska and Cieciuch, 2018).

Saarni (2000), on the other hand, focused on what is necessary for navigating the demands of the social context and distinguished the following skills (named by her as competencies): (a) awareness of one's emotional state, (b) discerning others' emotions, (c) using the vocabulary of emotion, (d) empathic and sympathetic involvement in others' emotional experiences, (e) understanding the difference between inner emotional state and outer expression, (f) adaptive coping with aversive or distressing emotions, (g) understanding the influence of emotions on the relationship, and (h) emotional self-efficacy. Saarni (2000) emphasizes that the distinguished skills are not independent – they are

interrelated and condition each other. Such linkages beg the question of whether there are any more fundamental dimensions underlying the distinguished skills.

Catalogs Developed Outside Academia

The catalogs of the second type are developed outside academia, although scholars are often involved in their development. Their core is the identification of those skills, the acquisition of which increases, on the one hand, the chances for professional success and personal well-being, and on the other hand, economic development or good functioning of society. It happens that they do not have a personal authorship, because their authors are organizations or institutions. Interestingly, they are usually not introduced in the classical scholarly circuit – a system of publication in peer-reviewed journals that over the years turns into an archive that can be used to trace the evolution of a construct. As a consequence, it is sometimes difficult to reconstruct such an evolution, and it also happens to be the case that the understanding of a given construct is simply changed by a given organization or by another organization that in one way or another builds on the previous one. This is the case with so-called 21st century skills. It is a kind of widespread approach that draws attention to the need to change the thinking about what skills will be needed for personal and professional success in the 21st century (Trilling and Fadel, 2009). The movement was initially closely associated with the Partnership for 21st Century Skills, founded in 2002 as a nonprofit organization gathering members from the fields of business, education, and politics. This association distinguished three groups of 21st century skills: (1) learning and innovation skills, (2) information, media, and technology skills, and (3) life and career skills. Today, however, the ideas of the Partnership for 21st Century Skills are being pursued by Battelle for Kids, an American not-for-profit organization whose mission is to promote the teaching of 21st century skills. Battelle for Kids was established in 2001, and in 2018, the organization was joined by the Partnership for 21st Century Skills (according to information available at https://www.battelleforkids.org/about-us on 04/02/2021). The resources currently available in the public domain offer slightly varying lists of 21st century skills compiled by Battelle for Kids, Partnership for 21st Century Skills or their members. Trilling and Fadel (2009), co-authors of this approach as part of the Partnership for 21st Century Skills, distinguish even more specific skills within the above-mentioned types of skills. According to them, learning and innovation skills include the following: (a) critical thinking and problem solving, (b) communication and collaboration, and (c) creativity and innovation. Information, media, and technology skills – from the main classification – become, in their approach, specific skills from the area of digital literacy skills. Life and career skills, meanwhile, include the following: (a) flexibility and adaptability, (b) initiative and self-direction, (c) social and cross-cultural interaction, (d) productivity and accountability, and (e) leadership and responsibility. However, other detailed suggestions can also be found on the websites of Battelle for Kids,[1] which indicates that the essence of this proposal is a general approach rather than detailed catalogs.

The construct of 21st century skills and the list thereof were further refined by the National Research Council by establishing the Committee on defining deeper learning and 21st century skills under the leadership of Pellegrino and Hilton (2013). This approach adopts the concept of *competence* as a term organizing various skills and at the same time linked to a person's knowledge and attitudes (Pellegrino and Hilton, 2013). Proposal of Pellegrino and Hilton (2013) to organize skills is presented in the next paragraph.

Using the term of competencies in the meaning indicated above originated from the OECD (2005) and was adopted by the European Commission in the Council Recommendation of 22 May 2018 on key competences for lifelong learning (The Council of the European Union, 2018). It employs the category of key competence defined as a combination of knowledge, skills, and attitudes. The Council of the European Union (2018) identifies eight key competencies "necessary for employability, personal fulfilment and health, active, and responsible citizenship and social inclusion": (1) literacy competence, (2) multilingual competence, (3) mathematical competence and competence in science, technology, and engineering, (4) digital competence, (5) personal, social, and learning to learn competence, (6) citizenship competence, (7) entrepreneurship competence, and (8) cultural awareness and expression competence.

Catalogs Developed at the Meeting Point of Basic and Applied Research

Another prominent example of a construct introduced by an organization into the public, but in this case also much more into the scholarly circuit, is the construct of social and emotional learning (SEL) and the organization is the Collaborative for Academic, Social, and Emotional Learning (CASEL). The organization was founded in 1994 by, among others, Goleman (1996), one of the main propagators of the concept of emotional intelligence. The goal of the CASEL was establishing and promoting SEL as a crucial part of education. The construct of SEL is present in papers published in mainstream scientific psychology journals (e.g., Durlak et al., 2011; Domitrovich et al., 2017). Here, the focus is directly on the category of learning, and thus, SEL is defined as the process through which people (both children and adults) acquire and effectively apply the knowledge, attitudes, and skills, collectively referred to as competencies (Jagers et al., 2019). From the perspective of SES, what is crucial is the defining purpose of this process of learning and that is precisely the acquisition of core social and emotional competencies. In the CASEL proposal, these core social and emotional competencies are as follows: (1) self-awareness, (2) self-management, (3) social awareness, (4) relationship skills, and (5) responsible decision-making (CASEL - Collaborative for Academic, Social, and Emotional Learning, 2003; Jagers et al., 2019).

Another list of positive, malleable characteristics that emerged from a collaboration of practitioners, policy makers, and

[1]www.battelleforkids.org

researchers is the so-called Five Cs model proposed by Lerner (review in: Geldhof et al., 2015). It was proposed within the positive youth development perspective, which proposes an education focused on developing positive qualities instead of an education focused on making up deficits (Lerner, 2015). The Five Cs that group the positive qualities are as follows: competence, confidence, character, caring, and connection. The list groups together characteristics similar to the character strengths proposed by Peterson and Seligman (2004) discussed earlier, but unlike the latter, it is oriented toward identifying the purposes of school education and from the outset has been introduced into both research and educational practice (Phelps et al., 2009; Bowers et al., 2010; Lerner and Lerner, 2013). Therefore, it is situated at the meeting point of basic and applied research. **Figure 1** graphically depicts the dual genesis of various catalogs of skills.

PRIOR ATTEMPTS AT ORGANIZING SOCIAL AND EMOTIONAL SKILLS

A Map of All Skills

In the literature, there have been attempts to integrate several catalogs of skills and similar constructs and develop a kind of map of all skills, including both cognitive skills and SES. Each time, the starting point is some well-established model in the psychology of individual differences, which becomes a kind of reference system for organizing the distinguished skills.

For example, the National Research Council (Pellegrino and Hilton, 2013), in order to structure skills, adopted two well-established taxonomies of individual differences. For cognitive skills, it was the "three stratum" hierarchical model of intelligence with the general cognitive ability factor at the top, eight second-order abilities (factors) at the second stratum, and more narrowly defined abilities at the third stratum (Carroll, 1993). The Big Five framework (Goldberg, 1992; McCrae and Costa, 2003), on the other hand, was adopted for noncognitive skills. The various detailed lists of 21st century skills are sorted by the National Research Council (Pellegrino and Hilton, 2013) into three main groups labeled as competencies: (1) cognitive, (2) intrapersonal, and (3) interpersonal. Within each group, three clusters were distinguished, and then, each of these clusters was assigned to one of the Big Five traits (clusters from intrapersonal and interpersonal groups) or to one of the first three factors of intelligence (clusters from cognitive group) at the second stratum of the "three stratum" model (Carroll, 1993): fluid intelligence, crystallized intelligence, general memory, and learning.

The OECD (2015) also adopted a similar categorization of skills into (1) cognitive and (2) SES and distinguished three clusters in each of these two groups. **Figure 2** depicts propositions of such general maps of skills by the National Research Council (Pellegrino and Hilton, 2013) and the OECD (2015) along with the corresponding constructs from the hierarchical model of intelligence and the Big Five.

This paper deals with SES, so they are the ones we will focus on, and we will come back to the whole map after presenting our theoretical proposal.

Taxonomy of Social and Emotional Skills

The attempts to integrate different lists of SES have, to date, generally been made in the Big Five framework

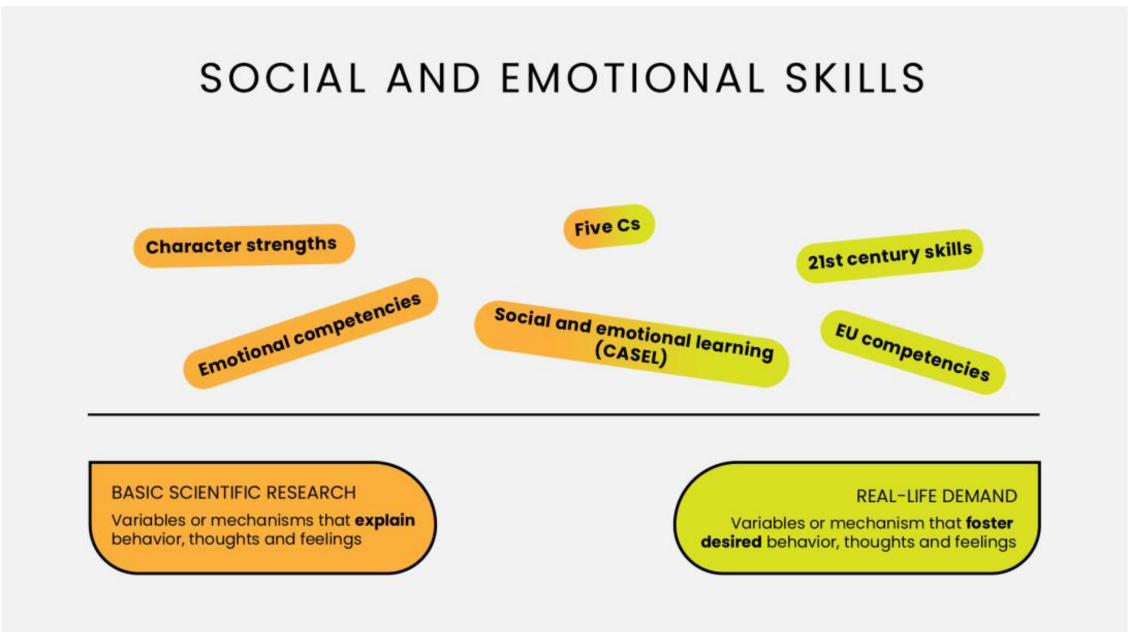

FIGURE 1 | The dual genesis of various types of skills catalogs.

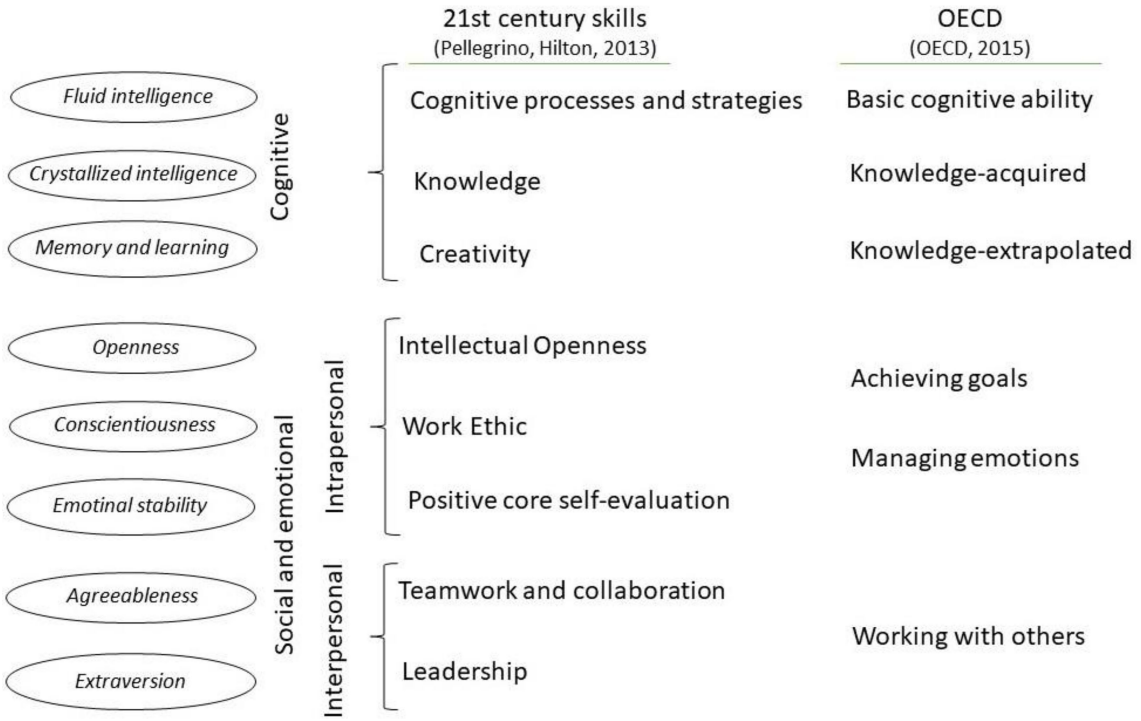

FIGURE 2 | Proposals of structuring skills according to the National Research Council (Pellegrino and Hilton, 2013) and the OECD (2015).

(Pellegrino and Hilton, 2013; Kautz et al., 2014; De Fruyt et al., 2015; John and De Fruyt, 2015; Kankaraš, 2017; Chernyshenko et al., 2018; Kankaraš et al., 2019; Kankaraš and Suarez-Alvarez, 2019; Soto et al., 2020, 2021). The literature indicated above presents proposals of integrating various lists of SES within the framework of the Big Five, also taking into account lower-order traits (for a review of structural models of personality, see: Strus and Cieciuch, 2014). **Table 2** summarizes these attempts by taking into account the most synthetic ones, that is, the theoretical and empirical synthesis in the OECD study (Kankaraš and Suarez-Alvarez, 2019) and the proposal of Soto et al. (2020, 2021). The work on organizing the skills in both of these approaches followed three similar steps. As a first step, both Soto (Soto et al., 2020) and researchers under the OECD (John and De Fruyt, 2015; OECD, 2015) sorted out the various existing lists of SES by assigning the distinguished skills to the Big Five domains. Since the Big Five proved to be effective in integrating catalogs of SES created outside this paradigm as well, in the second step, Big Five was no longer used to organize other lists of SES that more or less matched the Big Five domains, but to find SES within facets distinguished in several Big Five models. In the research conducted under the OECD (Kankaraš and Suarez-Alvarez, 2019), the second step consisted of selecting skills from those facets that meet the following criteria: (a) predictive value, (b) malleability, (c) appropriateness for children and adolescents, (d) possible to measure in a comparable way across cultures, (e) relevant for the future world, and (f) already well researched (Kankaraš and Suarez-Alvarez, 2019). Soto et al. (2021), on the other hand, selected from various hierarchical Big Five models those facets that correspond to skills they defined as capacities used to maintain social relationships, regulate emotions, and manage goal- and learning-directed behaviors. It should be added here that Soto et al. (2021) expand the name of "social and emotional" (SE) skills to social, emotional, and behavioral (SEB) skills to better reflect the scope of the skills domain, as well as to distinguish the acronym describing SES from SES for socioeconomic status, which is often used in the literature. In addition, Soto et al. (2020) identified prototypical SES within each domain, thus emphasizing that the lists are not closed. **Table 2** presents specific SES identified in both approaches assigned to the five personality domains. Moreover, the third step in both proposals involved developing an operationalization of the identified SES. The OECD researchers (Kankaraš and Suarez-Alvarez, 2019) largely used items from the International Personality Item Pool resources (Goldberg et al., 2006). In contrast, Soto et al. (2021) created items in such a way as to distinguish capacity (definitional for skills) from tendency (definitional for traits).

Both proposals led to a fairly similar list of variables, with Soto's proposal (Soto et al., 2020, 2021) systematically differentiating between skills and traits in addition to the catalog of SES in the Big Five framework, as well as deriving implications of this differentiation for measurement. Both proposals, while interesting in their holistic approach, nevertheless inherit the concerns and problems associated with the Big Five, as will be discussed below.

TABLE 2 | Specific social and emotional skills located within Big Five domains in two approaches.

The Big Five	The proposal of Soto et al. (2020, 2021)	The proposal of OECD (Kankaraš and Suarez-Alvarez, 2019)
Conscientiousness	Self-management – **Task management** – Time management – Detail management – Organizational skill – Responsibility management – Capacity for consistency – **Goal regulation** – Rule-following skill – Decision-making skill	Task performance – Self-control – Responsibility – Persistence
Extraversion	Social engagement – **Leadership skill** – Persuasive skill – **Conversational skill** – Expressive skill	Engagement with others – Sociability – Assertiveness – Energy
Agreeableness	Cooperation – Teamwork skill – Capacity for trust – **Perspective-taking skill** – **Capacity for social warmth**	Collaboration – Empathy – Trust – Cooperation
Openness	Innovation – **Abstract thinking skill** – Creative skill – **Artistic skill** – Cultural competence	Open-mindedness – Tolerance – Curiosity – Creativity
Emotional stability	Emotional resilience – **Stress regulation** – Capacity for optimism – **Anger management** – Confidence regulation	Emotion regulation – Stress resistance – Optimism – Emotional control
Blends or additional traits	– Energy regulation (blend of Self-management with Social engagement) – Ethical competence (blend of Self-management with Cooperation) – Information processing skill (blend of Self-management with Innovation) – Impulse regulation (blend of Self-management with Emotional resilience)	Additional indices – Achievement motivation – Self-efficacy

In bold – examples of prototypical skills from Soto et al. (2020).

PROBLEMS WITH PAST PROPOSALS TO ORGANIZE SOCIAL AND EMOTIONAL SKILLS UNDER THE BIG FIVE FRAMEWORK

Attempts to organize personality variables into Big Five domains are a fairly natural and frequently used approach when in a given personality sphere many constructs are differentiated with unclear relations between them. Such an approach was applied, for instance, to 24 character strengths, which, as it turned out, can also be clustered into factors similar to the Big Five (review in Najderska and Cieciuch, 2018). This was also applied to attempts at describing personality disorders in the dimensional approach proposed by DSM-5 (American Psychiatric Association, 2013) and ICD-11 (World Health Organization, 2020), which also distinguish five domains analogous to the Big Five. A similar approach has also been applied to organizing the traits characterizing specific categories of personality disorders (cf. Bagby and Widiger, 2018). This approach transforms an unorganized set of characteristics into an ordered structure, which is of significant added value, especially at the initial stages of research on a given phenomenon. At the same time, however, this approach has its limitations, some of which are inherited from the Big Five model itself.

Interestingly, the application of the Big Five to describe other spheres of personality intensified when basic research on personality structure led to the conclusion that the Big Five cannot be treated as a final model of basic personality trait structure any longer. In psychology, it rarely happens that one dominating model is completely replaced by another. Rather, competing models appear, which in some way improve or complement those previously dominated and considered most accurate. They all continue to coexist in the scholarly circuit, and the initial model is no longer the only point of reference. This is the situation of the Big Five. Its potential to organize the area of personality traits is unquestionable, which is shown in a vast amount of literature. At the same time, however, if there are new personality spheres to be described using the basic dimensions of personality, then the Big Five is no longer the only candidate worth considering, and one could even argue that it is not the best one. This is because, on the one hand, models have emerged that propose a different number of basic dimensions that are at least equally well-supported (especially the HEXACO model; Ashton and Lee, 2007, 2020), and on the other hand, there are other structural proposals that offer an integration of various models of personality and emotional and social functioning in at least as broad a manner as the Big Five models (especially the CPM; Strus et al., 2014; Strus and Cieciuch, 2021).

Strus et al. (2014) have distinguished three major controversies now related to the Big Five: (1) the number of basic dimensions, (2) the orthogonality of the five dimensions, and (3) the problems with overcoming the purely descriptive nature of the five-factor taxonomy of personality. Each of these problems has quite far-reaching implications for the SES model that is built within the Big Five framework.

The first problem, with respect to SES, is the question of why exactly these five basic SES domains should be distinguished to describe the diversity of SES. There are, after all, alternative models – for example, HEXACO, which distinguishes six domains, adding Honesty-Humility and reconceptualizing Agreeableness and Neuroticism (Ashton and Lee, 2007). While there are considerations on the HEXACO model in the literature on the classification of SES (Kankaraš, 2017), it is the Big Five that ultimately appears in the proposed approaches. Even if the Big Five is good enough to describe the diversity of

personality traits, it is not clear why it should be optimal for describing the diversity of SES, since the nature of skills (as a malleable capacities) is different from that of traits (as tendencies; Soto et al., 2020).

