DIGITAL MEDIA AND SOCIAL CONNECTION IN THE LIVES OF CHILDREN, ADOLESCENTS AND FAMILIES

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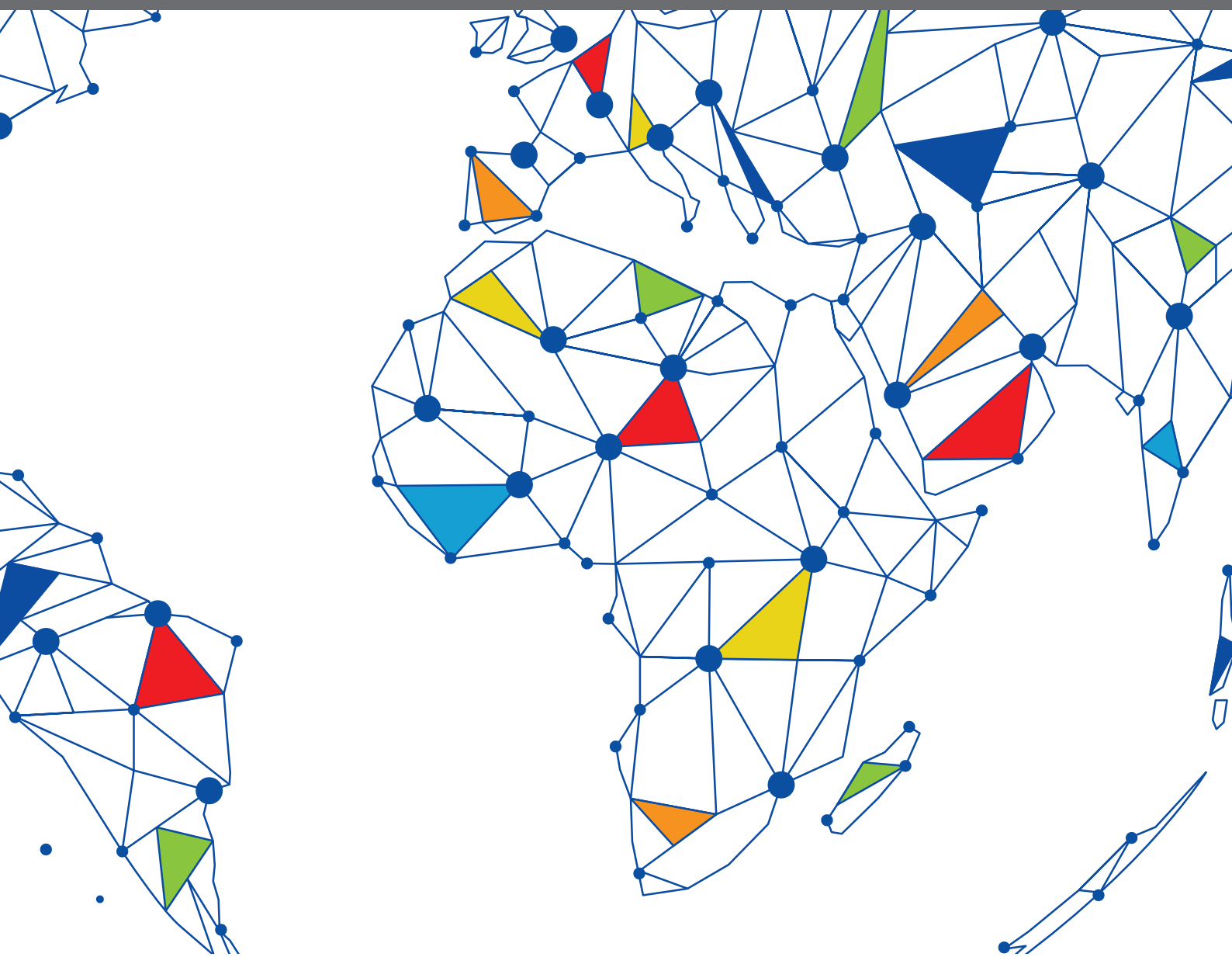

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DIGITAL MEDIA AND SOCIAL CONNECTION IN THE LIVES OF CHILDREN, ADOLESCENTS AND FAMILIES

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EDITORIAL
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Editorial: Digital Media and Social Connection in the Lives of Children, Adolescents and Families

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Keywords: digital media, social media, connection, wellbeing, adolescence, family

Editorial on the Research Topic

Digital Media and Social Connection in the Lives of Children, Adolescents and Families

Digital and mobile media—including visual social media—are impacting children's and young people's sense of connection, belonging, and wellbeing. While the call for this Research Topic was first published in early 2020, the questions we raised took on greater significance with the spread of COVID-19. Indeed, the pandemic led to increased reliance on digital media given shelter in place and social distancing that greatly limited face-to-face interactions. Accordingly, it is even more critical to understand whether and how these media support or detract from social connection.

As researchers studying youth and media, we were particularly concerned with how the constantly evolving changes in technology (Subrahmanyam and Michikyan, in press) may lead to changes in digital media effects both positive and negative, during youth development (Uhls et al., 2017). For the purposes of this Research Topic, the term digital media was conceptualized to include the internet (e.g., websites, online forums and communities, and video and image sharing platforms), communication applications/platforms (e.g., social media and messaging apps), and electronic games. More broadly digital media are also referred to as interactive media following England and Finney (2002) definition of interactive media as the integration of digital media including combinations of electronic text, graphics, moving images, and sound, into a structured digital computerized environment that allows people to interact with the data for appropriate purposes" (see p. 2).

This Research Topic, "*Digital Media and Social Connection in the lives of children, adolescents and families*" brings together 14 papers including 11 original research studies, two brief research reports and one perspective article. Taken together, this body of work addresses the implications of a range of digital media technologies and constructs among an array of youth from diverse parts of the world. The majority of the papers focus on early to late adolescents as well as young/emerging adults, while two papers also focus on parents. Reflecting the broad ways that digital and mobile media are integrated into our daily lives, examined contexts included social media, educational settings, Internet cafes, messaging apps, audio visual content (e.g., streaming and YouTube), and mobile applications. The papers also showcase a variety of methods including Ecological Momentary Assessment (EMA), large scale surveys, in depth interviews, content analysis of comments and more. Overall, the papers uncover nuanced effects which differed in myriad ways depending on mechanisms such as what kind of digital media (social media vs. messaging apps), frequency and motivation of communication (e.g., high texters vs. low texters) and individual characteristics.

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Although there is a proliferating literature on the ways children and young people use digital technology, the global North tends to lead these discussions. A strength of this collection is that it canvasses insights from diverse parts of the world (e.g., Italy, Argentina, Indonesia, UK, Taiwan, India) helping to redress the imbalance in perspectives from different cultural contexts. Keep in mind one third of all internet users around the world is a child—a number that is expanding rapidly. And nine tenths of the world's children live in the global South—so it's critical that, as those children come online, we are documenting and responding to their lived experiences—particularly given that they come online primarily via mobile phone, and without the necessary structures of adult support around them that children in the global North often have.

Taken together the papers highlight the need to go beyond categorizing media as monolithic with simple effects (Haidt and Twenge, 2021) and to instead attempt to tease apart individual differences, definitions of wellbeing and connection, different affordances and developmental stages (Moreno and Uhls, 2019).

AUTHOR CONTRIBUTIONS

YU, KS, and AT equally contributed to the editorial process. YU organized the group and all contributed to requesting submissions, reviewing, and editing manuscript.