Incidentally, in the first propositions to consider SES in the Big Five framework, it was believed that personality traits are also malleable and can change under the influence of external factors and learning, while SES, in contrast, demonstrate high stability (John and De Fruyt, 2015). Pellegrino and Hilton (2013), who used models of intelligence structure in addition to the Big Five to classify skills, cited research, which even demonstrated the malleability and changeability of intelligence. Such an approach, reducing the differences in malleability between traits and skills, was an important argument to justify the use of the Big Five (and intelligence) to classify and describe skills. Indeed, the definitional prerequisite was to assume malleability of skills, but – as argued – personality traits are also changeable and malleable. The integration of skills with traits in the Big Five framework is sometimes so far-reaching that, for example, Chernyshenko et al. (2018) explicitly write that "skills," "sub-domains," and "facets" are used interchangeably, and they review trait models not only of personality but even of temperament in order to identify facets/skills below the Big Five in the hierarchical structure of traits.

In recent years, however, the concepts of skills and traits have been increasingly distinguished. Kankaraš and Suarez-Alvarez (2019) explicitly state that they use the term skills rather than traits to indicate the possibility of change and development, and Soto (Soto et al., 2020) introduces the postulate of a necessary systematic differentiation of malleable skills from rather stable traits (see McCrae and Costa, 2003). At the same time, in both the approaches mentioned above (OECD, Kankaraš and Suarez-Alvarez, 2019 and Soto et al., 2020), SES are identified among facets of the Big Five or in another words lower-order traits. It is worth noting, however, that this means *de facto* accepting the assumption that lower-order traits of the Big Five can be divided into malleable skills and nonmalleable nonskill traits and that this can be done essentially in each of the five personality domains. This, in turn, has far-reaching theoretical implications for the Big Five models, particularly for the relationship between lower-order traits and the five basic dimensions of personality. If some lower-order traits are malleable, then the malleability of higher-order traits, that is, Big Five dimensions, becomes an issue and the distinction between malleable skills and stable traits becomes blurred again. To summarize – using the Big Five to describe SES (1) seems to be rather an arbitrary choice given competing models (e.g., HEXACO) and (2) carries quite serious theoretical implications for the Big Five itself.

The second problem of the Big Five is the orthogonality of the distinguished five basic dimensions. Orthogonality was an important thesis of the Big Five models, because it aimed to provide a set of basic, independent dimensions for describing personality. Application of the Big Five as a framework for SES in principle should also imply the adoption of the thesis that the underlying dimensions of SES are orthogonal. However, many SES models explicitly mention deviations from orthogonality. Both Soto (Soto et al., 2021) and the OECD (Kankaraš and Suarez-Alvarez, 2019) distinguish SES that are blends of Big Five traits (cf. **Table 2**). Similarly, of the eight main SES distinguished in the PRACTICE model (Guerra et al., 2014), half are assigned to Big Five traits and half are blends of basic traits. The far-reaching nonorthogonality of the domains is also evidenced by the Five Cs research results, in which a higher-order factor grouping of all the Cs is clearly evident (Bowers et al., 2010). It is worth noting that the question of the relationship between SES (orthogonality is a special case of such relationships) is relevant to any model or catalog of SES because it determines whether the development of SES belonging to one domain can contribute to the development of SES belonging to another domain or whether these are independent groups of SES. Knowing this is of great practical importance, yet the demand of practice is the starting point for creating SES models. Thus, the linkages and relationships between SES, grouped in the basic domains/dimensions, are crucial.

The third problem in Big Five research (a purely descriptive nature of the five-factor taxonomy) is the most significant. Applying the Big Five taxonomy to grouping and organizing SES does bring some order, but unfortunately in principle does not open up the possibility of better understanding what SES are, the mechanisms behind their development, and to locating them in the dynamic structure of personality. A model that merely assigns SES to five personality domains fails to answer a number of questions, including: (1) what are the relationships between individual SES within a domain and across domains; (2) is there any hierarchy of SES, and if so, what does it tell us – is it better to shape general SES that will extend into specific ones, or is it better to shape specific skills that shape the general one; (3) is transfer between particular skills possible; and (4) does the malleability of SES mean that they are completely undetermined by biological factors, or do people differ in some initial level of readiness to develop various SES? Lack of knowledge of the SES shaping or developmental mechanisms in the Big Five framework greatly limits the practical usefulness of such a model.

The final unresolved problem with the SES model under the Big Five framework – which is no longer inherited as a problem with the Big Five model – is the question of the optimal level of intensity of a given skill and the conditions on which that optimal level depends. Two approaches are possible, which can be provisionally named as maximalist and balanced. In the first approach, the greater the intensity of a given skill, the better – greater chances for professional and personal success, and therefore, each skill is worth strengthening almost indefinitely, regardless of other SES. In the second approach (balanced), the Aristotelian golden mean applies, so that both extreme intensities of a given dimension are suboptimal, while the optimal one is the middle one. An example is courage, located after Aristotle as the golden mean – between the wrong extremes of cowardice and bravado. Adopting the Big Five model does not allow for a conclusive answer to the question of an optimal SES intensity level. On the one hand, each of the five traits

– despite the neutral nature of the description – has its adaptive pole, which together form the so-called General Factor of Personality (Musek, 2007; Rushton and Irving, 2011). This is high extraversion, agreeableness, conscientiousness, openness to experience, and emotional stability. On the other hand – there are some arguments that both extremes of a trait can be maladaptive. ICD-11 (World Health Organization, 2020), taking the Big Five as a starting point to distinguish pathological traits responsible for personality disorders, assumed that in the case of extraversion, agreeableness, and emotional stability, it is the negative pole that is maladaptive, but in the case of conscientiousness – both poles are maladaptive. They are labeled as disinhibition (extreme low conscientiousness) and anankastia (extreme high conscientiousness). This issue becomes even more pertinent given that conscientiousness is the domain that appears to be particularly important to success and well-being in the professional sphere.

CHANGING THE FRAMEWORK FROM THE BIG FIVE TO THE CIRCUMPLEX OF PERSONALITY METATRAITS

The SES model we propose incorporates the advantages of considering SES in the Big Five framework, while addressing the problems with the Big Five discussed above. Specifically, our proposal (1) identifies basic dimensions that match the nature of SES and that can describe diversity of SES in a relatively simple manner; (2) roots these dimensions in a complex, holistic model of personality structure with deduction of their underlying mechanisms; and (3) precisely formulates the conditions under which the maximum intensity of a given skill is optimal and under which its average intensity is optimal.

The issue of the nonorthogonality of the Big Five discussed above led to the development of the Two Factor Model of personality (review in Cieciuch and Strus, 2017). Its essence, however, is not just the reduction in dimensions, but rather the identification of the basic mechanisms underlying personality dynamics (see Digman, 1997; DeYoung, 2006, 2015). This model was later extended to the CPM (Strus et al., 2014), which distinguishes the four most basic meta-dimensions of personality (and the eight metatraits located at their poles). As we will show below, the CPM can be the basis of the SES model.

Two Factor Model of Personality

As Cieciuch and Strus (2017) show, the TFM of personality integrates three quite different lines of psychological research. The first is the psycholexical research that originally led to the discovery of the Big Five in the English language (Goldberg, 1990), but replications in non-Germanic languages conducted since the 1990s have shown increasing problems with Big Five replicability. It is now quite widely accepted that only two broad factors appear to be fully ubiquitous across languages and cultures, and they are usually called self-regulation and dynamism (Saucier et al., 2014).

The second line of research integrated into the TFM model is questionnaire-based personality structure research, which led to the unexpected discovery of higher-order personality factors above the Big Five (Digman, 1997). One higher-order factor is formed by the shared variance of emotional stability (vs. neuroticism), conscientiousness, and agreeableness, with the other one being formed by the shared variance of extraversion and openness to experience (intellect). Digman (1997) named the former Alpha and interpreted it as a socialization factor, while the latter was named Beta and was interpreted as a personal growth factor.

The third line of research combined by TFM is the most diverse. It was initiated by Digman (1997) and includes a number of dual constructs in psychology that, in different approaches and in very different theoretical traditions, were used for describing the underlying dimensions or mechanisms that describe and explain personality or even more broadly – psychological life. Some of the best-known dual constructs that are theoretically related to the two higher-order factors of personality include the following: openness (vs. conservation) and self-transcendence (vs. self-enhancement) as basic human values (Schwartz et al., 2012); ego-resiliency and ego-control as basic properties of ego (Block and Block, 1980); power and intimacy as basic motivations (McAdams, 1988); positive and negative affect as basic dimensions of affect (Watson and Tellegen, 1985); impulsiveness (BAS) and anxiety (BIS) as basic dimensions of temperament (Gray, 1991); internalizing and externalizing problems as basic classes of psychopathology (Krueger and Markon, 2006); and also accommodation and assimilation as basic developmental processes (Piaget, 1952). It is worth noting that such dual constructs also occurred at the intersection of psychology and other sciences. In particular, a pair of concepts proposed by Bakan (1966) in philosophy were used to describe the basic modalities of human existence: Agency and Communion and a pair of concepts proposed by Grossberg (1980) in cybernetics to describe the necessary conditions for the functioning of each artificial and biological learning system: Plasticity (ability to acquire new knowledge) and Stability (ability to maintain the acquired knowledge). The Stability-Plasticity pair was used by DeYoung et al. (2002) to redefine Alpha and Beta of Digman (1997) and is commonly used nowadays to describe the two personality metatraits. Stability and Plasticity in original approach of Grossberg (1980) explicitly refer to skills, which is particularly relevant to SES, although Grossberg uses the term ability (due to the fact that he is describing a cybernetic system in which it is not possible to distinguish skills from abilities).

Two Factor Model therefore integrates: (1) the inductive discovery of two factors in psycholexical research, (2) the unexpected discovery of two metatraits in the questionnaire research on personality structure with (3) various dual constructs (mechanisms) identified in different areas of psychology and beyond. This means that the constructs highlighted in the TFM are not merely dimensions that only combine descriptive traits, but have great theoretical potential to explain the entire personality functioning.

Circumplex of Personality Metatraits

Circumplex of Personality Metatraits proposed by Strus and colleagues (Strus et al., 2014; Strus and Cieciuch, 2017, 2021) continues the line of thinking in terms of broad personality dimensions. The CPM applies the idea of circular organization of metatraits, arranging Alpha/Stability and Beta/Plasticity as orthogonal axes within a circumplex structure. In addition, the CPM incorporates two other metatraits, that is, Gamma/Integration and Delta/Restraint, which are located orthogonally to each other and at a 45 degree rotation to the Alpha/Stability and Beta/Plasticity. Importantly, the CPM in its refined version (Strus and Cieciuch, 2021) defines Alpha/Stability and Beta/Plasticity not only in terms of the five factors of the FFM, but also by using the six factors of the HEXACO, while somewhat reconstructing the metatraits built over the Big Five. The model is presented in **Figure 3**, while the metatrait definitions can be found in **Table 3**.

Inheriting, as it were, the integrative potential of the TFM and further extending it by identifying two additional metatraits, the CPM has become a general model of personality, synthesizing several models of various personality variables. Previous empirical research supports this synthesizing potential of CPM, which (1) integrates the Big Five and HEXACO (Strus and Cieciuch, 2021); (2) allows for demonstrating subtle differences between the Big Two derived from the psycholexical and questionnaire traditions (Strus and Cieciuch, 2019); (3) allows for the integration of models of temperament, emotion, motivation, values, well-being, and mental health problems, including personality disorders, into a single framework (Strus and Cieciuch, 2017; Zawadzki, 2017; Rogoza et al., 2019). Moreover, as demonstrated by Strus et al. (2021c); (4) the CPM has proved to be useful for resolving which pathological Big Five is more justified – the one proposed by the DSM-5 (American Psychiatric Association, 2013) or by the ICD-11 (World Health Organization, 2020); and (5) it has helped resolve issues with the number and content of personality types (Strus et al., 2021a,b). The CPM is also used to create new models in which the relationships between constructs are precisely defined in a reference system of two basic dimensions, as in the CPM. This was the case for the example of (6) Rogoza et al. (2021, under review) who constructed a model of vulnerable narcissism in this way, (7) Rymarczyk et al. (2020) who proposed a reconceptualization of type C of personality, and (8) Strus et al. (2021, under review) who developed a new model of temperament. Given the above, the CPM seems a good candidate to be used for developing the SES model.

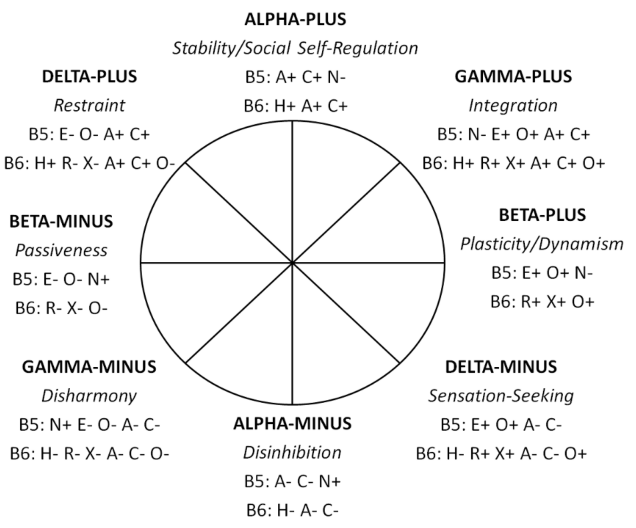

FIGURE 3 | The Big Five and Big Six traits within the modified Circumplex of Personality Metatraits. B5, Big Five traits; N, Neuroticism/Emotional Stability; E, Extraversion; O, Openness to experience/Intellect; A, Agreeableness; C, Conscientiousness; B6, Big Six traits; H, Honesty-Humility/Propriety; R, Resiliency/Emotionality; X, Extraversion; A, Agreeableness; C, Conscientiousness; O, Originality/Openness to experience; + positive pole of the trait; – negative pole of the trait (Strus and Cieciuch, 2021).

Terminological Clarifications: Personality Competencies and Social-Motivational-Emotional Skills

In the literature on SES, the terms *skill* and *competence* are often used interchangeably. This is the case both in the literature from the area of basic and applied research highlighted above, as well as in official documents. The name of the *21st century skills* construct contains the *skills* term, while in the systematizing proposal of Pellegrino and Hilton (2013), 21st century skills are divided into three domains of competencies. Similarly, the term *key competencies* used in documents of the European Union basically refers to 21st century skills. In their comprehensive compilation of multiple SES models and related constructs, Berg et al. (2017) also use the term *competence*. We argue, however, that these terms, although used interchangeably, are worth distinguishing because they refer to slightly different subjects. Below we suggest how skills can be systematically distinguished from competencies.

In the models proposed by the OECD (Kankaraš and Suarez-Alvarez, 2019) and especially Soto and colleagues (Soto et al., 2020, 2021), the term *skills* is used precisely and is clearly distinguished from traits (as a reminder, skills mean capacity, and traits mean tendency). This approach has the advantage of being unambiguous and precise, but reducing skills to pure capacity is problematic. To see the problem, let us consider empathy as an example. Empathy can be understood as the capacity to understand other people's thoughts and feelings. However, a skill understood in this way does not mean that empathic behavior will occur and that a person, who has such a capacity, will demonstrate an understanding of another person's feelings and thoughts even if there is an opportunity for that. This is because capacity is only the possibility (potential), and there still needs to be a motivational element that triggers the behavior. But where does this element belong – to skills, traits, or somewhere else? It seems that it is the term *competence* that contains such an element that actualizes the potential of skill (understood as capacity). Skill is just a capacity that may or may not be activated in behavior. Competence, on the other hand, includes motivational elements in addition to skill-specific

TABLE 3 | Description of the eight metatraits in the revised Circumplex of Personality Metatraits.

Metatrait	Meaning
Delta-Plus (Restraint)	Low emotionality (both negative and positive), high behavioral and emotional control, meticulousness, and perfectionistic tendencies as well as modesty, conventionality, and severe social adjustment.
Alpha-Plus (Stability)	Stability in the area of emotional, motivational, and social functioning, expressed as a general social adaptation tendency, an ethical attitude toward the world, benevolence, and calmness, as well as the ability to delay gratification, diligence and perseverance.
Gamma-Plus (Integration)	Well-being, a warm and prosocial attitude toward people, both intra- and interpersonal balance and harmony; serenity, openness to the world in all its richness, as well as endurance and effectiveness in attaining important goals.
Beta-Plus (Plasticity)	Cognitive and behavioral openness to change and engagement to new experiences, a tendency to explore, self-confidence, initiative and invention in social relations, enthusiasm and orientation toward personal growth.
Delta-Minus (Sensation-Seeking)	Broadly defined impulsiveness, recklessness, emotional volatility, stimulation seeking and risk taking; self-enhancement and hedonistic tendencies as well as interpersonal dominance and expansiveness.
Alpha-Minus (Disinhibition)	High level of antisocial tendencies underpinned by unsustainability, low frustration tolerance and egotism as well as aggression and antagonism toward people, social norms, and obligations.
Gamma-Minus (Disharmony)	Inaccessibility, coldness and distrust in interpersonal relations; negative affectivity and low self-worthiness; depressiveness, pessimism and proneness to suffer from psychological problems.
Beta-Minus (Passiveness)	Social avoidance and timidity, along with submissiveness and dependency in close relationships; cognitive and behavioral passivity and inhibition; some type of stagnation, apathy, and tendency for anhedonia.

capacity. The Council of the European Union (2018) defines competence as a combination of skill, knowledge and attitude, which also captures this idea of competence that is realized in the appropriate way under the given conditions (knowledge and attitude).

Previous approaches to systematize SES started with specific skills and consisted of grouping them into the Big Five domains. It was an approach analogous to those that led to the discovery of the Big Five itself. In our proposed approach to SES through the lens of the CPM, the case is different. This is because the starting point here is not specific skills, but looking for general characteristics necessary for satisfactory and effective functioning. The category of competence seems to be particularly useful here because by containing some additional motivational elements, it is broader than skill. Moreover, these additional motivational elements also additionally makes it possible that a competence can be composed by a set of several detailed skills.

This understanding is also supported by linguistic intuitions – both contemporary and etymological. Let us start with the former. When we attribute competence to someone, the implication is that this person (a) uses his or her skills in a way he or she behaves (b) also in situations he or she has never been in and which may in fact require some new skills. For example, a competent teacher is one who not only knows how to teach, but really does so effectively. He or she therefore has and applies skills of attracting student interest, disciplining students, conflict resolution, but also perhaps of working on Self-motivation and preventing professional burnout. Moreover, he or she is able to operate in both routine and nonroutine teaching situations he or she has never found himself or herself in before, using various specific SES and other skills he or she possesses. This distinction between specific skills and broader personal competence is also consistent with the etymology of the words "skill" and "competence." The etymological root of the word 'skill' led to old the Norse and Proto-Germanic meaning of "difference", while the etymological root of the word "competence" led to the Latin meaning of "meeting together, agreement" (Online etymology dictionary at https://www.etymonline.com on 04/02/2021); thus, etymologically, skill is related to "differentiation" while competence to "synthesizing."

In our model, we adopt the distinction between traits and skills proposed by Soto (Soto et al., 2020), but we focus on basic competencies, which include various SES, combined with knowledge and attitudes and thus mean applying the skills in real behavior. One could say that the relationship between skills and competencies is analogous to the relationship between traits and metatraits in the CPM when interpreting metatraits as basic dispositions or mechanisms underlying traits rather than just constellations of traits.

In the case of competencies that underlie and organize SES, we propose the label of *personality competencies*. One of the definitional features of SES was their association with positive outcomes in various life spheres, including socioeconomic outcomes (e.g., John and De Fruyt, 2015). Moving from the level of specific SES to the level of general personality competencies, it is also worth generalizing the usefulness of these outcomes – from many detailed outcomes to social, personal, and vocational well-being. Incidentally, well-being, as a generalization of positive outcomes, already appears in the literature (Chernyshenko et al., 2018), so we continue this line of thinking.

Following Soto's proposal (Soto et al., 2020, 2021) to include a broader range of skills under this label and in order to distinguish between two different meanings of the SES acronym, namely, "social and emotional skills" and "socioeconomic status," whenever we talk about our proposal, we will use the term SEMS – that is, social, emotional and motivational skills, because the ability to motivate oneself is an important domain of SES, which often appears in various SES catalogs.

We therefore formulate the following definitions: Personality competencies (PC) are consistent patterns of thoughts, feelings, and behaviors that (a) enhance well-being in various life domains including work, personal and social life, (b) can be developed through formal and informal learning experiences, and (c) underlie a number of specific SEMS. In turn, SEMS can be defined after Soto et al. (2021) as a capacity to maintain mutually satisfactory social relationships, regulate impulses and emotions, and manage goal-directed behaviors.