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ORIGINAL RESEARCH
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The Moderating Effects of Young Adults' Personality Traits on Social Media Immersion

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Young adults are currently among the heaviest users of Internet-based social media applications. The goal of this study was to develop and empirically validate a conceptual model to test associations between students' attitudes toward social media and their experiences in social media use and immersion. Participants were 9,633 students (average age 16 years; 4,702 males, 4,931 female) who randomly selected from 150 high schools in Taiwan. Participants completed questionnaire surveys describing their attitudes toward social media, immersion experiences, and Big Five personality traits. Structural equation modeling was used to determine factors that predicted and moderated social media immersion. The results of this study highlight the impact that specific personality traits have on the connections between attitudes toward social media and the immersion young adults experience when engaged with social media platforms. These findings suggest that schools and families should establish guidelines to protect young adults from excessive immersion in social media usage, ensure the safety of online environments for this user group, and inform youth regarding the proper use of social media.

Keywords: internet use, young adults, personality traits, social media, immersion

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INTRODUCTION

The Internet has spurred the development and widespread use of new forms of social media (Correa et al., 2010; Zhang et al., 2015; Hu et al., 2017; Manwong et al., 2018). Social media and multidimensional platforms allow users to exchange information and discuss ideas through posting, commenting, chatting, and other actions. Importantly, these platforms allow users to access knowledge and exchange information expeditiously, communicate easily and cost efficiently, and create collaborative environments (Zhang et al., 2015; Kaya and Bicen, 2016; Hu et al., 2017; Manwong et al., 2018; Yu et al., 2018). In addition to facilitating learning, communication, and collaboration, social media provides supportive leisure and entertainment environments (Kaya and Bicen, 2016; Zha et al., 2018).

Adolescents are currently among the heaviest users of Internet-based social media applications (Lu et al., 2016). Terzi et al. (2019) stated that social media is a broad field of internet, which encompasses social network sites (Facebook, Twitter, IG, etc.), cooperative websites (Wikipedia), professional networks (LinkedIn), gaming websites, and YouTube. These websites have accumulated huge, international bases of high school and young adult users

(Terzi et al., 2019). Adolescents also use social media websites and tools to interact online, which enhances the dynamics of interpersonal relationships (Wang et al., 2012; Balakrishnan and Gan, 2016; Kaya and Bicen, 2016; Kaczmarek et al., 2017; Alomar et al., 2019). For example, Pokémon Go is a popular augmented reality game in which players can socialize face-to-face with other players or interact via social networking sites (Kaczmarek et al., 2017; Alomar et al., 2019) to build teams, socialize, exchange experiences or ideas, and develop friendships.

Csikszentmihalyi (1997) pointed out that "consumers may experience an immersive state of flow in a variety of activities" (Csikszentmihalyi, 1997; Hamilton et al., 2016). Witmer and Singer (1998) defined immersion as a "psychological state characterized by perceiving oneself to be enveloped by, included in, and interacting with an environment that provides a continuous stream of stimuli and experiences" (p. 227). Jennett et al. (2008) argue that immersion has three features: (1) lack of awareness of time, (2) loss of awareness of the real world, and (3) involvement and a sense of being in the task environment. According to Csikszentmihalyi's (1997) perspective, this study argued that young adults may experience an immersive state of flow in the social media activities. In addition, based on the perspective of Jennett et al. (2008), this study also stated that excessive engagement with social media may negatively impact young adults. When students use social media for a long time and focus on the social media usage immersion may result, and three characteristics were occurring, include (1) lack of awareness of time, (2) loss of awareness of the real world, and (3) involvement and a sense of being in the task environment (Csikszentmihalyi, 1997; Jennett et al., 2008; Terzi et al., 2019).

In this study, we investigated the effects of attitudes toward social media in Taiwan young adults and the effect of these attitudes on immersion in social media. However, previous studies (e.g., Kim et al., 2013; Chen et al., 2015; Choi and Shin, 2017; Xiao and Mou, 2019) have demonstrated that influence of social media use on individuals' cognitions, attitudes, or behaviors is different for different types of individuals. Personality traits (e.g., Big Five) could moderate the influence of social media use on attitude formation (Kim et al., 2013; Chen et al., 2015; Choi and Shin, 2017). Moreover, few researchers have addressed dispositional factors such as attitudes and personality traits, moderator effects, or predictors of the mental absorption experienced. Therefore, this study developed a conceptual model regarding the effects of students' attitudes toward social media on immersion, with personality traits as moderating effects, then empirically tested it with structural equation modeling (SEM). This study aims to address the following research questions: (1) Do students' attitudes toward social media influence their immersion experiences? (2) How do students' personality traits (i.e., extraversion, agreeableness, openness to experience, conscientiousness, and neuroticism) moderate the effects of attitude toward social media on immersion? The results are expected to enhance understanding of social media immersion among adolescence, provide recommendations for schools and government education authorities, and elicit the effects of social media use on psychoeducation and related problems.

Immersion in Social Media

Flow theory has been widely used to explore individuals' attitudes, behaviors, and experiences in various contexts (Chen et al., 2017; Hu et al., 2017). In recent years, flow theory has been applied to information technology to explain human–computer interactions and to individuals' use of social media and social gaming (Hu et al., 2017; Chen et al., 2017; Liu et al., 2018). Flow is usually characterized by concentration and focus, loss of self-consciousness, and loss of a sense of time (Csikszentmihalyi, 1997). Csikszentmihalyi (1997) noted that flow is experienced when individuals fully engage or immerse themselves in specific activities. Hu et al. (2017) defined flow as "the feeling of enjoyment and pleasure arising from deep immersion in an activity." Cruz and Uresti (2017) pointed out that the flow state has several characterizations, including being less conscious of the passage of time, full immersion in the task, and feeling in complete control.

Flow and immersion are both psychological states and have many of the same characteristics (Cuny et al., 2015; Cruz and Uresti, 2017). Although immersion is associated with the concept of flow, immersion is a broader process. This study argued immersion results from individuals' interaction with a social media environment and thus relies on the features of the social media usage. Experiencing complete, indulgent focus on the social media usage, free from distraction, is often referred to as immersion (Burns and Fairclough, 2015; Hamilton et al., 2016; Liu et al., 2018). Some previous studies (Jennett et al., 2008; Hamilton et al., 2016) suggest that immersion is beneficial in a variety of activities. Immersion in video games and virtual worlds are considered important for user enjoyment (Christou, 2014; Grinberg et al., 2014; Burns and Fairclough, 2015). Immersion refers to the experience that completely invades individuals' perceptive and emotional systems and psychological processes, so that immersed individuals experience engagement, engrossment, and total immersion (Brown and Cairns, 2004; Cuny et al., 2015; Cruz and Uresti, 2017). Most research focuses on interaction with digital worlds, especially video game and virtual spaces (Christou, 2014; Burns and Fairclough, 2015). Social media not only provides virtual games environment but also provides a simple method for high school students to search for knowledge, share information, ask questions, and engage in leisure and entertainment. These activities have been shown to improve student interest and engagement in knowledge absorptive (Balakrishnan and Gan, 2016), as well as improve leisure and entertainment. When students use social media more frequently or for a long time, especially for leisure or entertainment, problems with immersion occur.

Although immersion has been an important topic regarding the study of virtual worlds (e.g., video games and research tools), few studies have covered the components which cause the phenomenological experience of immersion in virtual social media worlds, including the importance of the users' attitude toward social media. According to previous researchers (Jennett et al., 2008; Cuny et al., 2015; Hamilton et al., 2016; Cruz and Uresti, 2017), this study defines immersion as a psychological state in which young adults are fully engrossed within the social

media environment and focus on the social media usage, free from distraction. To our knowledge, there are no existing studies investigating the theoretical foundation of possible links between attitudes toward social media and immersion. Social media has been widely developed and used and has become an integral part of the lives of young adults. According to Csikszentmihalyi (1997), young adults may experience an immersive state of flow in the social media activities and focus on the social media usage, free from distraction. Therefore, this study argued that when young adults have well social media attitudes, they will experience an immersion in social media activities as better. Accordingly, in this study, we hypothesize that attitudes toward social media have a significant effect on immersion.