TOWARD A MODEL OF PERSONALITY COMPETENCIES WITHIN THE FRAMEWORK OF CIRCUMPLEX OF PERSONALITY METATRAITS

Below, we propose the model of basic PC, that can be shaped in education and are necessary for human well-being. In order to identify such competencies, we follow two ways that are analogous to two sources of SES catalogs developed so far in the literature: (1) The first is to identify people's basic characteristics necessary for sound functioning in society, effective work or stated at general level – for overall well-being, and (2) the second is to identify basic competencies in an established model of personality structure that is analogous to the procedure adopted by Soto (Soto et al., 2020, 2021) or the OECD (Kankaraš and Suarez-Alvarez, 2019), with the CPM rather than the Big Five as the reference model. As we show below, both ways lead to the same PC catalog.

The First Way – A Catalog of Personality Competencies Enhancing Well-Being

Human beings act in a social context – such a statement is a truism that is hard to disagree with. At the same time this obvious statement can be a good starting point for constructing the most general PC catalog. According to this brief statement, human activity takes place in two domains, which could be referred to as a task domain (*human acts*) and a social domain (*in a social context*). Of course, these two domains intersect; nevertheless, the realms of action and context are distinguishable. The SES domains differentiated by John and De Fruyt (2015) are close to this division: Achieving goals is the task domain, and Working with others is the social one, while Managing emotions combines both domains. Also, the distinction between intraindividual and interindividual domains that appear in many places in the literature (American Psychiatric Association, 2013; Pellegrino and Hilton, 2013; Domitrovich et al., 2017) is a similar distinction, albeit not identical.

The essence of human activity, then, is an action that is purposeful (the task domain) and takes place in a world that is largely a social world (the social domain). Thus, it can be said that people need such PC that enable them to (1) take effective purposeful action and (2) function well in social relationships. The question then arises – what types of PC are these? The most general answer is: In terms of taking effective purposeful action, one needs: (1a) Self-motivation competency to strengthen own (his/her) intentions, goals, motivations, and (1b) Impulse control competency to appropriately control impulse, urges and affective reactions that may interfere with performing the action. In the domain of social relationships, both of the following are needed: (2a) Social responsibility competency, to be able to enter into communion and make mutually satisfying relationships with others, and (2b) Assertiveness competency to be able to maintain one's autonomy and agency while entering into social relationships. This results in four competencies that, albeit at a general level, describe social-emotional-motivational functioning in a comprehensive way.

The Second Way – A Catalog of Personality Competencies Identified Within the Circumplex of Personality Metatraits

The CPM model describes personality functioning in terms of metatraits, distributed on the circumplex that is constituted by two orthogonal dimensions: Alpha/Stability and Beta/Plasticity. Stability and Plasticity are the two mechanisms whose proper functioning is responsible for sound functioning, mental health, and well-being. This means that core PC that contribute to sound functioning and well-being can be identified and located at the positive Alpha and Beta poles (Alpha-Plus/Stability and Beta-Plus/Plasticity, respectively). Such competencies can also be located at the positive pole of Gamma (Gamma-Plus/Integration), because Gamma-Plus is related to high intensity of Alpha-Plus and high intensity of Beta-Plus. The positive poles of the dimensions listed above describe the competencies responsible for effective functioning, mental health, and well-being, which means that the higher the intensity of the competencies located therein, the higher the well-being. The case is different for the Delta dimension (see **Figure 3**). This is the line that separates healthy functioning (above the Delta line) from potential problems (below the Delta line; for details, see Strus et al., 2021c). In the case of Delta-Plus, the intensity of Stability is still high, while that of Plasticity is low. Thus, it could be said that functioning is based on only one mechanism (Stability) with a deficit of the other (Plasticity). This is therefore a border and potentially dangerous situation – a further decrease in Plasticity may mean that Stability is no longer enough to ensure sound functioning. The analogy is Delta-Minus, in the case of which healthy functioning is based on only one mechanism, Plasticity (with a deficit of Stability). A further decrease in the intensity of Stability may lead below the Delta line and therefore to the area of problems with sound functioning and well-being. This structure has far-reaching implications for PC. All competencies located in Alpha-Plus, Gamma-Plus, and Beta-Plus are desirable in the sense that their increase always contributes to improved personal and social functioning. The case is different for competencies located in Delta-Plus and Delta-Minus. Their extreme intensity combined with weak Stability and/or Plasticity weakens effective functioning and well-being, while its medium intensity promotes it.

The question is what exactly PC are located in high intensity Alpha-Plus/Stability, Beta-Plus/Plasticity Gamma-Plus/

Integration, and located between high intensity of Delta-Plus/Restraint and Delta-Minus/Sensation seeking? These seem to be competencies that show a far-reaching convergence with those distinguished in the previous paragraph.

The important element of the meaning of Delta is emotional and behavioral control vs. impulsiveness and risk taking (see **Table 3**). In turn, Gamma-Plus seems to be the center of effectiveness in attaining important goals. Therefore, Gamma and Delta can be treated as the theoretical basis for two fundamental self-regulation competencies in the task domain, that is, Self-motivation and Impulse control, respectively. On the other hand, in the personality competence context, Alpha and Beta can be deemed as mainly concerning the social functioning domain, as these metatraits strongly correspond to constructs of Communion and Agency, respectively, which are often used especially in social psychology (Abele and Wojciszke, 2014). In consequence, Alpha – as a socialization and communion factor – can be treated as a basis for Social responsibility competence; in turn, Beta – as a personal growth and agentic factor – can be treated as a basis for Assertiveness competence (see Digman, 1997). These competencies will be described below.

Self-Regulatory Personality Competencies in the Task Domain

Self-regulatory processes take place both in relation to intentionally undertaken and realized goals or intentions and in relation to automatically or involuntarily aroused drive-affective impulses. Accordingly, the emotional-motivational self-regulation system contains two distinct and essentially independent mechanisms: Self-motivation and Impulse control, while the effectiveness of these mechanisms in a given individual reflects a certain level of that individual's self-regulatory (emotional-motivational) competencies. These competencies are thus expressed in the ability to manage and direct emotional-motivational processes (intentions and impulses; see Block and Block, 1980; Bandura, 1989; Kuhl, 1992).

Self-motivation is therefore a competence that is the basis for the capacity to strengthen motives related to the attainment of broadly defined goals and intentions, for example, values, personal standards, or commitments. These motives tend to be cognitively advanced structures that, from a motivational standpoint, tend to be weaker and more fragile than drive-emotional impulses. In order to motivate behavior, these structures must obtain the person's engagement, which then can either fade away or be fueled and sustained. Therefore, intention reinforcement can take place at three different time-points of the process, that is, in a phase of: (1) making the decision and triggering its implementation (initiating the activity); (2) carrying out the activity (sustaining the engagement); and (3) completing the activity (evaluating its effects) and being able to undertake the next activity.

Impulse control is the competence to regulate impulsive behavior. Drive-emotional impulses occur essentially independently of the person's will and intention, and they can be initiated from within (e.g., an organism's need) or from without (an external stimulus). In terms of functionality at the dispositional level, both opposite poles of impulse control, that is, both permanent impulse inhibition (as a result of an overactive control mechanism) and impulsiveness (as a result of an underactive control mechanism) are maladaptive. The adaptive form of impulse control, on the other hand, is the capacity to both inhibit impulses and realize them depending on the actual external (current circumstances) and internal situation (e.g., currently realized action) as well as in an appropriate form. The competence associated with the sound functioning of the mechanism described is therefore the capacity for flexible and controlled realization (expression) of impulses in an adequate manner.

The two competencies, although independent, often operate at the same time, and behavior is frequently the result of their interaction. For example, in pursuing a goal, Impulse control is responsible for weakening competing motives, while Self-motivation is responsible for strengthening the very intention to attain the goal.

Interpersonal Personality Competencies in the Social Domain

We treat the competencies of Social responsibility and Assertiveness as an expression of proper functioning of two basic mechanisms regulating social life of human beings: entering into relations with others and maintaining own individuality and autonomy, respectively.

In **Social responsibility**, community, other people, and the individual's relationship with them play a key role, and this competence is formed in the course of social development, inclusion in the group and the process of an individual becoming an integral part of society. Thus, Social responsibility can be understood as the capacity to anticipate and take into account the consequences of one's behavior for other people, to understand the internal states of others and respond emotionally to their situation, to identify with a social group and have a sense of being an integral part of some broader whole, as well as be guided in behavior by an internalized system of moral and social norms.

In the case of **Assertiveness**, the individual himself or herself as well as his or her needs realized in the social environment are of key importance, and this competence is formed in the course of separation and strengthening of the individual's self, and shaping his/her autonomy, subjectivity, and agency. Assertiveness competence is therefore built on the foundation of stable self-esteem and is connected with the capacity to perceive oneself positively and at the same time adequately regardless of current events, with confidence in one's own abilities and a strong conviction that one is a person who can effectively influence his or her surroundings and deal with adversities, as well as with the capacity to influence other people and function effectively in a group.

SUMMARY OF ADVANTAGES AND POSSIBILITIES OF THE PROPOSED MODEL OF PERSONALITY COMPETENCIES

The identification of core PC within the CPM has several advantages. The most important of these are listed below.

First, we can assume that our proposed model identifies all the key PC because they were found in a general model

of personality structure. Moreover, the relationships between the distinguished PC are precisely defined. Social responsibility and Assertiveness are orthogonal to each other and correspond to the Alpha and Beta dimensions in the CPM. Also, Self-motivation and Impulse control are orthogonal to each other and correspond to Gamma and Delta in the CPM. Therefore, Self-motivation and Impulse control are shifted 45 degrees in relation to the Social responsibility and Assertiveness arrangement. These relationships are shown in **Figure 4**.

Within a given competency, many specific SEMS can be distinguished. It is also possible to find and define skills that combine various PC, with the relationships and contributions of a given general PC to a specific skill following the relationships described above and presented in **Figure 4**. Thus, one can say that the PC we have distinguished provide a kind of matrix for locating many specific SEMS. What is more, the SES distinguished in the various catalogs discussed above are definable by the PC we have distinguished, although showing this is beyond the scope of this paper.

Second, adopting the CPM as a framework for PC and SEMS allows us to distinguish malleable SEMS from enduring traits, which should be treated, however, as temperamental traits instead of personality traits. A temperament model was also constructed within the CPM framework, in which two basic orthogonal dimensions of Reactivity and Activity were distinguished (Strus et al. 2021, under review). Certain configurations of given temperament traits facilitate the acquisition of certain PC, while others hinder it. Knowledge of temperamental conditions allows interventions to be tailored to optimize the development of PC.

Third, the CPM framework allowed precise determination of the conditions under which the maximum intensity of a given SEMS is optimal and under which the average intensity is optimal. Maximum intensity is optimal for all SEMS lying above the Delta line, namely, SEMS rooted in Self-motivation, Social responsibility, and Assertiveness. Average intensity, on the other hand, is optimal for the Delta line; therefore, for all SEMS rooted in the general ability to realize impulses in a controlled (adequate) manner (Impulse control), the Aristotelian golden rule applies of mean between inhibition and impulsiveness.

Fourth, the PC model identified in the CPM framework is not just a descriptive taxonomy, as it allows the identification of key mechanisms important to personal and professional sound functioning and well-being. From this point of view, it seems more fruitful to focus in education on developing the core PC – especially knowing their underlying mechanisms – rather than specific SEMS, because PC are a kind of reservoir from which various SEMS can grow.

To summarize, we propose a comprehensive model of (a) malleable core PC that, on the one hand, (b) are determined by stable, biologically based temperamental traits and, on the other hand, (c) underlie many specific SEMS. Such a holistic model is presented in **Figure 5**.

Specific SEMS are tailored to external changing demands and grow precisely out of the reservoir of PC. Environmental interventions, including education, can be directed toward shaping specific SEMS, but also toward shaping core PC, especially compensating for stable nonoptimal configurations of temperamental traits. However, it is the focus on shaping core competencies that seems to be a more effective solution, particularly in light of recognition of their underlying mechanism that we proposed. The model presented in **Figure 5** also considers the cognitive domain. The counterpart of enduring temperament traits are cognitive abilities. It may be worthwhile in the future to consider describing intellectual competencies in an way that is analogous to that we have described personality competencies herein.

LIMITATIONS AND FURTHER DIRECTIONS

The presented model is based on the thorough literature review and built on the current knowledge on personality structure and socio-emotional functioning. However, although this model can be deemed as theoretically justified, it has not yet been empirically verified, which should be admitted as a main limitation of this proposal. In order to overcome this limitation, the following four-step research agenda is proposed.

In the first step, a more detailed conceptualization of the model is needed. For now, four main PCs are differentiated; however,

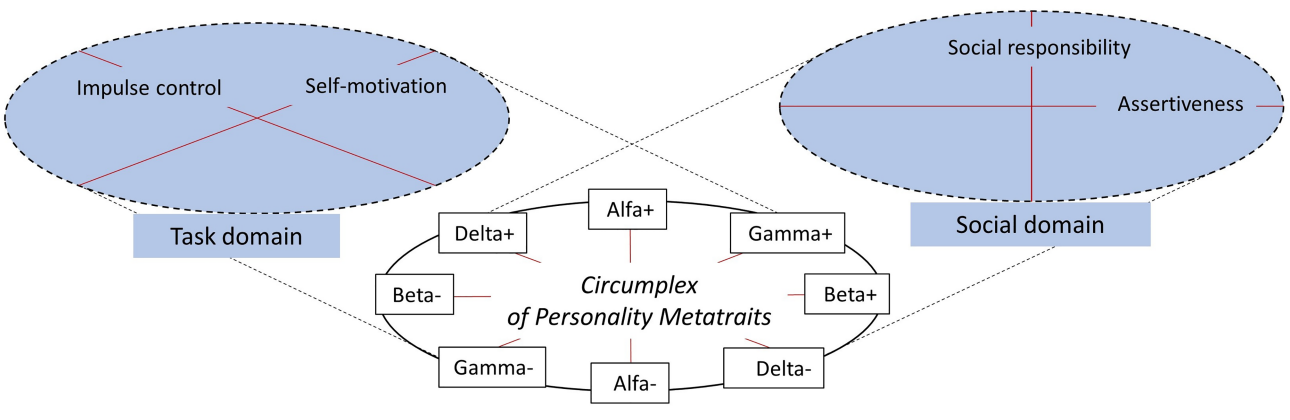

FIGURE 4 | Personality competencies within the Circumplex of Personality Metatraits.

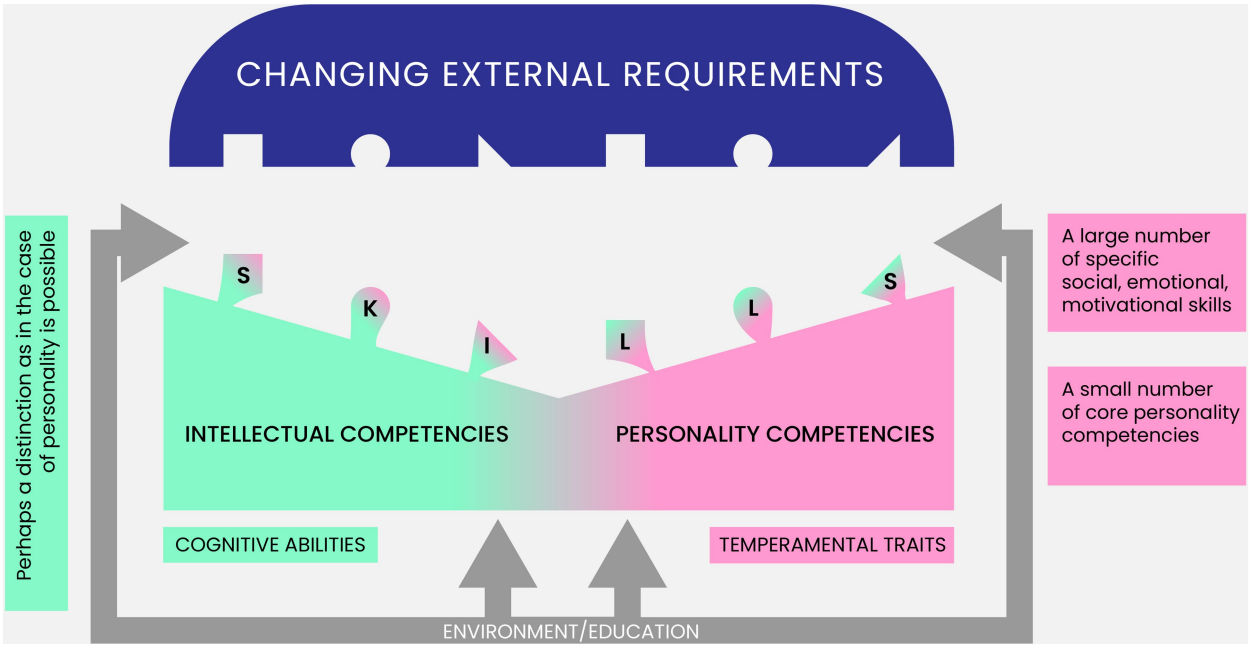

FIGURE 5 | A comprehensive model of competencies and skills both in cognitive and noncognitive domains.

there are many unknowns in this respect. In particular, what are the components or facets of these PC? Is it possible and desirable to distinguish such facets in order to fully and precisely cover the theoretical meaning of these constructs? Next, what are the mechanisms underlying the PC. Although these mechanisms were initially outlined above, they should be further elaborated, as it seems that their precise identification is necessary for practical application of the model in order to help in developing these PCs during intervention and education.

In the second step, the differentiated PC and/or their facets have to be operationalized. The measurement instruments should be prepared for both self- and other-report. Moreover, the instruments should be designed for various developmental or educational periods because the PC are shaped during education to a larger extent.

In the third step, the model proposed above should be empirically verified. Especially important are the relations between (1) PC and detailed SEMS that are rooted in PC, (2) PC and metatraits from the CPM, that organize the structure of PC, and (3) PC and temperamental nonmalleable traits that determine the susceptibility for development of PC and can help to make interventions more effective.

In the fourth step, the usefulness of the proposed model in practical (e.g., educational) settings should be examined and evaluated. Particularly, interventions to enhance the developing PC must be proposed and their effectiveness should be measured with a rigorous research design. Of particular importance is testing the effectiveness of developing general PC for shaping the detailed SEMS.

Therefore, although the paper presented the theoretical foundation and outlined the theoretical "heart" of the new model of PC (and SEMS), further efforts and research on the model's conceptualization, operationalization, verification, and application are needed.

AUTHOR CONTRIBUTIONS

JC: literature review and a draft of the paper. JC and WS: conceptualization of the model and final version of the paper. All authors contributed to the article and approved the submitted version.

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REVIEW
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Formative Assessment of Social-Emotional Skills Using Rubrics: A Review of Knowns and Unknowns

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Educational practitioners have been increasingly interested in the use of formative assessment and rubrics to develop social-emotional skills in children and adolescents. Although social-emotional rubrics are nowadays commonly used, a thorough evaluation of their psychometric properties has not been conducted. In this scoping review, we examine the knowns and unknowns of the use of formative assessment approaches and rubrics in social-emotional learning. We first review initiatives of formative assessment and development of rubrics to assess social-emotional skills. Then, we discuss challenges associated with the development and use of rubrics to evaluate social-emotional skills in youth focusing on 1) assessment of single skills versus assessment of a comprehensive taxonomy of skills; 2) developing rubrics' performance level descriptions that accurately describe increasing mastery of skills; 3) obtaining adequate internal consistency and discriminant validity evidence; 4) self-reports versus observer reports of skills; and finally 5) how to account for adolescents' development in the construction of rubrics. This review outlines a research agenda for the psychometric study of rubrics to be used in social-emotional skill assessment.

Keywords: rubrics, social-emotional skills, formative assessment, scoping review, challenges

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INTRODUCTION

In the past decades, social-emotional skills (SEMS) have received increasing attention in educational settings because of their role in students' positive development (Kern et al., 2016; Taylor et al., 2017). Several studies have suggested that a *deeper* learning of SEMS involves the use of formative assessment approaches and self-assessment tools to enhance self-regulating capacities in students (Trilling and Fadel, 2009; Griffin et al., 2011; Pellegrino and Hilton, 2012; OECD, 2015). Rubrics are an attractive way to formatively assess SEMS because their concrete and behaviorally-oriented criteria may facilitate students' self-reflection in terms of where they situate themselves and what kind of social-emotional mastery level they want to achieve in the future (Panadero and Jönsson, 2013). However, despite their importance, very few attempts have been made to develop rubrics to assess social-emotional skills and evaluate their psychometric properties in youth. The objective of this scoping review is to present what we know and what we need to know on the use of formative assessment approaches and rubrics in SEMS learning, and to discuss the challenges associated with the development and use of rubrics to evaluate SEMS in youth.

TABLE 1 | Social-emotional skill domains and facets Primi et al. (2017).

Domain	Facet	Definition
Self-management	Determination	Setting goals and high standards, motivating oneself, working very hard, and applying oneself fully to the task, work, or project at hand
	Organization	Possessing organizational skills and meticulous attention to detail that are useful for planning and executing plans to reach longer-term goals
	Focus	Focusing attention and concentrating on the current task, and avoiding distractions
	Persistence	Overcoming obstacles in order to reach important goals
	Responsibility	Possessing time management skills, being punctual, and honoring commitments
Engaging with others	Social initiative	Approaching and connecting with others, both friends and strangers, initiating, maintaining, and enjoying social contact and connections
	Assertiveness	Speaking up, voicing opinions, needs, and feelings, and exerting social influence
	Enthusiasm	Showing passion and zest for life; approaching daily tasks with energy, excitement, and a positive attitude
Amity	Compassion	Using empathy and perspective-taking skills to understand the needs and feelings of others, acting on that understanding with kindness and consideration of others
	Respect	Treating others with respect and politeness
	Trust	Assuming that others generally have good intentions and forgiving those that have done wrong
Negative-emotion regulation	Stress modulation	Modulating anxiety and response to stress
	Self-confidence	Feeling satisfied with self and current life, having positive thoughts about self, and maintaining optimistic expectations
	Frustration tolerance	Regulating temper, anger, and irritation; maintaining tranquillity and equanimity in the face of frustrations
Open-mindedness	Intellectual curiosity	Mustering interest in ideas and a passion for learning, understanding, and intellectual exploration
	Creative imagination	Generating novel ways to think about or do things through experimenting, tinkering, learning from failure, insight, and vision
	Artistic interest	Valuing, appreciating, and enjoying design, art, and beauty, which may be experienced or expressed in writing, visual and performing arts, music, and other forms of self-actualization

Notes. *Extracted from Primi et al. (2017).*

Social-Emotional Skills

Social-emotional skills are defined as "individual characteristics that originate from biological predispositions and environmental factors, are manifested as consistent patterns of thoughts, feelings, and behaviors, continue to develop through formal and informal learning experiences, and that influence important socio-economic outcomes throughout the individual's life" (De Fruyt et al., 2015; p. 279). Cumulative evidence has shown the importance of SEMS on different spheres of individuals' life, ranging from educational attainment, job performance, employability, physical and mental health, and personal and societal well-being, among others (see Chernyshenko et al., 2018 for a review). Longitudinal research has provided evidence on the supportive and protective functions of SEMS; supportive, because they are associated with healthy development, and protective, as they prevent the exposure to or help to cope with risk factors across people's lives (Domitrovich et al., 2017).

Although there is considerable variability in the number and nature of skills included in different SEMS frameworks (see Abrahams et al., 2019, for a review), there is convincing evidence that these skills can be grouped under the umbrella of the Big Five personality factors of Conscientiousness, Neuroticism, Extraversion, Agreeableness and Openness to Experience (see Shiner et al., 2021 for a review of the Big Five)[1]. Providing additional support for this perspective, Primi et al. (2016) examined the overlap and commonalities across more than 200 items of eight scales that are frequently used to measure SEMS in children and youth (i.e., ages 10–17) with the idea of representing their common variance by a more manageable group of SEMS.

Based on the evidence above, Primi et al. (2017) proposed an integrative framework of five domains of SEMS with a set of more specific skills grouped under these five domains that cover the broad spectrum of social-emotional functioning in youth (see **Table 1** for further detail). The framework aims to capture skills that have predictive value and could serve as stand-alone skills or building blocks of more sophisticated "hybrid" constructs like citizenship, critical thinking, or entrepreneurship, among others. The framework is also useful to support policymakers, researchers, and educational specialists for policy decisions, for example to make decisions about the kind of skills that have to be included in educational curricula (Abrahams et al., 2019).

Formative Assessment and Rubrics

The assessment of SEMS is critical to elucidate students' social-emotional strengths and weaknesses, to provide useful information to guide social-emotional learning, and, ultimately, to contribute to students' short and long-term positive outcomes (Durlak et al., 2015). Durlak et al. (2015) proposed that in order to assess SEMS effectively, educational systems should consider clear standards (i.e., goals and benchmarks) to follow students' progress, and develop evidence-based curricula and instruction guidelines, as well as formative and summative approaches to stimulate, monitor and evaluate students' learning progress.

Contrary to summative assessment, where tests are used to evaluate students' learning at a given point of time, formative

[1]Where useful and necessary, we will refer to findings from personality research and literature to discuss parallels with SEMS.

assessment focuses on the use of tests to continuously improve students' performance *during* the learning process (Pellegrino and Hilton, 2012). Thus, formative assessment is the process where students actively and continuously engage in assessment activities such as self-, peer, and teacher feedback to achieve objectives and develop students' self-regulation and meta-cognitive capacities (Bolden et al., 2020). A growing number of studies support its pedagogical use (e.g., Andrade and Brookhart, 2020; P. P. Chen and Bonner, 2020; Durlak et al., 2015; Marshall and Drummond, 2006) and have provided evidence of its positive effects on students' achievement. A meta-analysis conducted by Hattie (2009) concluded that formative assessment was one of the most critical pedagogical strategies for improving students' learning. Likewise, Kingston and Nash (2011) found that formative assessment had a modest but significant effect on learning, while a meta-analysis by Graham et al. (2015) showed that the formative use of feedback by teachers yielded a larger effect size on students' writing achievement.

Rubrics are an attractive and innovative promising way to formatively assess SEMS because they have the potential to help students to reflect on their strengths and difficulties and guide their performance (Andrade, 2007; Panadero and Romero, 2014; Jönsson and Panadero, 2017). Moreover, the characteristics of rubrics' design may facilitate formative assessment processes. For doing so, rubrics should include explicit criteria that clearly explain what is assessed (Brookhart, 2018). In that sense, Brookhart (2018) stated that clear and quality criteria were crucial for students to conceptualize their learning goals and take the necessary steps to achieve them throughout the formative process. Rubrics should also include performance level descriptions that have descriptive rather than evaluative language, which can facilitate constructive feedback (Jönsson and Panadero, 2017). These characteristics are deemed to increase the transparency of the assessment and, consequently, promote self-reflection, self-regulated learning and feedback from peers and teachers (Jönsson and Panadero, 2017). However, very few studies have paid attention to clearly define and communicate how rubrics look like and how they can be used (Dawson, 2017). In other words, not enough information about the object of assessment, the scoring strategy, the evaluative criteria or the quality descriptions is provided in many studies, which might affect the transparency of rubrics' use. Additionally, rubrics have been mostly used to assess cognition-related competencies like writing, mathematics, or science (e.g., Lallmamode et al., 2016), and only a few attempts have been made to develop rubrics for assessing social-emotional skills in youth and evaluate their psychometric properties. Therefore, more steps are needed to maximize the use of rubrics for social-emotional skills assessment.

Psychometric Properties of Rubrics

Rubrics are defined as "a type of matrix that provides scaled levels of achievement or understanding for a set of criteria or dimensions of quality for a given type of performance" (Allen and Tanner, 2006, p. 197). They have been traditionally recognized as effective scoring guides because they enhance consistency in scores and support valid judgments of performance (Brookhart and Chen, 2015). Furthermore, research has suggested that rubrics can promote learning and support instruction because their defined skill levels create clear expectations of performance, making scoring more transparent and facilitating teachers' feedback on students' work (Jönsson and Svingby, 2007; Brookhart and Chen, 2015; Jönsson and Panadero, 2017). Likewise, other studies have claimed that rubrics' explicit assessment criteria may facilitate students' self-assessment in formative assessment settings, and help them to navigate in the learning progression of a specific competence or skill (Panadero and Jönsson, 2013). Hence, it is not surprising that rubrics have been widely used to assess individuals' academic achievements to evaluate educational programs and improve instruction across different education levels (Moskal and Leydens, 2000; Jönsson and Svingby, 2007; Reddy and Andrade, 2010).

Nevertheless, evidence on the contribution of rubrics to support students' learning is still inconclusive. On the one hand, Jönsson and Svingby (2007) review of 75 studies about rubrics could not draw a definite conclusion on the effect of rubrics on students' learning due to the diversity of methods and results they encountered. On the other hand, a more recent review by Brookhart and Chen (2015) of 63 studies showed that the use of rubrics contributed to students' achievement in different cognitive areas such as writing, general sciences, physics, and business education, among others. Additionally, other studies have shown that rubrics' use increases students' self-efficacy and self-regulation capacities in elementary and secondary school students (Andrade et al., 2009; Panadero et al., 2012).

Cumulative evidence has pointed out that rubrics' positive contributions may depend on a series of moderating factors (e.g., Wollenschläger et al., 2016). A review by Panadero and Jönsson (2013) on the formative use of rubrics concluded that rubrics might affect performance through one or more of the following processes: provide transparency to assessment, reduce students' anxiety, enable feedback, increase students' self-efficacy, or promote students' self-regulation. Likewise, several other studies have suggested that merely handing rubrics to students is not enough for improving performance (Panadero et al., 2012; Panadero and Jönsson, 2013; Wollenschläger et al., 2016). Instead, rubrics seem to be more conducive to learning when accompanied by constructive feedback with information about the task (i.e., "How am I going?") and the next steps to improve performance (i.e., "Where to go next?"). Moreover, rubrics' may promote students' positive SRL and prevent detrimental effects like stress when enough time is given to students to become familiar with the instrument through external guidance and practice (Panadero and Romero, 2014). As suggested by Brookhart and Chen (2015, p. 363), "scoring rubrics necessarily need to be part of instructional and formative assessment methods" to support students' learning.

In recent years, a growing number of studies have evaluated rubrics' psychometric properties. Two reviews by Jönsson and Svingby (2007) and Brookhart and Chen (2015) found that most studies report on the inter-rater reliability of rubrics (i.e., the

degree of consistency between different rater scores; Reddy and Andrade, 2010). In that sense, Brookhart and Chen (2015) suggested that rubrics yielded adequate inter-rater reliability levels and supported their use for decisions about individuals' performance, especially when their criteria are clear and raters receive training. By contrast, Jönsson and Svingby (2007) results showed that rubrics' inter-rater reliability estimates were relatively low for traditional testing, which led them to conclude that rubrics might not provide reliable scores for summative assessment purposes. However, they suggested that lower reliability levels could be considered acceptable for low-stakes assessments and when rubrics are used for classroom monitoring purposes (Jönsson and Svingby, 2007).

Similarly, a variety of methods have been used to collect evidence on different aspects of rubrics' validity (Jönsson and Svingby, 2007; Brookhart and Chen, 2015), including opinions of experts about rubrics' constructs (i.e., content-related validity), the correlation of rubrics' scores with external indicators (i.e., criterion-related validity), factor analyses to inspect the structural aspects of rubrics' scores (i.e., internal structure validity), as well as perceptions of teachers and students about the use of rubrics (i.e., consequential validity). Despite this great variety of information sources, Brookhart and Chen (2015) suggested that most studies used only one or two of these indicators for evaluating the validity of rubrics in mainly post-secondary school samples. Nevertheless, the authors concluded that "rubrics can produce valid and useful scores for grading or program evaluation in post-secondary education" (p. 362).

METHODS

The present study reviews the knowns and unknowns of the use of formative assessment and rubrics to evaluate social-emotional skills. We also discuss the challenges of the development and use of rubrics to evaluate SEMS in youth. We employed a scoping review method because of the novelty of the research area and because the objective was to map the key concepts and ideas as well as the main available evidence that supports the topic (Arksey and O'Malley, 2005). We followed the main guidelines of the five steps of the methodological framework proposed by Arksey and O'Malley (2005): 1) Identify the research question(s), 2) Identify relevant studies, 3) Select studies, 4) Chart the data, and 5) Collate, summarize, and report the results.

Identifying the Research Question

The research question of the present review is "What are the experiences of using formative assessment and rubrics to assess SEMS and what are the challenges to foster this field?"

Identifying Relevant Studies

To select articles, we searched for keywords in the databases Web of Science, ProQuest, and Google Scholar between January and December of 2020 limiting the start date to the year 2000. The search terms were extensive because of the nature of the topic. Examples of these terms were "assess*, AND social-emotional skills, AND rubrics", "assess*, AND social-emotional skills, AND formative assessment", "rubrics*, AND social-emotional skills, AND adolescence", etc. We included studies from peer-reviewed journals of the areas of education and psychology, as well as books, book chapters and reports from educational interventions. We also found valuable bibliography in the reference lists of the studies collected in the database searches. Additionally, we inquired five specialists in the area who suggested to review a small number studies (n = 4).

Study Selection: Inclusion and Exclusion Criteria

To be selected for inclusion in this review, we required that the papers were 1) published in English, Spanish or Portuguese; 1) report the analysis of quantitative and/or qualitative data or conduct a systematic or non-systematic review; 2) address the assessment of social-emotional skills; 3) address the use of rubrics to assess social-emotional skills; 4) address formative assessment of social-emotional skills; 5) address the psychometric properties of social-emotional skills' measures; 6) address the psychometric properties of rubrics; 7) address the development of social-emotional skills in children and adolescents. After familiarizing with the literature, new criteria were developed to guide decisions of inclusion and exclusion to the review (Arksey and O'Malley, 2005). For example, instead of "social-emotional skills", we used the terms "life skills", "soft skills" or specific nomenclature of the skills such as "creativity", "responsibility", etc. We followed the nomenclature of the integrative framework of Primi et al. (2017; see **Table 1**) to guide our search.

In the meanwhile, a study or article was excluded from this review if it was 1) published before year 2000; 2) published in a non-peer reviewed journal; 3) published in other language than English, Spanish or Portuguese; 4) published in journals that were not related to the education or psychology fields; 5) address the use of rubrics in summative assessment interventions.

Charting the Data

In this next step, we charted the data, which according to Arksey and O'Malley involves "sifting, charting and sorting" the collected material. After reading all the material and applying the inclusion and exclusion criteria, two researches sorted and classified the data in a "data charting form" by the authors' names, title, year, type research design (i.e., empirical, non-empirical, literature review, scoping review, etc.), objective, as well as age and origin of the sample used in the study. This classification helped us to select a total of 66 studies that dated from the year 2000–2020 that had a broad variety of research designs. We identified 41 empirical studies. From these, 30 had a cross-sectional design and 11 were longitudinal. Another group of 19 studies were reviews and from these, only three were literature or scoping reviews. The others were reviews that did not report following a systematic method to collect and analyze data. We also included one book and two book chapters. Three other documents were reports from international organizations. Around a third of the empirical studies involved the participation of adolescents (n = 22), eight involved the participation of children and 13 dealt with adults

(i.e., university students, teachers, pre-service teachers, parents or other caregivers, etc). Some studies involved the participation of more than one of these age groups. Most of the samples of the empirical studies were from the United States (n = 23), but other studies recruited participants from a wide variety of different countries such as Australia, Belgium, Brazil, Canada, Estonia, Spain, etc.

Collating, Summarizing, and Reporting the Results

The selected 66 studies were sorted again according to their thematic area. After reading all the material, two researches identified eight categories in which the studies could be classified: 1) studies that used formative assessment to evaluate one or more social-emotional skills; 2) studies that developed rubrics to assess one or more social-emotional skills; 3) studies that were about the implications of measuring social-emotional skills; 4) studies that were about the design and evaluation of performance level descriptions in rubrics; 5) studies that were about the psychometric properties of social-emotional skills' measures and/or rubrics; 6) studies that used rubrics as a self-assessment and/or observers' report method; 7) studies that involved self-reports and observers' reports of social-emotional skills; 8) studies that were about the development of social-emotional skills in youth.

In the following section we present the results of our findings giving a brief description of the reviewed studies and we also discuss the main implications of our results for researchers and practitioners.

RESULTS

Using Formative Assessment and Rubrics to Assess Social-Emotional Skills

A group of initiatives has already put into practice formative assessment strategies for developing specific social-emotional skills in classrooms with promising results (e.g., Brookhart, 2013; Andrade et al., 2014; Valle et al., 2016; Chen et al., 2017; Chen and Andrade, 2018; Bolden et al., 2020). Bolden et al. (2020) reviewed the effect of summative and formative assessment strategies on creativity learning in classrooms showing that interventions that used explicit and transparent criteria and which practices promoted students' self-assessment were effective in supporting creativity. This review further suggested that creativity assessment is more accurate and meaningful when teachers and students are provided with assessment criteria (i.e., the definition of creativity and a list of related behaviors) and have a clear conceptual understanding of what they are assessing. Concerning self-assessment practices, Bolden et al. (2020) showed that strategies of self-reflection (i.e., students using criteria to reflect on their or others' work) could enhance higher levels of creative and divergent thinking and verbal and figural creativity, among other processes.

Similarly, other studies have evaluated the effect of formative assessment on more specific social-emotional behaviors like arts' performance (e.g., Valle et al., 2016; Chen et al., 2017; Chen and Andrade, 2018; Fei). A group of these studies showed that formative assessment strategies where students used rubrics or checklists to self-assess their work or assess their peers' work had a significant positive effect of around 0.25 on arts achievement (Chen et al., 2017; Chen and Andrade, 2018). Chen et al. (2017) concluded that: "student learning in the arts is measurably deepened when students know what counts, receive feedback from their teachers, themselves, and each other, and have opportunities to revise" (p. 308).

Meanwhile, research on the use of rubrics to assess social-emotional skills is still limited. However, some studies have focused on developing rubrics to assess social-emotional related competencies such as theater arts' skills, creativity, music, and critical thinking, and evaluating how much they can contribute to assessing students' performance (e.g., F. Chen and Andrade, 2018; Lindström, 2006; Menéndez-Varela and Gregori-Giralt, 2018; Vincent-Lancrin et al., 2019). From these studies, very few have paid attention to assess the psychometric properties of rubrics. For example, a recent study of Susman-Stillman et al. (2018) constructed and tested a Preschool Theatre Arts Rubric including a group of scales (e.g., vocalization, focus/persistence/commitment to the play, and collaboration/awareness of others) for the observation of theater arts skills in preschool children. Their results showed adequate internal consistency and inter-rater reliability but weak evidence of convergent validity (i.e., the degree to which two measures that assess similar constructs are related) with measures of preschool-learning related behaviors and oral narrative skills.

Other studies have reported the educational benefits of using rubrics in areas like creativity and music learning. Brookhart (2013) created a rubric that measured creativity to help teachers and students to clarify the criteria and share with students "what they are aiming for, where they are now, and what they should do next" (Brookhart, 2013, p.29). The four-level rubric (i.e., very creative, creative, ordinary/routine, and imitative) assessed four different areas of creativity: the variety of ideas, the variety of sources, the novelty of idea combinations, and the novelty of communication. As Brookhart (2013) reported, the assessment of creativity using rubrics not only helped teachers to assess and give feedback to students but also helped students in the process of thinking creatively. Concerning music learning, a literature review conducted by Blom et al. (2015) concluded that the use of rubrics to assess music performance enhanced students' self-reflection and motivated them to be more sensitive and critical about their work. Additionally, the authors highlighted that rubrics are a valuable peer and self-assessment tool for music learning. Hence, despite the growing interest in rubrics' use to assess social-emotional behaviors, many questions on the topic remain unanswered. Thus, the following section raises a group of challenges related to the development and use of rubrics to assess children and adolescents' social-emotional skills.

Challenges for Developing and Using Rubrics to Assess Social-Emotional Skills in Youth

Single Social-Emotional Skills or Social-Emotional Skills Taxonomies

Research on the assessment of SEMS using rubrics has mainly focused on a small number of specific skills instead of

operationalizing a full taxonomy of social-emotional skills (e.g., like the Senna framework described in **Table 1**). Assessing only one or a few skills imposes fewer constraints, whereas representing a full taxonomy of skills raises questions on the assumed structure of skills and their convergent and divergent validities. There are also more basic concerns and choices to make.

First, several authors recognize that there is considerable variability among skills included in different SEMS models (Kyllonen et al., 2014; Primi et al., 2016). Many of these models include skills that have different names but describe the same underlying construct (i.e., "jangle fallacy"; Kyllonen, 2016; Voogt and Roblin, 2012). This lack of shared definitions and overlap among constructs may have several implications for measurement (Ziegler and Brunner, 2016). Hence, the advantage of constructing an instrument based on a SEMS taxonomy that includes well-defined constructs and specifies how these are related to each other has the potential to improve the accuracy of the assessment (Kyllonen et al., 2014; Ziegler and Brunner, 2016).

Second, SEMS can be assessed at different levels, i.e., at a higher-order or more abstract domain level, representing the common core of a group of lower-order or more specific facets. The broad domain of Self-management, for example, groups variance shared by the specific skills of Organization, Focus, Persistence, Responsibility, and Determination. This choice may have different implications for measurement. On the one hand, an instrument that measures higher-order domains will have the advantage of comprising many different behavioral manifestations and predicting a wide variety of outcomes (i.e., high bandwidth; Ozer and Benet-Martínez, 2006). On the other hand, an instrument that measures lower-order facets may have the benefit of describing more specific behaviors and predicting particular outcomes with greater accuracy (i.e., high fidelity; Paunonen and Ashton, 2001). Moreover, an instrument that assesses a specific facet (e.g., organization skills) may have higher internal consistency, stronger inter-item correlations, and a more simple factor structure because all its items measure similar patterns of behavior (Soto and John, 2017). By contrast, an instrument that measures broader domains (e.g., the five domains of the Senna taxonomy) may have lower internal consistency estimates and a more complex factor structure with higher chances of shared variances among domains (Soto and John, 2017).