Hypothesis 1: Attitude toward social media has a significant effect on immersion.

Personality Traits

Recognizing the potential importance of social media use to the development of adolescents and young adults, researchers have been working to identify the personal characteristics that best predict social media use (Wang et al., 2015; Marino et al., 2016; Azucar et al., 2018). Many previous studies have analyzed the effects of gender and various personality traits on social media use (Clemens et al., 2015; Chen et al., 2016; Azucar et al., 2018); findings indicate that some personality traits are associated with interpersonal interactions and social media use (Wang et al., 2015; Chen et al., 2016; Marino et al., 2016; Azucar et al., 2018). Several scholars have examined the influence of the "Big Five" personality traits on social media use. The popular Big Five model categorizes personality traits into five domains: agreeableness, openness, extraversion, neuroticism, and conscientiousness (McCrae and Costa, 2004; Wang et al., 2012; Chen et al., 2016; Tang et al., 2016; Choi and Shin, 2017).

The findings of Tang et al. (2016) suggest that certain personality traits, including agreeableness, openness, extraversion, neuroticism, and conscientiousness, are associated positively with the use of social media. Wang et al. (2012) argued that personality factors are related to an individuals' use of social networking sites and found that extraversion, neuroticism, and openness played important roles in how social networking sites were used. Correa et al. (2010) found that extraversion and openness to experiences were positively related to social media use and emotional stability (high neuroticism) negatively predicted social media use. Choi and Shin (2017) analyzed the moderating effects of the Big Five personality traits in a homogeneous or heterogeneous community on the relationship between social media use and political compromise. The results found that agreeableness and conscientiousness moderated the influence of social media use on attitudes toward political compromise. However, the non-significant interaction among social media use and extraversion, emotional stability, openness. Xiao and Mou (2019) found that two of the Big Five personality traits, neuroticism and extraversion, moderates the impact of social media characteristics on stressors. In addition, Kim et al. (2013) found that extraversion and openness to experiences moderate the influence of social media on discussion network heterogeneity and civic participation. Chen et al. (2015) explored the moderating effects of personality traits on the relationship between the motive traits (need for affiliation and need for popularity), self-esteem traits (self-esteem) and self-disclosure on Facebook. The results demonstrate that (1) conscientiousness and emotional stability moderate the relationship between need for affiliation and self-disclosure; (2) openness to new experience, emotional stability, and extraversion moderate the relationship between need for popularity and self-disclosure; (3) agreeableness, conscientiousness, and extraversion moderate the relationship between self-esteem and self-disclosure.

According to the above discussion, most previous studies have examined personality traits as factors external to social media use and found that certain personality traits (i.e., extraversion, neuroticism, and openness to experiences) are important external factors that affect individuals' use of social media. In addition, some social media studies (i.e., Kim et al., 2013; Chen et al., 2015; Choi and Shin, 2017; Xiao and Mou, 2019) also found that the Big Five personality traits have moderating effects. However, to our knowledge, no research has examined whether young adults' individual personality traits (i.e., extraversion, agreeableness, openness to experience, neuroticism, and conscientiousness) moderate the relationships between the independent variables (attitude toward social media) and the dependent/outcome variable (immersion). Accordingly, we argued that extraversion, agreeableness, openness to experience, neuroticism, and conscientiousness moderate the impact of attitude toward social media on immersion. Specifically, the following hypotheses were proposed:

Hypothesis M1: The relationship between attitude toward social media and immersion is moderated by the level of extraversion.

Hypothesis M2: The relationship between attitude toward social media and immersion is moderated by the level of agreeableness.

Hypothesis M3: The relationship between attitude toward social media and immersion is moderated by the level of openness to experience.

Hypothesis M4: The relationship between attitude toward social media and immersion is moderated by the level of neuroticism.

Hypothesis M5: The relationship between attitude toward social media and immersion is moderated by the level of conscientiousness.

METHODOLOGY

The empirical analysis uses data from a survey of 9633 high school students from both high schools and vocational high schools in Taiwan, aged between 15 and 20 years. SEM was used to analyze the causal effect of six hypothesized predicting factors (includes five moderating effect). SPSS 18.0 was used to analyze sample and describe statistics, while for the analysis of causal relationships, moderating effect, and hypotheses testing, PLS 30 was applied for parameter estimation and structural equation model ("SEM") evaluation.

Research Model

The primary purpose of the present research was to examine whether attitudes toward social media and the Big Five personality factors moderate and/or predict immersion. The hypothesized model was constructed using (1) the exogenous variable (attitude toward social media), (2) the endogenous variable (immersion), and (3) the moderator variables (the 5 personality traits of extraversion, agreeableness, openness to experience, neuroticism, and conscientiousness). The hypotheses are numbered and illustrated in the proposed path model, shown in **Figure 1**.

Instruments

There were two self-report instruments that participants accessed and completed online: the "Attitudes, Immersion, and Personality Traits" (AIPT) questionnaire and the "Parent–Child Relationship" (PCR) inventory. The AIPT questionnaire included four sections: (1) basic demographics and Internet usage, (2) attitude toward social media, (3) immersion experiences, and (4) personality traits. Measure development followed MacKenzie et al. (2011) and standardization procedures followed those suggested by DeVellis (2003). On the AIPT, the 8 items on attitude toward social media and 6 immersion items were adapted from previous studies (Jennett et al., 2008; Wang et al., 2012; Christou, 2014; Grinberg et al., 2014; Balakrishnan and Gan, 2016). The personality trait items were developed by McCrae and Costa (2004), Clemens et al. (2015), Tang et al. (2016), Choi and Shin (2017), and Xiao and Mou (2019), and consisted of five dimensions and 22 items. The scale dimensions were extraversion (five items), agreeableness (four items), openness to experience (four items), neuroticism (five items), and conscientiousness (four items). Respondents used a Likert four-point scale (1 = strongly disagree, 4 = strongly agree) to respond to AIPT attitude, immersion, and personality sections. Items for each of these AIPT sections are shown in the **Appendix**.

The questions in the PCR inventory were written from a student's perspective to evaluate stories participants had heard about parent–child relationship. A pilot test using the questionnaire was conducted with 1,086 senior high school students in central Taiwan to evaluate the revised questionnaire in terms of readability, ease of understanding, and formatting. Students who participated in the pilot test were excluded from the subsequent study. Further, a Cronbach's alpha test was performed to test the reliability and internal consistency of each of the 36 measured attributes. The alpha coefficients for all of the 36 attributes ranged from 0.70 to 0.93, exceeding the minimum value of 0.6 that is widely used to indicate reliability Hair et al. (2010).

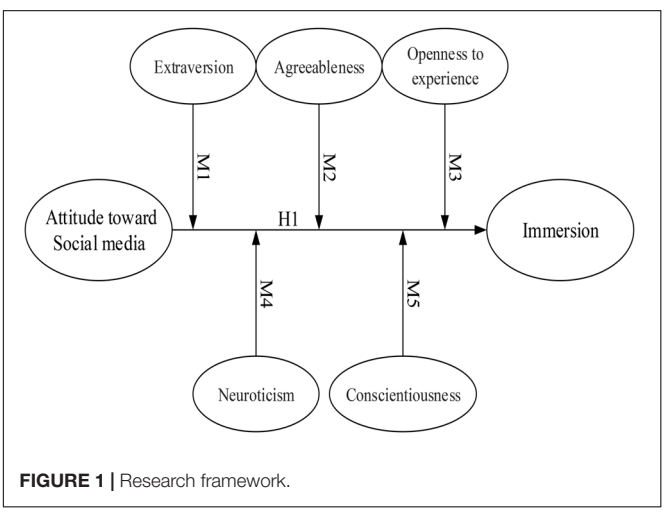

FIGURE 1 | Research framework.