Building Performance Level Descriptions for Rubrics

Traditionally, rubrics have been constructed by first identifying the criteria for good work on which the scoring will be based (e.g., the structural organization and clarity in a writing assignment) and then defining the content of the categories of quality of work based on examples of good and bad performance (e.g., examples of good or bad organization in writing assignments, Nitko and Brookhart, 2007).

By contrast, when constructing rubrics to assess SEMS, the definition of the categories of "quality of work" or "performance" level descriptions should be based on developmental theories that describe the increasing mastery levels of skills according to the age of the student. For example, a rubric that assesses emotion regulation in adolescents would include as the first and the latest performance levels descriptions that define, respectively, the least and the highest level of development that we can expect for emotion regulation at that age. The performance level descriptions in-between the first and the last would describe the intermediate steps adolescents could take on the hypothetical continuous path of emotion regulation performance. On top of these developmental processes and "defined" stages, there are also individual differences shaping and affecting such development.

Hence, designing rubrics for the assessment of SEMS in youth is not a simple task because social-emotional instruments have traditionally included descriptors of the absence (i.e., false-keyed items) and presence (i.e., true-keyed items) of the constructs (e.g., the BFI-2, Soto and John, 2017). However, much less is known about descriptors for the "middle steps" or "in-between levels" of the social-emotional construct continuum. Hence, one of the significant contributions of rubrics to social-emotional skills assessment is the inclusion of performance level descriptions that reflect the continuous and increasing mastery levels of the skills (Abrahams et al., 2019). Due to these performance level descriptions, students better understand the expectations associated with increasing skills' mastery and hence gain a clear picture of the learning objectives that they need to achieve (Rusman and Dirkx, 2017).

A major challenge when constructing rubrics is to statistically evaluate whether the performance level descriptions can be meaningfully differentiated by the rater and empirically related to the scores on the measured skills (Tierney and Simon, 2004; Brookhart, 2018; Panadero and Jönsson, 2020). In that sense, Brookhart (2018) emphasized that the number of performance level descriptions should correspond to "the number of reliable distinctions in student work that are possible and helpful" (p. 2). Humphry and Heldsinger (2014) stated that this is particularly important for construct validity as the scores of rubrics' performance level descriptions should have a continuous and smooth distribution that reflects the fine-grained variations in the levels of the construct being measured (Humphry and Heldsinger, 2014; Brookhart, 2018). By contrast, there is considerable uncertainty in the literature about the formulation and the methods to statistically evaluate the adequacy of rubrics' levels used to describe skill mastery (Rusman and Dirkx, 2017; Brookhart, 2018).

Item Response Theory (IRT) models could help to solve this challenge. IRT is a set of latent variable techniques designed to model the relationship between an individual's response to a particular item and that individual's position in probabilistic terms along the latent trait measured (Baker and Kim, 2017). As such, IRT would allow evaluating rubrics' rating scale structure by inspecting the Category Response Curves (CRCs) that represent the probabilities of endorsing rubrics' performance level descriptions displayed along the continuum of the underlying skill. Thus, the CRCs could reflect how well the

performance level descriptions represent the measured skill and help diagnose how well these level descriptions are used in the rating process (Linacre, 2002). However, it should be noted that an unbalanced distribution of responses in rubrics' performance level descriptions (i.e., low endorsement of rubrics' lowest level description) might affect the effectiveness of the rubrics' rating scale.

Additionally, IRT multidimensional models could contribute to evaluating whether rubrics' performance level descriptions are ordered as expected along the different dimensions of the measured skills (Bolt and Adams, 2017). Similarly, based on IRT modeling, rubrics could be graphically and empirically expressed in Wright maps or construct maps (Wilson, 2011), which indicate how well rubrics' performance level descriptions unfold with students' increasingly more elaborated responses. Construct maps could also contribute to represent rubrics' difficulty levels (i.e., from the easiest to the most difficult ones) and locate them together with students' observable scores on a single scale to provide insight into students' learning progression on a skill (Wilson, 2011).

Reaching an Optimal Internal Consistency and Discriminant Validity

Rubrics have been used to assess multidimensional constructs like theater arts' skills (Susman-Stillman et al., 2018), creative writing (Mozaffari, 2013), or pre-service teaching competencies (Bryant et al., 2016), among others. A typical multidimensional rubric includes several criteria, each of which has a scale of at least three performance level descriptions. For example, the rubric of creative writing developed by Mozaffari (2013) has four criteria—i.e., image, characterization, voice, and story- and four levels of achievement-i.e., excellent, good, fair, and poor. A few studies have evaluated whether rubrics' criteria that were not supposed to be related were actually related (i.e., discriminant validity or the correlation among scales that measure different traits) although with no promising results. A group of studies, for instance, found a high degree of collinearity ($r > 0.80$) among the dimensions of rubrics that assessed teaching competencies and dispositions when testing their structure through confirmatory factor analysis (Flowers, 2006; Bryant et al., 2016). In that sense, Flowers (2006) acknowledged that this result could be due to respondents' difficulties in distinguishing among the separate rating categories of the tested rubric. Similarly, Ciorba and Smith (2009) found high correlations (0.81–0.89) among the three scale dimensions of a rubric that aimed to assess music performance. As a result, the authors evaluated whether a unidimensional indicator could replace their rubric. Still, they argued that valuable information on students' strengths and weaknesses could be lost if the different rubric dimensions were not considered distinctively.

One plausible explanation for rubrics' discriminant validity challenge is that ratees and raters might not be able to account for differences among multiple skills when describing their own performance using rubrics (Sadler, 2009; Panadero and Jönsson, 2020). Sadler (2009) stated, for example, that raters might not be interested in evaluating individual criteria and, instead, prefer to assess performance as a whole. In response, Panadero and Jönsson (2020) stated that empirical evidence had suggested that judges can reliably assess multiple criteria using rubrics. The authors added that rubrics with multiple criteria of commonly known "tacit competencies" such as creativity had been well-differentiated and evaluated by teachers in other studies (e.g., Lindström, 2006). Still, Sandler's claims cast doubts on whether differentiating between criteria such as SEMS is possible for or even interest students when they self-assess their performance. Perhaps the idea that students need to have a clear compartmentalization of their skills may not be strictly necessary to promote the awareness of their own strengths and difficulties.

Meanwhile, research on social-emotional skills has paid greater attention to test the discriminant validity and internal consistency of their measurement tools. However, this effort has not been exempt from difficulties. On the one hand, research on Big Five personality instruments has shown adequate discrimination among the five domains and the facets within each domain (e.g., Soto and John, 2017). On the other hand, a large body of literature has claimed that it is unreasonable to assume that the Big Five measure completely independent clusters that could be tested via restricting approaches like confirmatory factor analysis (Marsh et al., 2010; Aichholzer, 2014). Additionally, evidence on the internal consistency and discrimination among the Big Five seems to be less strong in children or adolescents' self-ratings of personality (Soto et al., 2008). Allik et al. (2004) showed, for example, that the intercorrelations among the NEO-FFI scales gradually decreased from 0.24 at age 12 to 0.12 around age 18. Similarly, Soto et al. (2008) found that the between-domain differentiation (i.e., discriminant validity) and within-domain consistency (i.e., internal consistency) of various personality instruments increased in magnitude from late childhood until late adolescence.

Moreover, several studies have found that the internal consistency of short personality measures might be lower than the ones typically found in standard multi-item measures of the Big Five (Gosling et al., 2003; Woods and Hampson, 2005). Gosling et al. (2003) developed the Ten-Item Personality Inventory (TIPI), a 10-item measure of the Big Five. They found that although the instrument had adequate validity evidence, it showed lower reliability estimates than longer personality scales such as the Big Five Inventory. Likewise, other authors have argued that Cronbach's alpha internal consistency estimate is often misleading when used on short personality measures (Woods and Hampson, 2005). Woods and Hampson (2005), for instance, showed that Cronbach's alpha decreased from an average value of 0.85 for a personality measure of 100 items (i.e., Trait Descriptive Adjectives TDA) to a value of 0.50 for the TIPI.

Hence, as the previous evidence has shown, the evaluation of discriminant validity and internal consistency in traditional Likert-scale personality and skill measures is challenging. Thus, several questions remain concerning the evaluation of similar characteristics in non-traditional measures like rubrics when they include multidimensional criteria to assess SEMS in youth.

Accuracy in Reporting SEMS Using Rubrics

Youth's Self-Reports. Children and adolescents experience several developmental changes that may have considerable implications for their ability to think about themselves and use rubrics to report on their social-emotional skills. Children, compared to adolescents, have fewer capacities to think abstractly and logically about statements, as well as to ask questions about their identity (i.e: "Who I am?", "How I am different from others?"; Soto et al., 2008). However, this gradually changes as children approach adolescence. At this age, adolescents "are more likely to think about and describe themselves with abstract and psychological terms to differentiate among multiple aspects of the self, to recognize consistencies and inconsistencies among these self-aspects, and to organize them in a clear way" (Soto et al., 2008; p. 719).

Additionally, the abilities of verbal comprehension and information processing gradually grow from late childhood to adolescence. Youth uses more frequently new and more complex words to describe themselves in psychological terms (Soto et al., 2008), comprehend better what they read (Siegler, 1998), and process information faster and more fluently (Anderson, 2002). Similarly, longitudinal studies have shown that children's self-reflective skills involved in their metacognitive processing capacity gradually improve towards adolescence, although their growth might remain stable after age 15 (van der Stel and Veenman, 2010, van der Stel and Veenman, 2013).

The above-mentioned developmental changes may have consequences on how well children and adolescents can provide ratings of their own behavior and performance (Soto et al., 2008; Brown et al., 2015; Panadero et al., 2016). Compared to late adolescents or adults, younger children seem to be more optimistic and lenient, less coherent and rely more on others' opinions when self-reporting their performance and behavior (Soto et al., 2008; Brown et al., 2015). For example, some studies have shown that young students self-assess their performance influenced by their parents and teachers' academic standards and normative values but become more independent as they get older (Hogaboam-Gray, 2002; Kasanen and Räty, 2002). Meanwhile, a study of children's narrative abilities from 5 to 12 years indicated that students with less ability were more prone to overestimate their academic performance than those with better skills, but that this tendency decreased with age. This optimistic bias has also been found in self-reports of personality characteristics. Soto et al. (2008) showed, for example, that young children tend to systematically agree more with items (or disagree with negatively keyed items) in personality questionnaires (i.e., acquiescent responding) than adolescents or adults. In Soto et al. (2008) 's study, this response style affected the factor structure of personality self-reports at age 10 in such a way that the Big Five Factors could not be well recovered, although this improved in older ages (Soto et al., 2008).

Observers' Reports. Besides self-assessment, rubrics have also been used by teachers or other raters to evaluate students' performance in diverse cognitive abilities such as writing, math, or science. Overall, research has found that raters can provide reliable and consistent judgments of performance using rubrics, although several factors might influence their rating accuracy. Among others, the expertise and training of the raters, their attitudes towards students' ethnicity or the content, or the lack of clarity of the rubrics (Jönsson and Svingby, 2007; Reddy and Andrade, 2010; Brookhart and Chen, 2015) have been listed as factors that may affect the validity of ratings. Relative to the knowledge on self-assessments, much less is known, however, about how well raters report on students' SEMS using rubrics. Experiences in the fields of music, arts, and creativity, for example, have investigated the degree of agreement between raters (i.e., inter-rater reliability) when evaluating students' performance using rubrics (Lindström, 2006; Ciorba and Smith, 2009; Latimer et al., 2010; Susman-Stillman et al., 2018). Overall, most studies have found moderate to high levels of agreement among raters' judgments, which supports that rubrics can yield reliable results when raters have a good understanding of the criteria and are well-trained. Despite these promising results, many questions about rubrics observer reports remain unanswered. Several questions warrant further investigation, including: "What is the degree of consistency between raters' reports and students' self-reported SEMS scores?"; "Are teachers good raters of students' SEMS performance?"; and "How can teachers' personal characteristics affect their reports?".

On the other hand, evidence from research on SEMS assessment using Likert-type questionnaires has shown that teachers' reports are a valuable source of information of students' social-emotional characteristics across time (Measelle et al., 2005; Wienke Totura et al., 2009; Edmonds et al., 2013; Margherio et al., 2019). Results from a longitudinal study of Measelle et al. (2005), for example, indicated that teachers and parents' scores of children's Extraversion, Agreeableness, and Conscientiousness increasingly but moderately converged from ages 5 to 7. By contrast, another group of studies has suggested that teachers might not be good informants of students' social and emotional difficulties using Likert-based scales. Margherio et al. (2019) found, for example, that it was easier for teachers to recognize conduct problems than emotional problems in students, while Wienke Totura et al. (2009) reported a low agreement between teachers and students on experiences of bullying and victimization. Meanwhile, Kokkinos and Kargiotidis' (2016) study concluded that teachers' mental health characteristics (i.e., psychopathological symptoms) influenced their perceptions of students' emotional and behavioral problems. For example, teachers' interpersonal sensitivity symptoms (i.e., feelings of personal inferiority and inadequacy) predicted their ratings of students anxiety, affective, and somatic problems.

Accounting for Development of Social-Emotional Skills

A teacher that uses rubrics to formatively assess SEMS during the school year might expect that all his/her adolescent students would develop their SEMS in a similar way. However, a group of studies has shown that youth personality traits do not develop uniformly and increasingly. That is, youth's mean levels of

personality traits do not continuously increase with age (e.g., Soto et al., 2011), but may show temporary dips, which Soto and Tackett (2015) called the *disruption hypothesis* in personality development.

The disruption hypothesis proposes that "the biological, social, and psychological transitions from childhood to adolescence are accompanied by temporary dips in some aspects of personality maturity" (Soto and Tackett, 2015; p. 360). In that sense, evidence from self- and parents' reports have shown that mean levels of Agreeableness, Conscientiousness, and Openness to Experience tend to decrease from late childhood into early adolescence, and then increase from late adolescence into early adulthood (Soto et al., 2011; Denissen et al., 2013; Van den Akker et al., 2014; Soto, 2016). Similarly, Extraversion and Activity levels tend to considerably decrease from childhood to adolescence until they stabilize during adulthood. Special attention deserves Neuroticism as it develops differently in boys and girls. During childhood, girls and boys have similar levels of Neuroticism, but this pattern changes dramatically when they arrive in adolescence when girls increase their levels of negative affect while boys remain almost stable (Klimstra et al., 2009; Soto et al., 2011; Van den Akker et al., 2014; De Bolle et al., 2015; Soto, 2016). At this age, girls may experience more social and psychological difficulties than boys, such as negative stereotyping, gender-biased roles, body image concerns, and negative self-perceptions (Stice and Bearman, 2001). These gender differences persist until early adulthood when both girls and boys return to have more similar levels of Neuroticism (Klimstra et al., 2009; Soto et al., 2011; Van den Akker et al., 2014; De Bolle et al., 2015; Soto, 2016).

Besides mean level changes in personality, research has suggested that we should look at the way youth differ in how they express their personality characteristics and how these individual differences change across the lifespan. Several recent studies have shown that there are individual differences in personality trait development that tend to increase with age, from early childhood into early adolescence, and then remain relatively stable during adulthood (Damian et al., 2019; Mõttus et al., 2017, 2019). Mõttus et al. (2017) suggested that these increasing individual differences could be due to developmental mechanisms that manifest strongly during childhood and adolescence. Among several plausible factors, Mõttus et al. (2017) highlight socialization pressures on behavior, intrinsic personality maturation, or the expansion of the behavior repertory driven by the acquisition of new cognitive, self-regulatory, and emotional capacities, among others.

Altogether, the mentioned evidence highlights the importance of considering the particular characteristics of SEMS development in youth when drawing expectations about their learning progressions. In other words, educators should consider that not all youth will have similar learning trajectories or goals when using rubrics to develop their SEMS. For example, girls might not learn to regulate their emotions at the same "rhythm" as boys during adolescence; therefore, their goals should adapt to their different learning progression.

CONCLUSIONS AND FUTURE DIRECTIONS

In this review, we examined literature and empirical studies on the use of formative assessment and rubrics for SEMS learning and discussed some of the key challenges for the construction and use of rubrics to assess social-emotional skills. First, we identified an increasing number of initiatives that have implemented formative assessment strategies and constructed rubrics to assess social-emotional dimensions such as creativity, critical thinking, and arts learning (e.g., Vincent-Lancrin et al., 2019). However, these dimensions are only some of the many social-emotional skills included in SEMS taxonomies that are considered crucial for students' social-emotional learning. In that sense, more efforts are needed to expand the use of rubrics for the multidimensional skills proposed in the existing social-emotional taxonomies. Evidence-based guidelines and recommendations could be used to effectively design rubrics to measure SEMS (Pancorbo et al., 2020). In that sense, Dawson (2017) provided a framework of 14 elements (e.g., evaluative criteria, specificity, quality levels, etc.) that can be useful for researchers to make informed decisions on rubrics' design and use. Likewise, these endeavors should put emphasis on evaluating rubrics' psychometric properties with diverse methods as well as examining their power in predicting relevant outcomes.

Second, we highlighted the importance of testing the organization of rubrics' most basic components—performance level descriptions—to evaluate whether they capture the different dimensions of the construct they intend to measure. Sadly, very few attempts have been made so far to assess the organization of rubrics' descriptions using innovative statistical methods (e.g., Humphry and Heldsinger, 2014). This challenging task could be tackled using IRT models, which have the advantage of providing valuable information of the degree to which performance level descriptions contribute to rubrics' rating scale characteristics.

Third, we also raised some questions of what we could expect concerning the discriminant validity and internal consistency of SEMS rubrics, especially when they are administered to young respondents. As mentioned before, the discriminant properties of rubrics' scores in previous studies were overall weak. In the study of Pancorbo et al. (2020), for example, these properties were even weaker in the social-emotional rubrics' scores of young respondents with low language proficiency. To avoid these constraints as much as possible, future research initiatives could consider maximizing the differentiation of the content of rubrics that measure different SEMS. Building several rubrics per assessed domain could also improve the internal consistency of rubrics' scores.

Lastly, we emphasized that research should further explore how individual differences in youth's social-emotional development might affect the measurement of SEMS using rubrics. To our knowledge, no study has explored this topic, which points out its significance in designing a rubrics' research agenda. This could be ideally investigated in longitudinal studies that focus on exploring the developmental trajectories of rubrics' psychometric properties across adolescents' life span so that the interaction of age and cognitive abilities can be further understood.

The present review raised a number of critical concerns on social-emotional rubrics' conceptual and psychometric properties that should not discourage their use especially for formative

assessment purposes, where the objective is to support the student and his/her learning environment. We outlined a number of ways to examine and improve rubrics' properties and hence increase their impact and effectiveness in students' development. Given their current limitations, social-emotional rubrics should be used in a tentative way, and not considered as robust information or landmarks for at stake decision making or summative evaluation purposes. We hope that this review will contribute to research advancing the status of rubrics as a critical method to be used by students, teachers and educators, providing also actionable information for policy makers.

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All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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SENNA Inventory for the Assessment of Social and Emotional Skills in Public School Students in Brazil: Measuring Both Identity and Self-Efficacy

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Responding to the need for school-based, broadly applicable, low-cost, and brief assessments of socio-emotional skills, we describe the conceptual background and empirical development of the SENNA inventory and provide new psychometric information on its internal structure. Data were obtained through a computerized survey from 50,000 Brazilian students enrolled in public school grades 6 to 12, spread across the entire State of São Paulo. The SENNA inventory was designed to assess 18 particular skills (e.g., empathy, responsibility, tolerance of frustration, and social initiative), each operationalized by nine items that represent three types of items: three positively keyed trait-identity items, three negatively keyed identity items, and three (always positively keyed) self-efficacy items, totaling a set of 162 items. Results show that the 18 skill constructs empirically defined a higher-order structure that we interpret as the social-emotional Big Five, labeled as Engaging with Others, Amity, Self-Management, Emotional Regulation, and Open-Mindedness. The same five factors emerged whether we assessed the 18 skills with items representing (a) a trait-identity approach that emphasizes lived skills (what do I *typically* do?) or (b) a self-efficacy approach that emphasizes capability (*how well can I do that?*). Given that its target youth group is as young as 11 years old (grade 6), a population particularly prone to the response bias of acquiescence, SENNA is also equipped to correct for individual differences in acquiescence, which are shown to systematically bias results when not corrected.

Keywords: 21st century skills, social-emotional skills, instrument development, Big Five, five-factor model, measurement invariance, exploratory structural equation modeling

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INTRODUCTION

Over the past two decades, education scientists and policy-makers showed an increased attention for the assessment and learning of Social-Emotional Skills, also called 21st century skills (from here onward abbreviated as SEMS) (Abrahams et al., 2019). This interest shift built on the notion that more traditional indicators of scholastic achievement, such as scores on math and reading, are

not sufficient for a successful and happy life and for dealing with the challenges of today's volatile, uncertain, complex, and ambiguous (VUCA) world[1]. In addition to content-specific knowledge and skills, students nowadays also need transferable skills such as collaboration and dealing with diversity, presentation skills, skills to regulate emotions, managerial and implementation skills, and a need to be open-minded, creative, and innovative, among others (De Fruyt, 2019). Hence, schools today pay considerable attention to the development of SEMS that they have been shown to affect a range of consequential outcomes, both in the short term and the long term (Taylor et al., 2017; Bertling and Alegre, 2018).

The increased attention to SEMS raised questions on their conceptual status, their underlying structure, and how SEMS develop normatively, driven by a complex interaction between biological factors and formal and informal learning experiences, including scholastic intervention (Kyllonen et al., 2014; Lipnevich et al., 2016; Abrahams et al., 2019). The reviews by Abrahams et al. (2019) further clarified that, in order to advance this field, we first need to converge on a taxonomy structuring SEMS, so we can design assessment instruments to examine pertinent research questions and support educators and teachers with formative and summative tools for assessing SEMS.

The present paper will review the conceptual background and construction of SENNA, an inventory designed to assess SEMS in Brazilian public education that is also useful for scientific and applied research. SENNA's psychometric features will be examined in a sample of more than 50,000 students enrolled in grades 6 to 12 in public schools in the State of São Paulo. Little is known about the structure of socio-emotional variables in South America, especially in the public schools in Brazil that serve large numbers of underprivileged youth from poor and uneducated family backgrounds. Thus, the present research also provides important information about the applicability and generalizability of research from the Western, educated, rich, and industrialized countries (Henrich et al., 2010) that have so far dominated the SEMS research agenda.

Defining and Structuring Social-Emotional Skills: The "Social-Emotional" Big Five

A Google search using the terms 'social-emotional skills,' 'transferable skills' or '21st century skills' results in hundreds of hits referring to a plethora of different SEMS frameworks and taxonomies, with some advocating only a few and others proposing hundred or more skills[2] (Abrahams et al., 2019). **Table 1** provides an overview of some of the more comprehensive frameworks and their associated skills. Although there may be notable reasons why these frameworks differ in terms of the number and nature of specified SEMS, this mixture of models and diversity of vocabularies hampers an integrative and in-depth discussion on how to organize evidence-based learning of SEMS in education. The field further suffers from the jingle-jangle fallacy, where similarly named constructs across frameworks indicate different skills (jingle), whereas nearly identical skills are labeled differently by different researchers (jangle) (Olderbak and Wilhelm, 2020).

The challenge to bring order in the chaos of (often overlapping) skill terms closely resembles personality psychologists' struggles to structure the hundreds of personality descriptive adjectives in the natural language into the Big Five personality taxonomy (John et al., 2008). Today, personality psychologists agree that five broad dimensions, namely Extraversion, Agreeableness, Conscientiousness, Emotional Stability (vs. Negative Emotionality), and Openness to Experiences, form the largest common denominator to describe personality differences observable in various age and cultural groups (McCrae and Terracciano, 2005; De Fruyt and Van Leeuwen, 2014; John, 2021). This encompassing empirical framework helped to solve the issues of overlap among constructs, and significantly advanced knowledge on how personality develops. A parallel trimming and structuring exercise is required for the field of SEMS.

During the past decade, the Organization of Economic Cooperation and Development (OECD) started an explicit study on the assessment of SEMS in a number of large cities around the world, as a complement of their Program of International Student Assessment[3]. John and De Fruyt (2015), serving in the technical advisory committee of this project, reviewed the SEMS literature at that time and concluded that there was an emerging consensus that the multitude of SEMS could be conceptually grouped in five broad skills categories, namely *Engaging with Others*, *Collaboration*, *Task Performance*, *Emotion Regulation, and Open-Mindedness*. **Table 1** also includes more specific skills, such as persistence and empathy, and illustrates how they can be conceptually grouped into these broad dimensions. These five SEMS dimensions show strong conceptual similarities with the Big Five personality dimensions; hence we refer to them as the 'Social-Emotional Big Five.' This resemblance is not surprising, given that traits and cognitive abilities form constituting building blocks of competencies or SEMS (Hoekstra and Van Sluijs, 2003; Bartram, 2005).

The OECD (John and De Fruyt, 2015; Kankaraš and Suárez-Álvarez, 2019) and De Fruyt et al. (2015, p. 279) defined SEMS as "individual characteristics that: (a) originate in the reciprocal interaction between biological predispositions and environmental factors, (b) are manifested in consistent patterns of thoughts, feelings and behaviors, (c) continue to develop through formal and informal learning experiences, and (d) influence important socio-economic outcomes throughout the individual's life." This definition is broad enough to capture skills and their building blocks, underscoring their malleability across life and their consequential impact on outcomes that matter for the individual and society.

Social-Emotional Skills in South America: Early Research in Brazil

In Brazil, interest in the development and assessment of SEMS has been steadily growing over the past 15 years to improve general welfare and prepare youth for upcoming challenges via

[1] https://www.vuca-world.org

[2] http://exploresel.gse.harvard.edu

[3] https://www.oecd.org/pisa/publications/

TABLE 1 | Relationship of Big Five traits, functional aspects, and dimensions in major socio-emotional skills frameworks.

Big Five traits and facets (e.g., Soto and John, 2015, 2017)	**Functional aspects**	**CASEL**	**CHICAGO consortium**	**OECD model**	**SENNA v2.0**
O: Open-mindedness Creative imagination Intellectual curiosity Aesthetic sensitivity	Exploration system	*Self-awareness:* Identification and recognition of one's own emotions		*Open-mindedness* Creativity Curiosity Tolerance	*Open-mindedness* Creative imagination Curiosity to learn Artistic interest
C: Conscientiousness Organization Productiveness Responsibility	Self-management system	*Self-management:* Persistence, goal setting, and motivation *Responsible decision making:* Evaluation and reflection, and personal and ethical responsibility.	Academic perseverance, learning strategies, academic behaviors	*Task performance* Responsibility Persistence Self-control Achievement-motivation	*Self-management* Determination Organization Focus Persistence Responsibility
E: Extraversion Sociability Assertiveness Energy level	Approach system	*Relationship skills:* Cooperation, help seeking and providing, and communication	Social skills	*Engaging with others* Sociability Assertiveness Energy	*Engaging with others* Social Initiative Assertiveness Enthusiasm
A: Agreeableness Compassion Respectfulness Trust	Belonging system	*Social awareness:* Empathy, respect for others, and perspective taking *Responsible decision making:* Evaluation and reflection, and personal and ethical responsibility.	Social skills	*Collaboration* Empathy Trust Co-operation	*Amity* Empathy Trust Respect Gratitude
N: Emotional stability (vs. neuroticism or negative emotionality) Anxiety Depression Emotional volatility	Coping system	*Self-awareness:* Sense of self-efficacy, and self-confidence. *Self-management:* Impulse control, stress management	Academic mindset	*Emotion regulation* Stress resistance Optimism Emotional control	*Negative-emotion regulation* Stress modulation Self-confidence Frustration tolerance

public education and intervention programs. Challenges for the Brazilian public education systems have been numerous and urgent, with large and early school drop-out rates, poor results in PISA, complex social inequality challenges, high violence and crime rates, and considerable (youth) unemployment, amongst others (Miyamoto et al., 2014).

The Ayrton Senna Institute has played a pioneering role in raising awareness about the importance of SEMS in education and initiated and conducted a series of meetings and research activities to learn about SEMS assessment and their development. In 2013, the Ayrton Senna Institute collaborated with the OECD[4] and the Education Secretariat of Rio de Janeiro to investigate the measurement of SEMS and describe their associations with various outcomes (Miyamoto et al., 2014; Santos and Primi, 2014). Leading the first empirical OECD study on SEMS in a developing country, Santos and Primi (2014) identified eight SEMS instruments with constructs that predicted consequential outcomes of education, were feasible to administer, assessed malleable constructs, and showed robust psychometric characteristics. In a large sample of middle school and high school students, Primi et al. (2016, 2019c) examined the items and scales of the Strengths and Difficulties Questionnaire (Goodman, 1997), the Self-Efficacy Questionnaire for Children (Muris, 2001), the Core Self-Evaluations (Judge et al., 2003), the Big Five Inventory (John et al., 2008), the Rosenberg Self-Esteem Scale (Rosenberg, 1965), the Nowicki-Strickland Locus of Control (Nowicki and Strickland, 1973) scale, the Big Five for Children (Barbaranelli et al., 2003), and the Grit Scale (Duckworth and Quinn, 2009) and found that they could all be mapped under the umbrella of the 'Social-Emotional Big Five.' Also, a sixth factor resulted from the factor analysis, reflecting beliefs about personal control versus low self-esteem, hopelessness, and feeling defeated, that connects with low Emotional Stability. This study provided the first empirical support for the conceptual classification proposed by John and De Fruyt (2015) and the OECD (2015) (Primi et al., 2016, 2019c).

Resulting from this work, a first set with 92 items was compiled (tentatively called SENNA 1.0) that was used in the OECD's first pilot study on SEMS in Rio de Janeiro (Miyamoto et al., 2014; Santos and Primi, 2014; Primi et al., 2016). This first item set and data collection (N = 27,628) provided information at the broad Social-Emotional Big Five level and further helped to delineate requirements for a new broad SEMS measure that could be generally implemented in Brazilian education.

Five Major Considerations for the Development of a Social-Emotional Skills Inventory for Public Education

First, it quickly became clear that a feasible large-scale assessment of SEMS in Brazilian public schools needed to be a *broadly applicable* survey, available at a *low cost*, requiring little *time* to administer (no more than 50 min of class time), and preferably

[4]https://www.oecd.org/education/ceri/social-emotional-skills-study/

useful for *self-description without assistance*. The assessment further had to result in *feedback* for individual students, but also reports at the level of classes (for teachers), schools (for directors) and educational districts/states (for policy makers). Besides these more formal necessities, there were also some critical content and technical requirements.

Second, to avoid a WEIRD-culture bias (Henrich et al., 2010) and to acknowledge the unique features of Brazilian culture and education, it was recommended to use an *emic and bottom-up approach* to the questionnaire constructions; the goal was to write and select items that would be age and culture appropriate for students in Brazilian public schools, covering the age range of grades 6 to 12 (i.e., typically age 11 to 18). These requirements suggested that a large new item set would be developed, and assessment procedures would be checked, always in close collaboration with students (through focus groups and pretesting), teachers, and various educational stakeholders.

Third, although there was some first evidence that the Social-Emotional Big Five was a useful framework (Primi et al., 2016, 2019c), educational stakeholders were interested to get information on students' mastery of various more *specific skills*, such as responsibility, respect, or creativity, that could eventually be organized under the umbrella of the social-emotional five, as shown in **Table 1**. Information at the broad skill level is probably useful for directors and policy makers, but individual students and their teachers want to know the student's standing on one or more specific skills, a level that is more actionable in the classroom.

Fourth, the review by Santos and Primi (2014) made clear that SEMS can be assessed following two conceptually different approaches. One is the trait or identity approach (Wiggins and Pincus, 1992; see John, 2021, for a review), which focuses on *typical* skilled behavior and asks "How do you typically or generally behave (or think or feel)?" We can think of this approach as measuring "lived skills," that is the skill level at which an individual operates most of the time.

In contrast, other researchers have advocated an approach focused on capabilities or *maximal* behavior; here the interest is not on typical but on peak performance. In self-report form, students are asked "How well *can* you act (or think or feel) in a particular domain?"—in other words, self-efficacy. Bandura (1977) defined *self-efficacy* as students' belief that they have the capability to organize and execute the actions required to manage future situations. Bandura (2006, p. 308) emphasized that self-efficacy items "should be phrased in terms of *can do* rather than *will do*. *Can* is a judgment of capability" (emphases in the original).

As so often, most researchers have adopted only one of these two approaches. Thus, we know little about how measures based on one approach correlate with measures based on the other. Bandura (2006) has argued that perceived self-efficacy is a major determinant of what people typically do (suggesting a substantial correlation) yet also emphasized that "the two constructs are conceptually and empirically separable" (p. 309).

It is entirely conceivable that some SEMS, like 'trust' or 'responsibility,' may be better conceptualized and measured from the typical performance (trait) approach, whereas other like 'presentation skills' may be better understood from an maximal behavior (self-efficacy) approach. How much students trust others on a day-to-day basis may well be a better predictor of their citizenship behavior, whereas how well they can present may be a better predictor of a student's impact on an audience when they have to speak to a group. These kinds of hypotheses, however, that can be examined only if one has the two approaches to measure these skills (trait/identity versus self-efficacy) are represented in the same inventory.

Although we do not know how closely trait identity and self-efficacy measures are linked, the initial evidence is promising (Santos and Primi, 2014; Primi et al., 2016, 2019c): The three self-efficacy domains measured in children by Muris (2001) were substantially and differentially correlated with three of the trait identity measures included in the Socio-emotional Five: Social self-efficacy with Extraversion (Engaging with Others); Emotional Self-efficacy with Emotional Stability (Negative-Emotion Regulation); and Academic Self-Efficacy with Conscientiousness (Self-Management). Moreover, the items set initially developed for SENNA 1.0 included some self-efficacy items but only for three of the SEMS domains. Given that we wanted to take SEMS assessment seriously, we decided to represent both trait/identity and self-efficacy scales for all skills in the new measure. Thus, we will be able to test (a) whether the self-efficacy based SEMS scales analyzed separately show the expected Socio-emotional Five structure and (b) whether self-efficacy and trait-identity based scales will jointly define the same underlying factor structure.

Finally, given the anticipated heterogeneous and young respondent samples it is critically important to think about ways to reduce systematic error due to response styles that can compromise structural and predictive validity (Primi et al., 2019a,b,d, 2020). Soto et al. (2008) observed that psychometric and structural analyses of personality descriptive items of younger and less-educated samples rarely resemble the better structural validities found in adults and well-educated samples. These effects, discovered first in the United States, should be even more pronounced in the less educated youth in developing countries. Examining a large sample of youth aged 10 to 20 years, Soto et al. (2008) found that the underlying cause is large variability in how children and adolescents use the numerical rating scale to indicate how well a particular item describes themselves. Specifically, on a 1–5 rating scale, some youth will show high acquiescence and preferentially use the upper or right-hand side of the scale (i.e., use 4 and 5 far more often than 1 and 2) regardless of the content of the item. In contrast, others will show low acquiescence and preferentially use the lower or left-hand side of the scale (i.e., use 1 and 2 more often than 4 and 5). The first response bias is called high *acquiescence* because these youngsters agree more with items (yeah-saying), whereas the second response bias is named low acquiescence (nay-saying). Soto et al. (2008) showed that individual differences in acquiescence bias were most pronounced at age 10 to 12 and then decreased substantially (by 50%!) all the way to age 18, at which point they reached stable adult levels. Primi et al. (2019a) replicated these findings with public school students in Brazil and found that the acquiescence corrections substantially

improved criterion validity. Having high-quality reverse (or false) keyed items is critical to assessing and controlling the effect of acquiescence. We therefore need carefully developed items that can be arranged like antonym pairs to measure not only high but also low levels of each of the SEMS dimensions in the new inventory.

Assessing Social-Emotional Skills in Brazil: Development Steps Leading to the SENNA Inventory

Relying on our previous work for SENNA 1.0, a succinct review of the literature (e.g., John et al., 2008; Soto and John, 2017), and consultation of various educational stakeholders, we developed a blueprint of 18 SEMS, with tentative labels and short definitional descriptions, as shown in **Table 2**. SEMS are conceptually grouped under the Social-Emotional Big Five headers. These definitions formed the starting point to write and compile a large pool of 527 candidate items; 92 items came from the original SENNA 1.0 and 435 new items. This was an iterative emic process, involving multiple item writing and revision sessions, with input from research psychologists, education experts, and economists as well as former and current teachers. The item set included both positively and negatively keyed trait items, and also included items written specifically to reflect a self-efficacy rating perspective. Our goal was to construct short and homogeneous scales through item factor analysis with nine items each, including three positively keyed SEMS identity items, three negatively keyed identity items, and three SEMS self-efficacy statements—note that the self-efficacy items are, by definition, positively keyed (i.e., it doesn't make sense to ask students how well they *can not* do something). The selection of items was done in a two-phase process relying on data from two different studies.

Our first study was conducted in 2014 and aimed to obtain a full inter-item covariance matrix across the 527 candidate items. Because we could not administer so many items to the same student, a Balanced Incomplete Block Design (BIB; van der Linden et al., 2004) was used to administer different subsets of items to different subsets of students, thus allowing us to estimate the full inter-item covariance matrix for every pair of items. Each student answered a booklet with a subset of 90 items on average, with a total of 24 paper-and-pencil booklets. The sample included 33,766 students from grades 5, 9, and 10 enrolled in public education in the State of Ceará, in the Northeast of Brazil. Students were randomly assigned to the 24 booklets. An average of 1,406 students answered each of the 24 booklets (min 1,268, max 1,427). We ran a series of exploratory factor and bi-factor analyses for the groups of items that designed to measure each of the intended 18 SEMS constructs. Our goal was to identify items that measured (a) the intended lower (or facet) level construct (e.g., Empathy) well and (b) showed good discrimination against both the other facets in the same domain (e.g., Respect) and the facets in the four other domains (e.g., Persistence in the Self-Management domain). After selecting preliminary candidate items for each facet, we ran exploratory factor analyses of candidate facet scales and inspected item-total correlations to further investigate convergent and discriminant validity. We selected those items that demonstrated a high loading on the general factor (from exploratory bi-factor analysis) and correlated more strongly with its intended facet scale than with other facets. As others have noticed in Western countries (e.g., Soto and John, 2017), results showed that it was particularly difficult to write items to measure low levels of Open-mindedness (e.g., lack of Intellectual Curiosity) and of high levels of Negative-Emotion Regulation; for example, items describing high levels of Self-confidence also tended to correlate with facets like Enthusiasm and Assertiveness (from Engaging with Others) and Persistence and Determination (from Self-Management). We retained the most promising items and wrote some additional candidate items for facets that were less well measured, resulting in a total of 306 items.

In a second study conducted in 2015, we analyzed these 306 items to select the final item set for SENNA. For this occasion, we developed a computerized web application that administered items in seven booklets to students using another BIB design. A sample of 5,485 high school students enrolled in public schools in the State of Ceará was randomly assigned to one out of the seven booklets (an average of 783 students answered each booklet), and each student answered a subset of 132 items. We followed the same method and rationale of the first study (internal structure analysis) to select the final set of 162 candidate items that composed SENNA. A more detailed description and materials of these two studies can be found in the SENNA manual (Primi et al., 2021).

To balance content across true keyed and false keyed items, and thus control acquiescence more systematically, we arranged the items on the trait identity scales into approximate antonym pairs. For example, a true-keyed identity item on the Curiosity to Learn facet scale (Open-mindedness domain) was "A lot of subjects awake my curiosity (identity +), whereas "I don't have much interest in finding out how things work (identity −) was a reverse-keyed item (see **Table 2** for more examples). A self-efficacy item example was "How well can you learn new things?" Thus, the self-efficacy items were all true keyed[5] and their item content was developed separately from the identity items to highlight specific skill components associated with each of the 18 SEMS to be measured. The final SENNA measure thus included nine items per SEMS facet, specifically (a) six identity items (three positively and three negatively keyed items, forming three opposite pairs to permit us to compute and correct for acquiescence) and (b) three true-keyed self-efficacy items. Example items can be found in **Table 2**.

PRESENT STUDY

One limitation of our initial instrument development studies was that participants had always completed only subsets of our item pools. Here, we administered the full inventory to

[5]We wrote only positively keyed self-efficacy items because it is strange to ask students to rate "how well they cannot do something." Given that acquiescence is considered a more general response tendency, we used the acquiescence index computed on the identity items to also correct the raw scores of the self-efficacy items.

TABLE 2 | Proposed socio-emotional skills domains, facets, and item examples for Senna-2.