Sample and Descriptive Statistics

A large sample was recruited in order to avoid common method variance and to increase the reliability of study findings. Survey data were collected from students attending 150 different high schools or vocational high schools in Taiwan. Using a sampling frame from a master list of Taiwanese high schools, a probability-proportionate-to-size sampling method was used to systematically draw a random sample of schools. Two or three classes were selected randomly from each of these 150 schools. An academic affairs staff member at each school was contacted and asked to help facilitate the work of the present study. A stratified purposive sampling method was then employed to select participants; information about the survey questionnaires was distributed either at school or, when schools were unwilling to distribute the survey, through the mail.

All respondents participated on a voluntary basis and were assured that their answers were anonymous or confidential, and they could refuse participation at any time without consequences. A total of 12,000 participants accessed the survey link: of these, 2,563 were eliminated due to incomplete or invalid answers. Completed questionnaires from the remaining 9,633 respondents were used in data analysis (valid response rate was 80.3%). Of these valid respondents, 4,702 were males and 4,931 females, and the average age was 16.33 years (SD = 0.94 years). Slightly over half (59.0%) of the participants reported having a "good" parent–child relationship and 92.7% reported "home" as the primary place of Internet usage. **Table 1** shows the demographic and Internet usage characteristics of the sample.

Statistical Analysis

Structural equation modeling is a widely accepted method used to gauge the validity of theories with empirical data and is used in comprehensive, combined analysis of both measurement models and structural models. One of the most common SEM techniques is partial least squares (PLS) (Chin, 1998). PLS, a component-based technique that uses a least-square estimation procedure, may be used for both construct validity and structural validity as well as to analyze measurements and structural models. This study used PLS with bootstrapping to test and validate the proposed model and the hypothesized relationships among the constructs.

Depictions of models that contain moderators that are obtained using PLS differ significantly from those that are obtained using traditional research model representations. In a PLS model, the moderators (personality traits in the current model) are shown as independent variables with a direct path to immersion. These interactive measures multiply

TABLE 1 | Profiles of participants (N = 9633).

Factor/Level	*N*	%	Factor/Level	*N*	%
Gender			*Parent–child relationships*		
Male	4702	48.8	Very good	3455	35.9
Female	4931	51.2	Good	5687	59.0
Place of Internet usage			Not good	491	5.1
Home	8934	92.7	*Purpose of Internet usage*		
School's computer room	235	2.4	Online dating	2882	10.0
Internet cafe	234	2.4	Online games	5328	18.5
Library	29	0.3	Online shopping	2418	8.4
Other	201	2.1	Information search	6230	21.7
			Browsing social networking sites (such as: Facebook, Twitter, Google+, LinkedIn, Blogger etc.)	8932	31.1
			Other	2973	10.3

Item	Mean	S.D
Age (years)	16.33	0.94
Average weekly online leisure activities (time in minutes, non-vacation)	8.65	7.34
Average weekly online leisure activities (time in minutes, vacation)	8.41	4.37

every indicator in the moderator by every indicator in the independent variable, following Chin et al. (2003). Conceptually, the interaction construct (personality traits multiplied by attitude toward social media) is depicted as having a direct path to immersion. Additionally, the present research uses PLS to analyze the research model.

RESULTS OF RESEARCH

Measurement Model Evaluation

The measurement model assessed the convergent validity and the discriminant validity of each first-order construct. Each first-order construct was modeled as a reflective latent construct that accounted for its indicators. Three criteria were considered for assessing convergent validity (Fornell and Larcker, 1981; Hair et al., 2010; Bagozzi and Yi, 2012): (1) all-item loading (λ), (2) investigation of reliability coefficients (Cronbach's alpha) and composite reliability coefficients (CR), and (3) average variance extracted (AVE).

Table 2 shows the indices of reliability and convergent validities for the AIPT questionnaire. The standardized item loadings ranged from 0.70 to 0.85; all items were larger than 0.70 and significant ($p < 0.05$ level) (Hair et al., 2010). Internal consistency was assessed using Cronbach's alpha coefficient for each of the multi-item factors included in the model. Cronbach's alpha coefficients ranged from 0.77 to 0.90, suggesting a high level of reliability. In addition, all constructs displayed a higher Cronbach's alpha coefficient than the 0.70 benchmark suggested by Hair et al. (2010). Composite reliability is a set of latent construct indicators that are consistent in their measurements. These composite reliability coefficients ranged from 0.85 to 0.92, higher than the 0.6 benchmark suggested by Fornell and Larcker (1981).

Convergent validity was examined using AVE. Here, all constructs examined earned AVE values between 0.54 and 0.64, exceeding the minimum recommended value of 0.5 Fornell and Larcker (1981). Overall, the AVE from the constructs demonstrated satisfactory reliability and validity. In addition, discriminant validity refers to the degree of distinctive concept measurements. As shown in **Table 3**, the discriminate validity values for all constructs were greater than 1.0, indicating an appropriate level of discriminate validity (Fornell and Larcker, 1981; Hair et al., 2010, 2016). Overall, the constructs demonstrated satisfactory reliability, convergent validity, and discriminant validity, which justified proceeding to the next step of estimating the structural model.

Hypothesis Testing

To test the research hypotheses, the paths between constructs were specified to build a structural model that matched the proposed relationships. **Figure 2** shows the results of the SEM estimation, including standardized coefficients for each hypothesized path in the model, with significance based on one-tailed t-tests, and the amount of variance explained (R^2). PLS analysis uses R^2 values as a goodness-of-fit measure (Hulland, 1999). **Table 4** reports the standardized beta-coefficients from the estimated structural model as well as the associated t-values for each construct.

Based on the moderator analysis method proposed by Baron and Kenny (1986), three models were explored. Model 1 explored the effects of the independent variable (attitude toward social media) on the dependent variable (immersion). Model 2 investigated the effects of the independent variable (attitude toward social media) and moderators (extraversion, agreeableness, openness to experience, neuroticism, and conscientiousness) on the dependent variable (immersion). Note that even when the independent variable and/or moderators are not significant independent predictors, they may interact. Model 3 investigated the interaction of attitude toward social media and each of the five personality traits on the dependent variable (immersion).

Among the Big-Five personality traits, openness to experience and neuroticism (hypothesis M3 and hypothesis M4) moderated

TABLE 2 | Validity and reliability.

Construct	Mean	*SD*	Cronbach's alpha	CR	AVE	R^2
Attitude toward Social media (ATSM)	2.56	0.63	0.90	0.92	0.59	
Extraversion (EXT)	3.07	0.59	0.86	0.90	0.64	
Agreeableness (AGR)	3.05	0.51	0.80	0.87	0.64	
Openness to experience (OPEN)	3.01	0.56	0.79	0.85	0.58	
Neuroticism (NEUR)	2.48	0.68	0.84	0.87	0.57	
Conscientiousness (CONS)	2.95	0.55	0.77	0.85	0.59	
Immersion (IMME)	1.69	0.63	0.82	0.87	0.54	0.44

TABLE 3 | Correlation matrix and square root of the AVE.

	ATSM	EXT	AGR	OPEN	NEUR	CONS	IMME
ATSM	**0.59**						
EXT	0.14*	**0.64**					
AGR	0.13*	0.60*	**0.64**				
OPEN	0.18*	0.52*	0.54*	**0.58**			
NEUR	0.08*	−0.23*	−0.05*	−0.01	**0.57**		
CONS	0.07*	0.38*	0.44*	0.45*	0.08*	**0.59**	
IMME	0.64*	0.08*	0.08*	0.15*	0.15*	0.06*	**0.54**
Discriminant validity	1.45	1.87	1.78	2.02	11.16	2.88	1.33

**p < 0.05; Diagonal elements (in bold) are the square root of the average variance extracted (AVE). Convergent validity = AVE ≧ 0.5. Discriminant validity coefficient = AVE/(Correlation)^2; where (Correlation)^2 = highest (Correlation)^2 between factor of interest and remaining factors.*

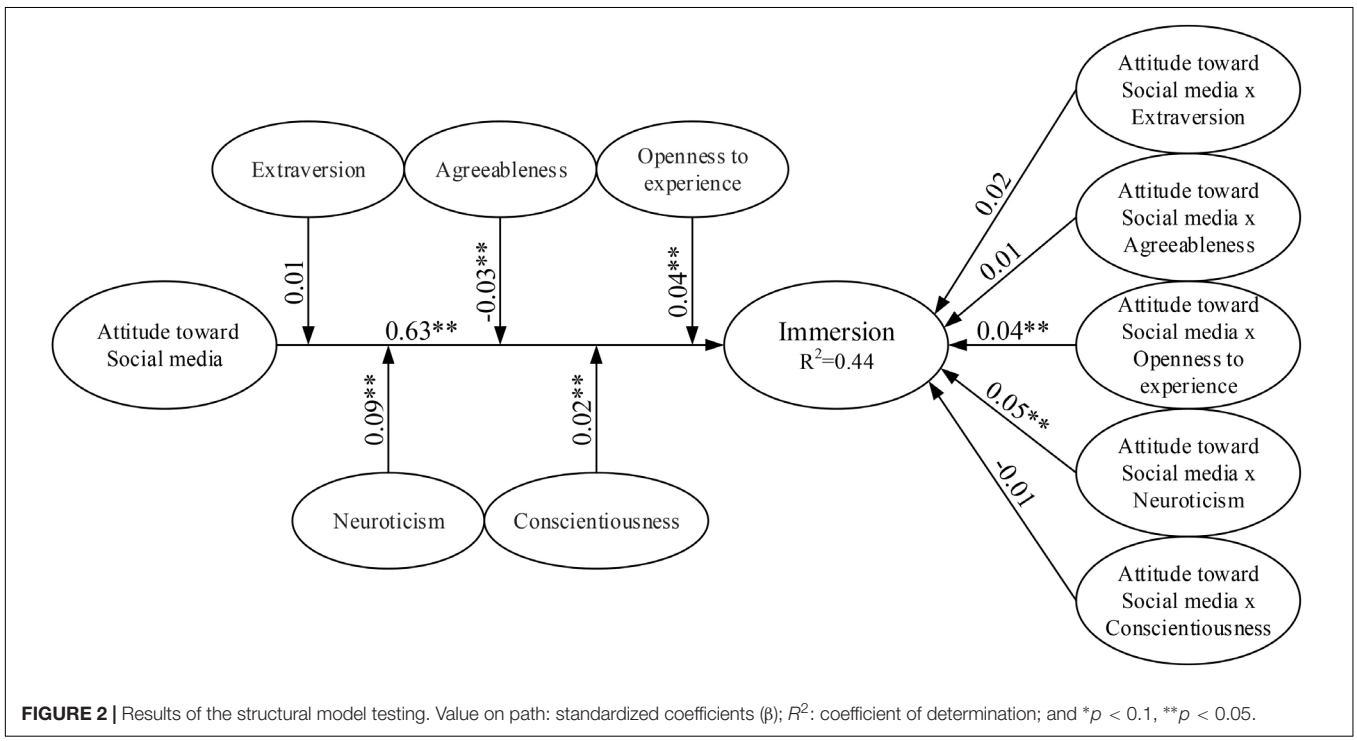

FIGURE 2 | Results of the structural model testing. Value on path: standardized coefficients (β); R^2: coefficient of determination; and *$p < 0.1$, **$p < 0.05$.

the effects between attitude toward social media and immersion (M3: β = 0.04, $p < 0.05$; M4: β = 0.05, $p < 0.05$) and each interacted with attitude toward social media to positively affect immersion. That is, the effect of attitude toward social media on immersion increased as openness to experience and neuroticism increased. Thus, this study finds support for hypothesis M3 and hypothesis M4. This is similar with some previous studies (Kim et al., 2013; Chen et al., 2015; Xiao and Mou, 2019). In addition, the Big-Five personality traits, extraversion, agreeableness, and conscientiousness, did not have moderating effects on the relationship between attitude toward social media and immersion (M1: β = 0.02, M2: β = 0.01, and M5: β = −0.01, respectively,

TABLE 4 | Estimation results for hypotheses.

Construct	Model 1		Model 2		Model 3	
	β	*t*-value	β	*t*-value	β	*t*-value
Attitude toward Social media → Immersion	0.65**	113.38	0.64**	101.55	0.63**	98.75
Moderator effect						
Extraversion → Immersion			0.01	1.02	0.01	0.82
Agreeableness → Immersion			−0.03**	2.53	−0.03**	2.69
Openness to experience→ Immersion			0.04**	3.53	0.04**	3.72
Neuroticism → Immersion			0.09**	9.71	0.09**	9.84
Conscientiousness → Immersion			0.02**	2.81	0.02**	2.69
Interaction effect						
Attitude toward Social media X Extraversion → Immersion					0.02	1.29
Attitude toward Social media X Agreeableness → Immersion					0.01	0.29
Attitude toward Social media X Openness to experience→ Immersion					0.04**	3.36
Attitude toward Social media X Neuroticism → Immersion					0.05**	4.54
Attitude toward Social media X Conscientiousness → Immersion					−0.01	0.88
Immersion (R^2)	0.43		0.44		0.44	

*$p < 0.1$, **$p < 0.05$.

$p > 0.05$); thus, hypothesis M1, hypothesis M2, and hypothesis M5 were rejected. Finally, the construct of attitude toward social media had a significant positive effect on immersion ($\beta = 0.63$, $p < 0.05$). This implies that attitude toward social media is the determinant of immersion. Thus, this study finds support for hypotheses 1. In summary, the results showed that attitude toward social media had a significant influence on immersion and the interaction among attitude toward social media, openness to experience, and neuroticism has a positive influence on immersion, with the explained variance (R^2) at 44.0%. Based on Cohen's classification system (Cohen, 1988), the effect sizes for the association between variables were small, between 0.12 and 0.30 (mean 0.21). **Figure 2** shows the full results of the moderation analysis, including the structural path estimates and explained variances.

DISCUSSION

This study investigated attitudes toward social media in terms of immersion in social media use for entertainment, which examined whether attitudes toward social media and the Big-Five personality factors moderated/predicted immersion. Questionnaire data from 9,633 students from senior high schools and vocational high schools in central Taiwan were collected and analyzed in order to test research hypotheses. There were several main findings.

First, there was a significant positive correlation between attitude toward social media and social media immersion. In Taiwan, information technology education has been implemented in elementary schools to enhance the ability of logic thinking and problem solving and national competitiveness. The school has taught the knowledge, classification, and use of social media. Through information technology education, young adults can learn about social media. When young adults' increase their attitudes toward social media, they can then increase their immersion. Weibel et al. (2008) posited that presence is a subjective feeling when one is immersed in a virtual space. Therefore, this study considered that attitudes of high school students toward social media should be identified and guidelines should be developed to prepare students to effectively use leisure and entertainment platforms. In addition, when students were completely focused on social media, without any distractions, there was immersion.