Facet	Definition	Examples of items
O: Open-mindedness: Interest and devotion to matters of the mind		
1. Curiosity to learn	Able to muster interest in ideas and a passion for learning, understanding, and intellectual exploration; an *inquisitive* mind-set that facilitates critical thinking and problem solving (likes to think, play with ideas)	A lot of subjects awake my curiosity (identity +) I don't have interest in finding out how things work (identity −) How well can you learn new things (self-efficacy)
2. Creative imagination	Is able to generate novel ways to think about or do things through experimenting, tinkering, learning from failure, insight, and vision (is original, comes up with new ideas)	I'm original, I have new ideas (identity +) I don't have a lot of imagination (identity −) How well can you create and write stories (self-efficacy)
3. Artistic interest (appreciation of aesthetics):	Valuing, appreciating, and enjoying design, art, and beauty, which may be experienced or expressed in writing, visual and performing arts, music, and other forms of self-actualization (is fascinated by art, music, or literature)	I like artistic activities (identity +) I find art useless (identity −) How well can you create artistic things, like a poem (self-efficacy)
C: Self-management (or: **goal orientation, task performance)**		
1. Organization (orderliness):	Has organizational skills and meticulous attention to detail that are useful for planning and executing plans to reach longer-term goals (keeps their school things neat and tidy; not disorganized or messy)	I always keep my things organized (identity +) My things are messy (identity −) How well can you keep your school materials organized (self-efficacy)
2. Determination (goal striving, high standards):	Is able to set goals and high standards, motivate themselves, work very hard (in terms of time and effort), and apply themselves fully to the task, work, or project at hand. This is the pro-active side of C (I do more than what is expected of me; I do my work as well as I possibly can; vs. I only need to be in the average; I find it difficult to motivate myself to excel)	I'm a dedicated and hard-working student (identity +) I put little effort in my tasks (identity −) How well can you motivate yourself to always do your best (self-efficacy)
3. Focus (concentration):	Is able to focus attention and concentrate on the current task, and avoid distractions even while performing repetitive tasks (I manage to concentrate on things I do, vs. I don't pay close attention during class and end up forgetting things)	Nothing distracts me once I start to work on a task (identity +) I deviate my attention easily (identity −) How well can you stay focused and not get lost when performing a task (self-efficacy)
4. Persistence (self-discipline):	Is able to overcome obstacles in order to reach important goals; "implement, persist, and finish." The emphasis here is on completing tasks and finishing whatever one has undertaken, in contrast to procrastinating or giving up. Related concepts are grit, perseverance, and effortful control (I finish my work by the time I have planned to, vs. I leave everything until the last minute)	I never give up (identity +) I usually turn in work late. (identity −) How well can you apply yourself when preparing for a hard test (self-efficacy)
5. Responsibility (reliability, dependability):	Has self-management skills needed for doing one's duty, meet commitments, act in reliable and consistent ways, and engender trustworthiness; this facet has a secondary link to A and should be important for predicting civic involvement and commitment (is reliable, can always be counted on)	I only make promises I know I'll be able to fulfill (identity +) I usually forget about commitments that I have made. (identity −) How well can you keep your word, what you promised (self-efficacy)
E: Engaging with others (vs. withdrawal and avoidance)		
1. Social initiative:	Able to approach and connect with others, both friends and strangers, initiating, maintaining, and enjoying social contact and connections; skilled at teamwork, including expressive communication skills, such as public speaking skills (is outgoing, comfortable around people)	I'm uninhibited and I get along with others (identity +) I'm reserved, I keep to myself (Brazilian slang, don't know how to translate properly) (identity −) How well can you make the first step to show that you like someone (self-efficacy)
2. Assertiveness (courage, finding your voice):	Able to speak up, voice opinions, needs, and feelings, and exert social influence; capacity to assert own will to accomplish goals in the face of opposition, such as speaking out, taking a stand, and confronting others if needed; courage (takes on leadership roles)	I usually give my opinion in group discussions (identity +) I don't say anything when my classmates say something I don't agree with. (identity −) How well can you ask your teachers for help when you have difficulties (self-efficacy)
3. Enthusiasm (energy; positive attitude):	Able to show passion and zest for life; to approach daily tasks with energy, excitement, and a positive attitude (is full of energy, shows enthusiasm)	I'm very happy and cheerful (identity +) I'm not a very excited person (identity −) How well can you cheer yourself up when you're sad (self-efficacy)

(Continued)

TABLE 2 | (Continued)

Facet	Definition	Examples of items
A: Amity (vs. enmity; tending and befriending others)		
1. Empathy (compassionate caring):	Able to use empathy and perspective taking skills to understand the needs and feelings of others, act on that understanding with kindness and consideration of others, and investing in close relationships by helping and providing support and assistance, both material and emotional; is rewarding and easy to deal/live/work with (considerate and kind to everyone)	I care about what happens to others (identity +) I don't care about other people's feelings (identity −) How well can you understand what others are feeling (self-efficacy)
2. Respect for others (politeness):	Able to treat others with respect and politeness, the way oneself would like to be treated, according to notions of fairness, justice, and tolerance, and keeping aggressive and selfish impulses in check (is respectful; treats others with respect vs. breaking rules; known for defying teachers)	I respect authorities (teachers, principals, etc.) (identity +) I make threats to get what I want. (identity −) How well can you treat respectfully people you don't like (self-efficacy)
3. Trust (forgiveness and appreciation of others):	Able to assume that others generally have good intentions and forgiving those that have done wrong; avoid being harsh and judgmental, giving people another chance (assumes the best about people)	I believe in the best in people (identity +) I feel it's better not to trust anyone (identity −) How well can you trust people to watch over your things (self-efficacy)
4. Gratitude (humility):	Able to feel gratitude for what we have and humble about our abilities and status in the world, rather than thinking of oneself as better than others and deserving special treatment (I avoid calling attention to myself, vs. I put myself first because I am very special).	I don't think I'm better than others (identity +) I think about myself first because I'm special (identity −) How well do you succeed in in being modest (self-efficacy)
N: Negative-emotion regulation		
1. Stress modulation:	Is effective in modulating anxiety and response to stress; untroubled by excessive worry and able to calmly solve problems (is relaxed, handles stress well)	After being scared, I calm down easily (identity +) I struggle with anxiety in difficult situations (identity −) How well can you deal with stress without worrying too much (self-efficacy)
2. Self-confidence (optimism):	Is able to feel satisfied with self and current life, think positive thoughts, and maintain optimistic expectations; anticipates success in actions undertaken; has a "can-do" mind-set; does not ruminate about failures, disappointments, or set-backs (feels secure, comfortable with self)	I'm happy and have few negative thoughts (identity +) I can't stop thinking about negative things (identity −) How well can you stay in good spirits even when something bad happens to you (self-efficacy)
3. Tolerance of frustration (temper control):	Has effective strategies for regulating temper, anger, and irritation; able to maintain tranquility and equanimity in the face of frustrations; not moody or volatile (keeps their emotions and temper under control)	I stay calm and control my frustration (identity +) I get very angry and usually lose my temper (identity −) How well can you control your anger when other people make are annoying you (self-efficacy)

Item examples were translated by the authors as literally as possible from the Brazilian Portuguese originals. The self-efficacy items are administered in a separate block from the trait identity items and are rated on a scale from 1 = not at all to 5 = very well.

all participants at their schools, thus testing the feasibility of our assessment approach in the field. The present work first reports a joint factor analysis of the 18 positive identity, 18 negative identity, and 18 self-efficacy SEMS cluster scales to identify how these unfold into the Social-Emotional Big Five framework. We hypothesized that (a) the trait-identity clusters and self-efficacy clusters will load together on the expected SEMS factor, and (b) that acquiescence variance will affect the clarity of that structure, such that the structure obtained for the raw-score, uncorrected scales will be less clear, and adhere less well to the expected structure, than when the clusters are all corrected for individual differences in acquiescence. Soto et al. (2008) had found in Western youth aged 10–20 that the acquiescence effect was most pronounced for Agreeableness, and we examine whether that is also the case in our Brazilian public school students.

In addition, we examine whether separate analyses of (a) the 6-item identity clusters and (b) the 3-item self-efficacy clusters each shows the expected five-factor structure, testing our hypothesis that both approaches lead to measures that conform to the same underlying structure when acquiescence is controlled. Finally, we present the results of a joint principal component analysis of the acquiescence-corrected identity and self-efficacy clusters to test the hypothesis that the five-factor spaces for two approaches to SEMS measurement converge on a common model.

MATERIALS AND METHODS

Participants

The sample included students from 234 cities and 501 public schools distributed across the entire State of São Paulo, and is the most comprehensive school-based assessment of SEMS attempted in Brazil so far. In total, 50,209 students completed the full 162-item SENNA item set via a dedicated web platform. Students were enrolled in grades 6 to 12, 52.7% were girls, and the average age was 14.9 years (SD = 2.1). All data were collected while students were participating in a reading program at their school.

Design and Statistical Analysis

The present study aimed to test if a five-factor solution can account for the covariance matrix formed by of the three sets of 18 SENNA cluster scales described above (see examples for the three kinds of items in **Table 2**). For example, would the newly developed self-efficacy item clusters load along with the identity item clusters or form separate factors? We expected convergence across the trait-identity and self-efficacy approaches but not perfectly simple structure because several of the SEMS facet scales fall at the boundaries between the standard Big Five factors, like Self-Confidence (between Negative-Emotion Regulation and Engaging with Others) and Respect (between Amity and Self-Management). Finally, we wanted to investigate how acquiescence would affect the internal structure and whether these effects could be controlled estimating each respondent's acquiescence tendency only from the (true and false keyed) trait identity items (as the self-efficacy items do not include any reverse-keyed items needed to compute acquiescence).

For each SEMS facet, three indicator variables were computed averaging scores on (a) three positively keyed identity items ('identity +'), (b) three negatively (or false) keyed identity items (after reversing items so high scores always still reflect a high skill level; 'identity −'), and (c) three positively keyed self-efficacy items, thus 18 SEMS constructs using three indicators with three items each, for a total of 54 short cluster scales. We then fitted a five-factor model with target rotation using Exploratory Structural Equation Modeling (ESEM) via MPLUS. We ran this analysis twice, one with the raw item scores and another with acquiescence corrected scores.

The identity scales of SENNA include 108 items (6×18) forming a balanced scale given that each facet has three positively and three negatively keyed items, or a total of 54 "antonym" pairs. We calculated an acquiescence index (ACQ) for each student, computing the average score across all 108 items, before reversing the negatively keyed items, per individual (see Soto et al., 2008, and Soto and John, 2017; for details on this procedure; Primi et al., 2020 for psychometric details and https://github.com/rprimi/noisecanceling for a R package to implement this method). If a student used the response scale in a fully symmetrical way, they would tend to have answer profiles such as 1–5, 2–4, 3–3, 4–2, or 5–1 to the two items in each semantic antonym, resulting in an ACQ score of 3, exactly at the mid-point of the 1–5 response scale labeled as:'1' (not at all like me), '2' (little like me), '3' (moderately like me), '4' (a lot like me) and '5' (completely like me)[6].

If a student is more likely to agree regardless of the content of the items, the average across antonym pairs will be ACQ > 3, indicating elevated levels agreement (acquiescence bias). If the student is more likely to disagrees regardless of the content, ACQ < 3 indicating dis- acquiescence bias. This ACQ-index was used to correct all item responses, including the responses to the self-efficacy items, which do not include reverse-keyed items and thus ACQ cannot be estimated directly. We do that by subtracting the individual's ACQ-index from each of their item scores. This procedure removes acquiescence variance from item scores (see more details in Primi et al., 2020).

[6]Note that these labels match trait identity items asking students to think about "*How do you behave/feel and think in most situations.*" For self-efficacy items asking students "*How well can you do.*" we used: '1' (nothing capable), '2' (little capable), '3' (moderately capable), '4' (very capable) and '5' (totally capable).

RESULTS

Overall Factor Structure Across Trait-Identity and Self-Efficacy Item Clusters

Table 3 shows the results of the ESEM internal structure analysis of the 54 indicators for the five-factor solution. The loadings on the left side of the table (columns four to eight) represent the final model when acquiescence variance was removed at the level of the individual respondent. The results were surprisingly clear: For 16 (out of 18) SEMS, all three indicators (positive identity, negative identity, and positive self-efficacy) had their highest loading on their intended social-emotional five-factor domain. Thus, quite consistently, positively and negatively keyed identity item clusters loaded together with their respective self-efficacy counterparts on the expected factors. There were two exceptions: the self-efficacy cluster for Assertiveness loaded more strongly on the Self-Management factor, whereas the self-efficacy cluster for Trust loaded more strongly on the Emotion Regulation factor. In fact, the other indicators of Trust did not clearly emerge as a facet of Amity, and were poorly represented in the overall factor solution.

As expected, some secondary loadings were observed: (a) Responsibility, a facet of Self-Management, also had secondary loadings on Amity across all indicators. This skill is conceptualized as the most interpersonal aspect of Self-Management and implies a commitment to others, thus associating it also with Amity; (b) The self-efficacy indicator of Enthusiasm, a facet of Engagement with Others, also loaded on Emotion Regulation because its items refer to experiencing energy and positive emotions in stressful situations; (c) The self-efficacy indictor of Respect, a facet of Amity, has a secondary loading on Emotion Regulation as items refer to the regulation of negative behavior and impulses (e.g., suspicion) in interpersonal situations; (d) Frustration tolerance, a facet of Emotion Regulation, also had a secondary loading on Amity because items refer to the regulation of anger and irritability in social situations that connects to caring with others; (e) Finally, all indicators of Self Confidence, a facet of Negative-Emotion Regulation, had secondary loadings on Engagement with others. These items refer to positive confidence in the self that is a necessary condition to reach out to others.

Effects of Acquiescence on Internal Structure

The second focus of our analyses was examining the effect of acquiescence correction on the internal structure. The acquiescence index had a mean of $M = 2.95$ (close to the expected 3.0, the mid-point of the rating scale); however, the standard deviation (SD) was 0.37, indicating substantial

TABLE 3 | Factor loadings of Exploratory Structural Equation Modeling (ESEM) of 54 SEMS indicators, measured with either positively keyed or negatively keyed trait-identity items or self-efficacy items.

			Corrected for acquiescence					Raw scores				
Domain and facet	**Item framing**	**Pole**	**O**	**C**	**E**	**A**	**N**	**O**	**C**	**E**	**A**	**N**
O: Openness												
Artistic interest	Identity	−	**0.426**	0.079	0.046	**0.316**	−0.132	*0.229*	*0.250*	*0.261*	**0.468**	−0.092
	Identity	+	**0.589**	−0.062	−0.038	0.123	−0.016	**0.595**	0.037	0.009	−0.002	0.02
	Self-efficacy	+	**0.724**	0.000	−0.175	−0.033	0.128	**0.729**	0.042	−0.155	0.136	0.098
Creative imagination	Identity	−	**0.473**	0.029	0.170	0.106	−0.137	**0.338**	0.093	**0.305**	**0.438**	−0.112
	Identity	+	**0.703**	−0.040	0.150	−0.100	−0.050	**0.760**	−0.075	0.098	−0.039	−0.02
	Self-efficacy	+	**0.812**	0.021	−0.006	−0.110	0.121	**0.850**	−0.003	−0.022	0.106	0.089
Curiosity to learn	Identity	−	**0.351**	0.021	0.107	*0.263*	−0.177	0.175	0.165	*0.295*	**0.399**	−0.152
	Identity	+	**0.448**	0.066	0.143	0.183	−0.114	**0.483**	0.158	0.160	−0.184	−0.056
	Self-efficacy	+	**0.562**	0.169	0.049	0.070	0.123	**0.590**	*0.214*	0.071	−0.02	0.105
C: Self-management												
Determination	Identity	−	0.149	**0.360**	0.106	0.086	−0.132	0.037	**0.339**	0.203	**0.428**	−0.105
	Identity	+	0.018	**0.797**	−0.011	0.006	−0.079	0.149	**0.709**	−0.087	−0.114	−0.028
	Self-efficacy	+	0.168	**0.493**	0.148	0.069	0.132	*0.244*	**0.481**	0.103	−0.208	0.127
Focus	Identity	−	*0.205*	**0.524**	−0.103	−0.047	0.022	0.113	**0.431**	−0.042	**0.553**	0.039
	Identity	+	0.078	**0.560**	−0.046	0.032	0.046	0.194	**0.493**	−0.113	−0.143	0.093
	Self-efficacy	+	0.182	**0.574**	−0.110	−0.059	0.253	0.258	**0.508**	−0.191	−0.054	0.24
Organization	Identity	−	−0.149	**0.727**	−0.027	0.010	0.003	−0.182	**0.644**	−0.015	0.297	0.04
	Identity	+	−0.139	**0.867**	−0.031	−0.014	−0.020	0.007	**0.752**	−0.131	−0.157	0.026
	Self-efficacy	+	−0.051	**0.750**	−0.063	−0.047	0.183	0.047	**0.669**	−0.161	−0.122	0.175
Persistence	Identity	−	0.013	**0.716**	0.016	0.103	−0.191	−0.052	**0.700**	0.086	0.336	−0.144
	Identity	+	0.007	**0.673**	0.124	0.033	−0.046	0.145	**0.585**	0.033	*−0.236*	0.01
	Self-efficacy	+	0.165	**0.680**	−0.074	−0.063	0.099	*0.253*	**0.620**	−0.15	−0.043	0.079
Responsibility	Identity	−	−0.008	**0.459**	0.173	*0.214*	−0.126	−0.108	**0.493**	*0.280*	**0.299**	−0.075
	Identity	+	−0.042	**0.530**	0.123	*0.265*	−0.100	0.039	**0.599**	0.128	*−0.283*	−0.033
	Self-efficacy	+	0.029	**0.456**	0.037	*0.268*	0.085	0.049	**0.583**	0.080	*−0.211*	0.088
Engaging with others												
Enthusiasm	Identity	−	0.079	−0.074	**0.534**	0.052	−0.041	0.007	−0.100	**0.575**	0.204	−0.021
	Identity	+	−0.017	0.063	**0.584**	0.060	*0.221*	0.120	−0.025	**0.467**	−0.360	0.264
	Self-efficacy	+	0.080	*0.236*	**0.300**	0.137	**0.322**	0.142	*0.232*	**0.279**	−0.241	**0.329**
Assertiveness	Identity	−	0.195	0.126	**0.445**	*−0.207*	0.01	0.158	−0.052	**0.400**	**0.327**	−0.004
	Identity	+	*0.261*	0.139	**0.351**	−0.188	−0.123	**0.402**	0.004	0.192	*−0.288*	−0.096
	Self-efficacy	+	0.189	**0.381**	0.191	−0.130	0.179	*0.288*	0.255	0.093	−0.088	0.158
Social initiative	Identity	−	0.052	−0.181	**0.607**	−0.073	0.023	0.015	*−0.263*	**0.587**	0.086	0.013
	Identity	+	−0.050	−0.078	**0.649**	*0.223*	0.014	0.055	−0.045	**0.605**	**−0.506**	0.051
	Self-efficacy	+	0.059	0.072	**0.316**	0.050	*0.259*	0.132	0.052	**0.252**	**−0.333**	*0.243*
A: Amity												
Empathy	Identity	−	0.148	0.074	*0.215*	**0.451**	−0.141	−0.021	*0.299*	**0.423**	0.255	−0.078
	Identity	+	0.053	−0.022	*0.217*	**0.540**	−0.013	0.063	*0.243*	**0.309**	**−0.401**	0.051
	Self-efficacy	+	*0.245*	0.039	0.184	**0.388**	−0.006	*0.237*	*0.263*	*0.279*	**−0.321**	−0.011
Gratitude	Identity	−	0.036	0.064	−0.109	**0.615**	−0.083	−0.184	**0.375**	0.185	**0.330**	−0.034
	Identity	+	0.050	−0.093	−0.199	**0.346**	−0.045	0.041	**0.129**	−0.101	*−0.202*	0.010
	Self-efficacy	+	0.187	0.124	−0.175	**0.318**	0.249	0.161	**0.313**	−0.091	*−0.135*	*0.248*
Respect	Identity	−	0.031	*0.299*	*−0.216*	**0.457**	0.138	−0.153	**0.492**	0.019	**0.438**	0.184
	Identity	+	−0.016	0.366	−0.025	**0.508**	−0.017	−0.013	**0.593**	0.107	−0.158	0.056
	Self-efficacy	+	0.136	0.166	−0.168	**0.437**	**0.353**	0.084	**0.402**	−0.043	−0.087	**0.375**
Trust	Identity	−	−0.011	−0.007	0.128	0.087	*0.267*	−0.126	−0.011	0.201	**0.381**	*0.266*
	Identity	+	−0.002	−0.117	*0.202*	**0.326**	0.187	0.040	0.022	0.220	**−0.341**	*0.232*
	Self-efficacy	+	0.069	−0.129	0.123	0.173	**0.347**	0.088	−0.055	0.124	*−0.229*	0.347

(Continued)

TABLE 3 | (Continued)

Domain and facet	Item framing	Pole	Corrected for acquiescence					Raw scores				
			O	C	E	A	N	O	C	E	A	N
N: Negative-emotion regulation												
Frustration tolerance	Identity	−	0.046	−0.041	−0.023	0.176	**0.586**	−0.108	−0.033	0.094	**0.545**	**0.640**
	Identity	+	−0.036	−0.060	−0.081	0.137	**0.527**	0.000	−0.051	−0.101	−0.057	**0.601**
	Self-efficacy	+	0.071	−0.074	−0.124	*0.205*	**0.747**	0.031	−0.004	−0.094	0.027	**0.789**
Stress modulation	Identity	−	0.031	0.085	0.193	−0.189	**0.444**	−0.031	−0.113	0.164	**0.484**	**0.434**
	Identity	+	0.046	0.102	0.214	−0.033	**0.397**	0.166	−0.003	0.086	*−0.227*	**0.428**
	Self-efficacy	+	0.110	0.034	−0.028	0.033	**0.739**	0.128	−0.001	−0.081	−0.035	**0.751**
Self-confidence	Identity	−	−0.127	*0.238*	*0.294*	0.009	**0.349**	−0.183	0.095	**0.306**	**0.403**	**0.354**
	Identity	+	−0.068	0.134	*0.291*	0.126	**0.300**	0.041	0.090	*0.217*	*−0.256*	**0.368**
	Self-efficacy	+	0.068	0.169	0.254	0.090	**0.496**	0.123	0.137	*0.206*	−0.21	**0.502**

Loadings higher then r > 0.30 in bold. Loadings higher than r > 0.20 in italics. Fit indices were: (a) Raw scores χ^2 = 55,271.8, df = 1,171, BIC = 1,489,415, CFI = 0.83, TLI = 0.79, RMSEA = 0.06, SRMR = 0.04. (b) Corrected for acquiescence: χ^2 = 78,888.0, df = 1,171, BIC = 1,437,677, CFI = 0.74, TLI = 0.68, RMSEA = 0.07, SRMR = 0.04.

individual differences in scale usage across the students and thus deviation from the expected score of 3.0. Thus, we expected acquiescence would have a salient effect.