Study participants perceived social media as a tool for social, leisure, and entertainment purposes as well as for educational purposes. They expressed positive attitudes and demonstrated positive outcomes related to social media usage, which supported the effectiveness of the government policy in Taiwan. When students had a positive attitude toward social media, they used social media more frequently to engage in related Internet leisure activities. During this engagement, young adults were immersed in social media, losing track of time and awareness of the real world. In addition, Jennett et al. (2008) found that the more immersed players were in a game, the longer they needed to readjust to the real world. That is, as information technology advances, social media may have a negative impact on students as they become immersed in virtual realities and disengage from the real world.

Further, participants were assessed in terms of the five Big-Five personality factors (extraversion, agreeableness, openness to experience, conscientiousness, and neuroticism) to provide empirical support for the structural model. The analysis demonstrated that interactive effects between attitude toward social media and two of the Big-Five personality traits (openness to experience and neuroticism) on immersion. Specifically, the influence of attitude toward social media on immersion was moderated by the extent of young adults' openness to experience and neuroticism. This empirical result is similar with some previous studies (Kim et al., 2013; Chen et al., 2015; Xiao and Mou, 2019). That is, young adults with neurotic personalities and openness to experience personality are more likely to understand

the strength of social media (e.g., improves work efficiency, beneficial for learning, maintaining interpersonal relationships, and contributing to society) and might cause them during this interaction with social media, absorbed in what they were doing and became immersed in this specific interaction. However, the non-significant interaction among attitude toward social media and extraversion, agreeableness, conscientiousness, which is similar with previous studies (Chen et al., 2015; Choi and Shin, 2017). Specifically, the influence of attitude toward social media on social media immersion was not moderated by the young adults' personality traits (extraversion, agreeableness, and conscientiousness). Moreover, the consistency of the behavioral model and the latent variables exhibited strong convergent and discriminant validities, suggesting that our model effectively predicted social media immersion in young adults. There was also a significant interaction between attitude toward using social media and personality characteristics. Participants who held a relatively more positive attitude toward social media and personality traits (openness to experience and neuroticism) tended to experience higher immersion. When participants had a good attitude toward the use of social media and felt that using social media was advantageous, they used social media more frequently to engage in leisure activities. Specifically, we found that the effect of attitude toward social media on immersion increased as openness to experience and neuroticism increased.

LIMITATIONS

The present study was affected by several potential limitations. First, personality traits were used as moderating effect without investigation excessive use of social media. Therefore, we recommend that the present experimental design be used in future research to investigate variances in attitudes toward online media and differences in immersion between excessive use of social media and non-excessive use of social media as a reference for secondary education teachers, students, parents, school officials, and relevant authorities. Second, this study focused on a single factor only (attitude toward social media). Future research should consider other factors (e.g., the theory of motivation and other psychological traits such as self-efficacy) that may explain young adults' immersion in social media. Finally, this research has relied on self-reports of attitudes toward social media, and immersion, which may elicit misreporting to avoid judgment and cause common method variance.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. All of the subjects were informed about the research and all of the participants who were enrolled in the study provided informed consent.

AUTHOR CONTRIBUTIONS

T-KY: research conceptualization, obtaining funding, interpretation of the data, study supervision, writing-original draft. N-HL: data collection, concept and design, interpretation of the data, statistical analysis, and writing–original draft. C-MC: data collection, data curation and statistical analysis, interpretation of data, and writing–original draft. All the authors wrote the manuscript together and approved the final manuscript.

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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.

APPENDIX

TABLE A1 | Measurement items.

Constructs	Items	Sources
Attitude toward Social media	I feel that the use of social media is beneficial for learning.	Christou, 2014; Zhang et al., 2015; Balakrishnan and Gan, 2016
	Social media has made a positive contribution toward society.	
	Social media allows me to get work done faster.	
	I feel that social media has allowed me to keep in touch with many people.	
	I enjoy using social media for instant messaging or other types of real-time communication.	
	I enjoy using social media to pass time and/or to have fun.	
	I feel that social media improves my productivity.	
	I enjoy browsing (surfing) websites without any specific purpose.	
Extraversion	I am talkative.	McCrae and Costa, 2004; Clemens et al., 2015; Tang et al., 2016; Choi and Shin, 2017; Xiao and Mou, 2019
	I generate a lot of enthusiasm.	
	I am socially outgoing.	
	I have an assertive personality.	
	I am full of energy.	
Agreeableness	I am helpful and unselfish with others.	
	I like to cooperate with others.	
	I am considerate and kind to almost everyone.	
	I have a forgiving nature.	
Openness to Experience	I have an active imagination.	
	I am inventive.	
	I am original and come up with new ideas.	
	I like to reflect on and play with ideas.	
Neuroticism	I worry a lot.	
	I can be tense.	
	I get nervous easily.	
	I can be moody.	
	I am depressed or sad.	
Conscientiousness	I do things efficiently.	
	I do a thorough job.	
	I make plans and follow through with them.	
	I persevere until the task is finished.	
Immersion	I was able to block out most other distractions during this interaction with social media.	Jennett et al., 2008; Grinberg et al., 2014; Burns and Fairclough, 2015
	I was absorbed in what I was doing during this interaction with social media.	
	I got distracted very easily during this interaction with social media.	
	I became immersed in this specific interaction during this interaction with social media.	
	My attention did not get diverted during this interaction with social media.	
	Time seemed to fly during this interaction with social media.	

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Browsing Different Instagram Profiles and Associations With Psychological Well-Being

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Social networking sites (SNSs) may be transforming young people's social experiences, and browsing SNSs in particular may harm psychological well-being. However, browsing different *types* of SNS profiles may differentially relate to psychological well-being. In a large and ethnically diverse sample of emerging adults ($N = 405$), this experimental study examined changes in state affect and self-perceptions after browsing one of three different types of profiles on Instagram: an acquaintance, an influencer, or one's own profile. Moreover, this study investigated how individual characteristics may moderate relations between browsing and well-being, by exploring feedback seeking behaviors and the fear of missing out. Browsing one's own Instagram profile led to positive changes in psychological well-being, whereas browsing the profile of either an acquaintance or an Instagram influencer led to negative changes in psychological well-being. Many observed effects, especially those found for the acquaintance and influencer conditions, were moderated by participants' dispositional levels of the fear of missing out and feedback seeking, in which effects were primarily observed for those higher in these characteristics. Findings suggest that SNSs may have positive or negative effects on well-being depending on *who* is online and *what* those individuals are browsing.

Keywords: Instagram, social media, feedback seeking, fear of missing out, well-being

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BROWSING DIFFERENT INSTAGRAM PROFILES AND ASSOCIATIONS WITH PSYCHOLOGICAL WELL-BEING

Digital technology is a major component of contemporary emerging adults' development (Coyne et al., 2013). The use of social networking sites (SNSs) is popular, with emerging adults especially drawn to Instagram (Perrin and Anderson, 2019). Some researchers, parents, and policy makers fear that SNSs can negatively influence young people's well-being (George and Odgers, 2015); however, associations between SNS use and well-being are mixed (Verduyn et al., 2017). Increasing evidence suggests that how users are interacting with SNS platforms, rather than how much time, matters more for well-being (Odgers and Jensen, 2020). Passively browsing SNSs (i.e., scrolling without direct interaction), a particularly common SNS behavior (Verduyn et al., 2015), may be one specific type of activity that is negatively associated with well-being (Verduyn et al., 2017). Notably, overall assessments of passive SNS browsing may still be too broad, as effects may differ depending on whose content is being viewed. Passively browsing one's own content can have positive effects, whereas browsing others' content can have negative effects (Vogel and Rose, 2016). In this experiment, we examined how browsing one's own Instagram profile, the profile of an acquaintance,

and the profile of an Instagram influencer affected emerging adults' psychological well-being. Dimensions of well-being included state mood, state self-esteem, positive self-perceptions, and interpersonal negativity (i.e., feelings of envy and jealousy). Further, we examined the moderation role of two constructs relevant to emerging adults' development: dispositional tendencies to seek feedback, and the fear of missing out (FoMO).

THE TRANSFORMATIVE NATURE OF INSTAGRAM

According to the transformation framework (Nesi et al., 2018a,b), young people's socio-developmental experiences are transformed through SNSs. These experiences are fundamentally changed by several SNS affordances, including asynchronous communication, availability of others, permanent content, the absence of in-person social cues, the publicness of posted content, quantifiable features such as likes and comments, and high visuality (Nesi et al., 2018a,b). Three of these affordances are particularly important in understanding how browsing Instagram relates to psychological well-being: visuality, quantifiability, and publicness.

First, SNSs such as Instagram are highly visual (Nesi et al., 2018a), allowing for the transmission of curated and perfected images (Underwood and Faris, 2015). Although most SNSs have a positivity bias, in which people tend to engage in positive self-presentation (Reinecke and Trepte, 2014), this bias may be especially pronounced on Instagram (Underwood and Faris, 2015; Underwood and Ehrenreich, 2017; Waterloo et al., 2018; Yau and Reich, 2019). The exposure to these positive portrayals is believed to be a driving factor in why passive browsing is linked to poorer well-being (Vogel and Rose, 2016), as exposure to others' positive self-presentation may contribute to the perception that they are leading more rewarding lives than the self (Chou and Edge, 2012). In contrast, viewing one's own positive self-presentation may have positive effects on well-being, perhaps through self-affirmation (Vogel and Rose, 2016), or by operating as a digital photo album (e.g., Budenz et al., 2020), in which users can re-view their saved old photos at the touch of a button.

Second, quantifiable metrics such as likes and comments provide visible feedback (Nesi et al., 2018a). This feedback is highly valued by emerging adults (Baker et al., 2019), and is linked to greater well-being (Valkenburg et al., 2006; Greitemeyer et al., 2014; Tobin et al., 2015; Reich et al., 2018; Zell and Moeller, 2018). Positive self-presentation tends to be perceived positively and elicit positive feedback (Sas et al., 2009; Yang and Brown, 2016); thus, Instagram users may be motivated to engage in positive self-presentation to obtain this positive feedback. It is possible that the exposure to one's previously received positive feedback could boost well-being, whereas exposure to others' received positive feedback could decrease well-being, such as by fueling comparisons to the number of likes and comments others received relative to the self (Nesi et al., 2018b).

Third, the publicness of SNSs allows young people to connect with a large number of known and unknown others (Nesi et al., 2018a). SNS connections vary in terms of social distance, in which users can connect with both "weak" ties, such as acquaintances, and "strong ties," such as close friends (e.g., Ziegele and Reinecke, 2017; Pham et al., 2019). Interacting with stronger ties, but not necessarily weaker ties, is associated with greater well-being (Burke and Kraut, 2013, 2016). Facebook research suggests that most users connect with others with whom they have "weak" ties (Manago et al., 2012; De Meo et al., 2014). Connections that can be classified as weak may be more prevalent on Instagram compared to Facebook, given that it is common on Instagram to form non-reciprocal connections (i.e., User A can follow User B, but User B does not have to follow User A in return). The current research examined two types of "weaker" ties that Instagram users can be exposed to: acquaintances and Instagram influencers. Although acquaintance connections are common, little research has examined the effects of browsing these profiles (but see Vogel et al., 2015, for an exception). Additionally, Instagram influencers (i.e., individuals who are not famous by conventional means, such as by being an actor or a singer, but still obtain a large following on SNSs) are increasingly common. These individuals often present a glamorous and luxurious lifestyle (Marwick, 2015; Abidin, 2016; Chae, 2018). Although some Instagram influencers may present this lifestyle via connections to famous friends or through personal fortune, other influencers appear to be ordinary people who engage in highly positive self-presentation and who happen to obtain a large following on the platform (Marwick, 2015). Thus, Instagram influencers may be particularly relevant for the transformative features of visuality and quantifiability, due to (a) their highly positive self-presentation, and (b) their large following may increase the likelihood of receiving a high number of likes and comments, which browsers can consequently view. Despite influencers' large presence on Instagram, no known research has experimentally examined the effects of browsing this content on emerging adults' well-being.

BROWSING ONE'S OWN PROFILE

Individuals may browse their own SNS profiles, perhaps to edit the content, check to see how many likes and comments they have received, or to reminisce, which may have positive effects on well-being (Vogel and Rose, 2016; Krause et al., 2019). Previous experimental research has demonstrated that both editing (Gentile et al., 2012) and viewing one's own Facebook page may boost self-esteem (Gonzales and Hancock, 2011; Toma, 2013). Self-affirmation theory has been applied as a framework to understand these effects (Toma, 2013; Toma and Hancock, 2013). Specifically, self-affirmation theory posits that people have an innate desire to maintain a positive self-image, and people may accomplish this goal by seeking out positive self-relevant information (Steele, 1988). Given the positive self-presentation that occurs on SNSs (Vogel and Rose, 2016), individuals can view positive content about themselves and thus engage in self-affirmation (Toma and Hancock, 2013).

Viewing one's SNS content may be beneficial for other reasons. For example, looking at old content depicting past positive events may promote adaptive effects from positive reminiscing (Good

et al., 2013). Likewise, feedback on SNSs tends to be highly positive (Valkenburg et al., 2006; Rideout et al., 2018; Wenninger et al., 2019). Receiving more likes on SNS content is associated with increased self-esteem (e.g., Burrow and Rainone, 2017), and users may experience positive effects re-exposing themselves to this feedback. For the present study, we expected that viewing one's own Instagram profile would increase psychological well-being, specifically by increasing mood, self-esteem, and positive self-perceptions.

BROWSING OTHERS' PROFILES

Perhaps due to the high visuality and positive self-presentation tendencies of SNSs (Vogel and Rose, 2016), passive SNS browsing, as a whole, is linked to poorer well-being, including greater depressed mood (Frison and Eggermont, 2016, 2017, for girls only; Escobar-Viera et al., 2018; Burnell et al., 2019; Thorisdottir et al., 2019; but see Beyens et al., 2020) and loneliness (Frison and Eggermont, 2020). Experimental studies in which participants browse content preselected by the researchers (which usually exemplifies especially highly positive self-presentation) have found that Instagram browsing can decrease positive mood, particularly for those who are likely to compare themselves to this content (Weinstein, 2017; de Vries et al., 2018), and can also increase negative mood (Brown and Tiggemann, 2016; Weinstein, 2017). Experiments with "real" SNS content (in which participants log into their personal SNS account and browse others' content) have thus far focused on Facebook, and have found that browsing Facebook can increase negative mood (Fardouly et al., 2015), and decrease positive mood (Yuen et al., 2019). Moreover, browsing one's Facebook news feed can decrease state self-esteem and increase depressive symptoms, although the effects on depressive symptoms may only occur for those with a higher tendency to socially compare (Alfasi, 2019). An additional study found that, after browsing Facebook, participants reported lower well-being at the end of the day compared to baseline assessments of well-being (Verduyn et al., 2015). As the positivity bias is potentially higher on Instagram than Facebook, ecologically valid designs examining Instagram specifically are still needed. Although findings from studies with preselected content and "real" content generally mirror each other, studies that preselect content could inflate estimates as this content may exaggerate the positivity bias, highlighting a need to confirm these findings with ecologically valid designs.