We computed a similar ESEM model but now with the uncorrected raw scores and loadings of indicators are reported on the right-hand side of **Table 3** (in columns 9 to 13). An inspection of these columns shows that in every broad SEMS domain, a substantively higher number of indicator scales had their primary loading on another factor than intended. This was mainly due to the negatively keyed identity indicators of several SEMS, which had their primary loading on the fourth factor. Overall, in this analysis, the Amity domain was not recovered, due to a strong influence of acquiescence in the covariance matrix. The fourth factor extracted in this analysis seems to reflect acquiescence variance because it has negative items with positive loadings contrasted with positive items with negative loadings.

To quantify these observations, we compared the ESEM results from the raw and the acquiescence-corrected SEMS indicators further using a novel variant of factor congruence analysis. To define a theory-based, idealized target matrix of loadings, we created a vector of 54 numbers for each of the five expected domains, one for each indicator variable, with perfect theoretical loadings of 1.0 only on the one intended domain and zero on all the other four domains (thus, somewhat unrealistically, not allowing any of the known secondary loadings). We then correlated this idealized target matrix with the observed loadings of the 18 indicators estimated by the ESEM model, separately for the raw and for the acquiescence-corrected scores. These congruence coefficients are presented in **Table 4**.

The upper half of **Table 4** shows the congruence coefficients for the acquiescence-corrected ESEM model, whereas the lower half shows the congruence coefficients for the raw-score model. Each cell shows the congruence coefficient for comparing the empirical loadings (rows) to the idealized theoretical loadings (columns). We calculated these coefficients for all pairwise combinations. If structures were identical, then the values on the diagonal would all be 1.0 and the off-diagonal values would be zero.

When we consider the data corrected for acquiescence, the loadings were much closer to this ideal. The five congruence coefficients on the diagonal averaged 0.85 and even the lowest was 0.78. In contrast, for the raw scores, the diagonal congruence coefficients averaged only 0.62. Moreover, the off-diagonal coefficients were much closer to zero for the acquiescence-corrected ESEM model. In other words, the loading pattern for the raw scores was a far less clear representation of the

TABLE 4 | Conceptual congruency coefficients: Correlations of the empirically observed loadings on the five factors with *a priori* theoretical (ideal) loadings (1 and 0) for (a) scores corrected for acquiescence (upper half) and (b) uncorrected raw scores (lower half).

Empirical factor loadings	Theoretical factor loadings				
	O	C	E	A	N
Corrected for acquiescence scores					
O	**0.89**	0.08	0.15	0.14	0.02
C	0.04	**0.92**	0.09	0.09	0.08
E	0.09	0.04	**0.78**	0.03	0.19
A	0.16	0.13	−0.01	**0.79**	0.11
N	−0.04	0.02	0.15	0.19	**0.80**
Raw scores					
O	**0.80**	0.16	0.22	0.03	0.03
C	0.11	**0.85**	0.01	0.34	0.01
E	0.20	0.00	**0.67**	0.27	0.15
(A)	0.21	0.04	−0.19	−0.06	0.11
N	−0.02	0.07	0.16	0.24	**0.83**

The numbers shown in bold font indicate the highest congruence coefficient for each empirical factor and thus the best match between the empirically obtained factor and the theoretically expected factor. In the raw-score analyses (in the lower half of the table), the expected A factor was not identified clearly as a separate factor.

social-emotional five-factor domains than the acquiescence-corrected one.

As expected on the basis of Western research, acquiescence affected the SEMS indicators in the Amity domain most strongly. Looking at the congruency of the empirical factor in row A in **Table 4**, there was no similarity of empirical loadings with the theoretically expected values for A (i.e., column A: $r = -0.06$) or with any other domain (O: $r = 0.21$, C: $r = 0.04$, E: $r = -0.19$, N: $r = 0.11$). When we look at column A (which represents the vector of theoretically expected perfect loadings of 1s and 0s), we see only small correlations with empirical loadings for factors representing C ($r = 0.34$), E ($r = 0.27$), and N ($r = 0.25$).

Structure of Identity Versus Self-Efficacy Indicators

Finally, we tested whether the newly devised self-efficacy scales would be well represented within the now familiar five-factor structure. We conducted separate principal component analyses of (a) the 18 SENNA identity indicators (now combining their true and false-keyed items into one 6-item scale) and (b) the self-efficacy indicators (three items each) after all indicators had been corrected for acquiescence. We used principal components because we wanted a model with no constraints in loadings. As can be observed in **Table 5**, the self-efficacy scales grouped as expected according to the five domains, and so did the identity scales. Some of the self-efficacy scales, however, showed secondary loadings on the Self-management factor: Curiosity to learn (O), Assertiveness (E), Gratitude (A), and Self-Confidence (N) had substantive loadings on Self-Management.

When analyzed together with the identity items, self-efficacy scales still had their highest loadings on the five factors along with their corresponding identity scales (see **Table 6**). SEMS identity and self-efficacy items hence seem to function as indicators of the same underlying latent social-emotional five factors.

DISCUSSION

This paper described the developmental history of SENNA and provided new psychometric information on its internal structure obtained from a large sample of 50,000 Brazilian students enrolled in public school grades 6 to 12, spread across the entire State of São Paulo. The SENNA inventory was designed as an instrument assessing 18 different skills, each operationalized by nine items that represent three types of items: three positively keyed identity items and three negatively keyed identity items, complemented with three (always positively keyed) self-efficacy items, totaling a set of 162 items. Individual skills were assumed to group into the higher-order structure of the social-emotional Big Five, labeled as Engaging with Others, Amity, Self-management, Emotional Regulation, and Open-mindedness. Given its youth target group is as young as 11 years old (grade 6), SENNA was also equipped to correct systematically for individual differences in acquiescence which are known to have particularly strong biasing effects from ages 10 to 13 (Soto et al., 2008).

The Social-Emotional Big Five

Our results showed convincing evidence that the 18 SEMS measured here aligned within the social-emotional Big Five structure, both when analyzing the identity and self-efficacy scales together and also when they were analyzed separately, with one critical condition: in samples of youth like our's, with children as young as 11 years old, individual differences in acquiescence have to be corrected. There were some expected secondary loadings that have also been observed in Western samples (e.g., Soto et al., 2008; Soto and John, 2017). The results for the Trust skill in this study were less clear, and this scale was more difficult to position uniquely in the social-emotional skill space. Overall, these findings underscore that the social-emotional Big Five is also a useful framework to organize SEMS in a non-WEIRD

TABLE 5 | Separate factor structures for the trait-identity item clusters (Id) and for the self-efficacy (SE) item clusters: Standardized loadings from a principal component analysis after controlling for acquiescence and communality (h^2) to indicate total variance explained.

	O		C		E		A		N		h^2	
	Id	SE	Id	SE	Id	SE	Id	SE	Id	SE	Id	SE
O1: Creative imagination	**0.77**	**0.82**	0.21	0.23	0.14	0.15	−0.03	0.11	0.17	0.14	0.68	0.79
O2: Curiosity to learn	**0.75**	**0.66**	0.20	**0.38**	0.11	0.21	0.17	0.13	0.01	0.17	0.64	0.67
O3: Artistic interest	**0.63**	**0.83**	0.25	0.20	0.08	−0.03	0.27	0.18	0.17	0.16	0.56	0.78
C1: Persistence	0.21	**0.37**	**0.83**	**0.75**	0.08	0.10	0.07	0.04	0.08	0.12	0.74	0.72
C2: Determination	0.26	0.28	**0.77**	**0.67**	0.08	**0.31**	0.06	0.11	0.09	0.13	0.67	0.66
C3: Organization	0.02	0.17	**0.81**	**0.74**	−0.02	0.13	0.05	0.04	0.18	0.21	0.68	0.64
C4: Focus	0.28	0.34	**0.70**	**0.69**	−0.10	0.08	0.05	0.03	**0.30**	**0.30**	0.66	0.69
C5: Responsibility	0.16	0.01	**0.71**	**0.72**	0.17	0.05	0.09	**0.37**	0.06	0.14	0.57	0.67
E1: Social initiative	0.09	0.05	−0.09	0.04	**0.84**	**0.77**	−0.08	0.22	−0.01	0.08	0.73	0.66
E2: Enthusiasm	0.18	0.17	0.08	0.38	**0.77**	**0.52**	−0.03	0.13	0.19	0.33	0.67	0.56
E3: Assertiveness	**0.45**	**0.33**	0.19	**0.47**	**0.42**	**0.38**	**−0.40**	−0.07	0.07	0.11	0.57	0.49
A1: Empathy	0.23	0.18	0.29	0.26	**0.49**	0.27	**0.56**	**0.72**	−0.03	−0.11	0.68	0.70
A2: Respect	0.10	0.17	**0.59**	**0.47**	−0.05	−0.05	**0.49**	**0.38**	0.28	**0.50**	0.68	0.65
A3: Trust	−0.05	0.12	0.12	−0.07	**0.42**	0.20	**0.44**	**0.57**	**0.38**	**0.31**	0.53	0.48
A4: Gratitude	0.18	0.14	0.09	**0.45**	−0.16	−0.19	**0.67**	**0.43**	−0.01	**0.37**	0.51	0.58
N1: Frustration tolerance	0.12	0.13	0.14	0.17	−0.07	0.09	0.19	0.10	**0.81**	**0.86**	0.73	0.80
N2: Stress modulation	0.18	0.19	0.17	0.24	0.12	0.22	−0.19	0.03	**0.77**	**0.79**	0.70	0.77
N3: Self-confidence	0.04	0.15	**0.31**	**0.35**	**0.35**	**0.48**	0.06	0.11	**0.62**	**0.52**	0.61	0.65

Loadings higher then r > 0.30 in bold.

TABLE 6 | Joint principal component analysis of person-centered identity and self-efficacy scales: Standardized loadings and communality (h^2) to indicate total variance explained.

	O	C	E	A	N	h^2
ID-O1: Creative imagination	0.75	0.16	0.22	0.03	0.08	0.64
ID-O2: Intellectual curiosity	**0.62**	0.20	0.15	0.19	−0.04	0.48
ID-O3: Aesthetic interest	**0.69**	0.20	0.04	0.25	0.11	0.59
SE-O1: Creative imagination	**0.76**	0.26	0.12	0.01	0.25	0.72
SE-O2: Intellectual curiosity	**0.64**	**0.37**	0.14	0.08	0.27	0.64
SE-O3: Aesthetic interest	**0.72**	0.24	−0.04	0.10	0.23	0.64
ID-C1: Persistence	0.23	**0.77**	0.11	0.11	0.05	0.67
ID-C2: Determination	0.28	**0.71**	0.10	0.11	0.05	0.61
ID-C3: Organization	0.09	**0.77**	0.00	0.04	0.16	0.62
ID-C4: Focus	0.32	**0.66**	−0.04	0.05	0.23	0.59
ID-C5: Responsibility	0.11	**0.68**	0.18	0.23	0.01	0.55
SE-C1: Persistence	0.28	**0.73**	0.03	0.06	0.21	0.66
SE-C2: Determination	0.28	**0.64**	0.24	0.08	0.22	0.60
SE-C3: Organization	0.09	**0.75**	0.03	0.04	0.28	0.65
SE-C4: Focus	0.27	**0.67**	−0.01	0.04	**0.37**	0.66
SE-C5: Responsibility	0.05	**0.66**	0.10	0.27	0.17	0.55
ID-E1: Social initiative	0.03	−0.12	**0.78**	0.17	−0.06	0.65
ID-E2: Assertiveness	0.32	0.18	**0.57**	−0.18	−0.03	0.50
ID-E3: Enthusiasm	0.15	0.04	**0.73**	0.16	0.10	0.59
SE-E1: Social initiative	0.03	0.12	**0.46**	0.07	0.24	0.29
SE-E2: Assertiveness	0.26	**0.44**	**0.33**	−0.07	0.23	0.43
SE-E3: Enthusiasm	0.15	**0.36**	**0.41**	0.14	**0.42**	0.51
ID-A2: Empathy	0.22	0.23	0.30	**0.65**	−0.05	0.62
ID-A1: Respect	0.18	**0.56**	−0.15	**0.43**	0.26	0.61
ID-A3: Trust	0.05	0.04	0.27	**0.57**	**0.30**	0.49
ID-A4: Gratitude	0.09	0.15	**−0.30**	**0.52**	−0.02	0.39
SE-A2: Empathy	0.23	0.26	0.29	**0.46**	−0.03	0.42
SE-A1: Respect	0.19	**0.43**	−0.11	**0.41**	**0.46**	0.61
SE-A3: Trust	0.01	−0.01	0.24	**0.53**	**0.33**	0.45
SE-A4: Gratitude	0.18	0.36	−0.16	**0.36**	**0.33**	0.43
ID-N1: Frustration tolerance	0.13	0.13	−0.04	0.14	**0.73**	0.58
ID-N2: Stress modulation	0.15	0.18	0.28	−0.11	**0.61**	0.52
ID-N3: Self-confidence	0.06	0.29	**0.37**	0.11	**0.47**	0.46
SE-N1: Frustration tolerance	0.11	0.16	−0.05	0.17	**0.80**	0.70
SE-N2: Stress modulation	0.14	0.23	0.07	0.06	**0.78**	0.70
SE-N2: Self-confidence	0.13	**0.34**	**0.34**	0.08	**0.59**	0.60

Loadings higher then r > 0.30 in bold.

culture like Brazil (John et al., 2008; Kyllonen et al., 2014; Lipnevich et al., 2016; Abrahams et al., 2019; Primi et al., 2019c).

This work further provided strong evidence that students from grades 6 to 12 are able to provide reliable and valid descriptions on identity and self-efficacy scales to assess a broad variety of SEMS, even when data are collected in the course of large-scale assessments. The instrument hence meets all requirements that were previously listed, including being broadly applicable, at a low cost (in time and financially), and to be completed independently by students. The SENNA inventory in its present form, is a significant step forward compared to its predecessor (SENNA 1.0; Primi et al., 2016) including (a) scales to assess five domains and 18 specific SEMS, (b) representing both identity and self-efficacy items to represent the constructs, and (c) an effective method to deal with acquiescence bias in responding.

Acquiescence Matters

Furthermore, this study demonstrated the importance of having a proper method to control for acquiescence variance, that is a main problem in large-scale assessment where participants are often younger, represent various backgrounds, are not necessarily motivated or paying attention during the entire assessment, and where some participants may demonstrate answering tendencies such as yes- or no-saying. Low motivation to complete assessments may produce inconsistent agreement and disagreements. In the literature, this is called Insufficient Effort Responding (Niessen et al., 2016). Since acquiescence varies across students, it may influence inter-item correlations confounding the correlations that we expect to be caused by the latent dimensions we are trying to measure. This systematic confounding suppresses correlations of items of opposite poles and inflates correlations between items assessing the same pole (++ and − −, Maydeu-Olivares and Steenkamp, 2018; Mirowsky and Ross, 1991; Primi et al., 2020; Primi et al., 2019b).

In this sample, as well as in our previous work (Primi et al., 2016), we observe sizable acquiescence variance. This influence usually produces two significant factors grouping positive and negative items. As Ten Berge (1999) points out, sometimes we can find an acquiescence factor having all items - positive and negative before reversing - loading positively on a factor (or reversed negative scales with positive loadings conflated with positive facet scales with positive loadings on a factor as was in our case) that can be interpreted as an acquiescence factor. In sum, acquiescence is a "ghost" cofounder that needs to be controlled before we can run item factor analysis. In our study, the Amity factor was difficult to recover, except when we controlled for acquiescence.

Trait-Identity and Self-Efficacy

While developing SENNA, we systematically included both trait-identity and self-efficacy items to assess all SEMS, to be in a position to systematically examine their relative contributions to assessing SEMS and investigate their validities to predict education outcomes of interest. Contributions and validities could be systematically different for methods (identity versus self-efficacy), but could also depend on the SEMS considered (see our example of trust and presentation skills in the introduction). As it stands now, and relying on the findings of the current study, we aggregate scores on identity and self-efficacy scales and take these aggregates as an index of a particular SEMS. This practice may have to be amended in the future, when new evidence would become available, demonstrating differential predictive validities favoring one over another measurement perspective (identity relative to self-efficacy). Although both assessment perspectives can be distinguished conceptually, it is not clear at the moment whether identity and self-efficacy items can be empirically distinguished well.

Moreover, the combination of positively- and negatively keyed identity items helped to correct for acquiescence. Scales composed exclusively of self-efficacy items miss negatively keyed items (low-skill items) and hence do not allow for the identification and correction for acquiescence bias. The combination of identity items (both positively and negatively keyed) together with self-efficacy items also enables the researcher to correct the self-efficacy items for acquiescence bias.

Practical Contributions

SENNA was primarily designed for implementation in education practice and policy making, but it should also serve fundamental and applied research purposes. We provided new evidence in this paper supporting its use and highlighting some of its research opportunities. Use of the inventory, its scales and its reports will help education in Brazil to use a common vocabulary to talk about SEMS development among students, teachers, parents, directors and policy makers. In addition, it creates an opportunity to develop evidence-based actions to be implemented in the classroom but also for policy-making. Intensive policy debates started in many countries, including Brazil, to represent SEMS learning in the educational curriculum (OECD, 2015). One significant initiative in Brazil is the Brazilian Common Core for Teaching Fundamentals[7], referring to global competencies that tap into various combinations of more foundational SEMS skills. SENNA results can provide input for this debate.

From a research perspective, the demonstration of the relationships between SEMS at school and outcomes across life will be important. Further examining the conceptual distinction between identity versus self-efficacy measurement perspectives will be additional avenues of research. Finally, the supplementary confirmation of the social-emotional Big Five framework as a model to structure SEMS also opens new perspectives to think about the construction of more formative assessment tools that can be directly used within classrooms to inform the learning of SEMS in education (Pancorbo et al., 2020).

Limitations

The present work has a number of strengths, such as relying on a large sample systematically sampled from public schools in a culture for which the instrument was designed, and providing a nuanced approach to represent diverse content and multiple measurement angles to assess SEMS. There are, however, also a number of limitations, that readers and potential users need to take into account. First, the present data are self-reports susceptible to a range of biases, beyond acquiescence. Second, at the present stage, SENNA is not designed to be used in summative assessment contexts, where the result of an assessment has important consequential outcomes, such as investing in new programs or providing extra support for teachers.

[7] http://basenacionalcomum.mec.gov.br/

Finally, evidence for external and criterion evidence in scholastic contexts is needed. One paper (Primi et al., 2019a) has already shown that the broad SENNA domain scales are related to students' objective test scores, with the Self-Management and Open-Mindedness domain scores showing the expected strongest validity coefficients. Future research needs to test the reasonable hypothesis that going from this broad level to the lower level of specific SEMS will further improve the prediction of important scholastic and life outcomes in public school students.

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DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Studies involving human participants were reviewed and approved by Universidade São Francisco. Written informed consent for participation was not required in accordance with the local legislation and institutional requirements. Data collected for this study were part of student's regular school activities involving minimal risk. We received approval from the educational secretariat to collect data as part of these activities.

AUTHOR CONTRIBUTIONS

RP, DS, OJ, and FD contributed to the conception and design of the study. RP analyzed the data and wrote the first draft of the manuscript. OJ, FD, and DS revised and wrote substantial sessions of the manuscript. All authors contributed to manuscript revision, read, and approved the submitted version.

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