Moreover, few studies have examined the effects of browsing different *types* of SNS profiles. To our knowledge, only one study has examined the effects of browsing the profile of an acquaintance. This study found that for those with a tendency to socially compare, browsing the Facebook page of an acquaintance negatively influences self-perceptions, self-esteem, and negative affect balance (Vogel et al., 2015). We focused on the effects of browsing an acquaintance's profile (rather than other types of profiles, such as friends) because of the high presence of "weak tie" content on SNSs (Manago et al., 2012; De Meo et al., 2014). Thus, when scrolling through one's Instagram feed, it is likely that users would be exposed to a large amount of content produced by and depicting acquaintances. Additionally, to our knowledge, no studies have yet examined how browsing different types of "real" Instagram profiles influences well-being, although one study examining pre-selected Instagram profiles found that browsing the profile of a traditional celebrity has comparable effects on negative mood as browsing the profile of an unknown peer (Brown and Tiggemann, 2016).

The current study expands on earlier research by examining the effects of browsing different types of profiles on Instagram. We hypothesized that browsing the profile of an Instagram acquaintance and an Instagram influencer would decrease psychological well-being, specifically by decreasing mood, self-esteem, and positive self-perceptions, and increasing interpersonal negativity. Examining differences between the two profiles was exploratory.

INDIVIDUAL DIFFERENCES

Media effects theorists argue that the influence of the media may depend on individual and situational characteristics (Valkenburg and Peter, 2013; Beyens et al., 2020). The current research considers two individual differences that are relevant for emerging adult development, but have yet to be experimentally explored as moderators in the link between passive browsing and well-being: feedback seeking and the fear of missing out (FoMO).

As previously noted, SNSs such as Instagram are rich in feedback. Emerging adults may be particularly interested in this feedback because of their ongoing identity development (Arnett, 2000). Feedback may help inform their own identity by garnering an assessment of how others view them, or by evaluating behaviors that are positively perceived (e.g., perhaps by viewing an acquaintance's positive feedback, and subsequently "trying out" the acquaintance's self-presentation strategy in an attempt to also receive positive feedback). Additionally, emerging adults may be interested in comparing the feedback that they receive with the feedback that others receive (Nesi et al., 2018b). Although receiving feedback on SNSs is linked to greater well-being (Valkenburg et al., 2006; Greitemeyer et al., 2014; Tobin et al., 2015; Burrow and Rainone, 2017; Reich et al., 2018; Zell and Moeller, 2018), SNS feedback could contribute to maladaptive processes. Individuals who use SNS feedback as a tool for reassurance seeking (e.g., expecting others to comment on their Facebook posts) report lower levels of self-esteem (Clerkin et al., 2013), and those with lower self-esteem place greater importance on receiving likes and feeling bad if they do not reach a desired threshold (Scissors et al., 2016).

In addition, we examined FoMO as a moderator. FoMO is conceptualized as experiencing anxiety over others potentially having more rewarding experiences than the self (Przybylski et al., 2013), and is linked to greater SNS use and poorer well-being (Przybylski et al., 2013; Baker et al., 2016; Blackwell et al., 2017; Buglass et al., 2017; Roberts and David, 2019). FoMO inherently requires some degree of upward social comparison, as a necessary component is perceiving that others are doing better than the self (Burnell et al., 2019; Reer et al., 2019). For emerging adults who are experiencing identity development, they

may experience greater comparison processes such as FoMO to better assess the self. Indeed, empirical evidence suggests that younger adults are more likely to report experiencing FoMO (Przybylski et al., 2013; Blackwell et al., 2017). As it is well-established in experimental studies that the negative effects of browsing are exacerbated for those who engage in social comparison (Vogel et al., 2015; Weinstein, 2017; de Vries et al., 2018; Alfasi, 2019), we focused specifically on FoMO in the current research, which has yet to be explored as a moderator.

We expected that when browsing the profile of an Instagram acquaintance and an Instagram influencer, negative effects from browsing would be enhanced for those greater in feedback seeking tendencies, as the exposure to the presumably positive feedback that others are receiving may be particularly detrimental for those who value receiving this feedback themselves (e.g., fueling comparisons to others' feedback). We also expected that these negative effects would be exacerbated for those higher in FoMO, as these individuals may be more sensitive to how others may be having more rewarding social experiences. Moderation hypotheses for the self condition were exploratory.

THE CURRENT RESEARCH

This study extends previous research by its greater emphasis on ecological validity, in that it involves browsing actual Instagram profiles to better assess generalizability of effects to real life browsing. Ecologically valid SNS studies would be useful to complement studies with pre-selected browsing stimuli, to ensure that the findings of these studies can generalize to people's actual SNS experiences (e.g., Griffioen et al., 2020). In this study, we include two conditions that contain "real" profiles (the acquaintance and self conditions), and a third condition with pre-selected but "real" profiles, rather than a series of independent images that exist on Instagram (the influencer condition). Additionally, this study extends prior research by examining browsing profiles of different targets, whereas participants in previous studies often engage in general, untargeted browsing (but see Vogel et al., 2015; Brown and Tiggemann, 2016; for exceptions).

The goal of the current research was to examine how browsing three different Instagram profiles (the self, an acquaintance, or an Instagram influencer) relate to psychological well-being. We examined multiple domains of well-being: positive affect, negative affect, state self-esteem, positive self-perceptions, and interpersonal negativity. Although previous research has examined affect (e.g., Fardouly et al., 2015; Yuen et al., 2019) and self-esteem (e.g., Gonzales and Hancock, 2011; Gentile et al., 2012; Toma, 2013; Alfasi, 2019), fewer studies have experimentally investigated self-perceptions and interpersonal negativity (i.e., envy and jealousy) as outcomes. These domains may be especially relevant as the social nature of Instagram may more heavily influence interpersonally oriented facets of well-being; indeed, envy is argued to be a particularly potent emotion tied to SNSs (Krasnova et al., 2015).

METHOD

Participants

Initially, 440 undergraduate students from a large, southwestern university were enrolled in the study. As we were interested in emerging adults' Instagram experiences, 23 participants who identified their age as 26 or older and 12 participants who did not identify their age were removed. The final analytic sample included 405 emerging adults (84% female, $M_{age} = 20.05$, $SD_{age} = 1.62$, $Range_{age} = 18–25$), recruited over two semesters in the 2017–2018 academic year. The sample was ethnically diverse (44% Asian/Asian-American, 29% White/Caucasian, 15% Hispanic/Latinx, 6% Black/African-American, 6% Mixed/Other). The study was advertised online to students in undergraduate psychology courses as a study examining how Instagram use relates to one's personality. Students received course research credit for their participation. Participation was limited to those with an active Instagram account (defined to students in the study advertisement as logging into their account at least once a week); there were no other requirements for participating. Sensitivity power analyses in G*Power suggest that, with a sample of 405, an alpha of 0.05, power set to 0.80, and an average correlation among repeated measures of 0.67 (the average correlation observed among the pre- and post-assessments of the variables), power was adequate to detect small effect sizes ($f = 0.06$) for within factor effects.

Procedure

On arriving at the laboratory, participants placed their belongings, including their cell phone, on a chair across the room to reduce distractions. After obtaining informed consent, participants provided demographic information and completed baseline measures of state affect and self-perceptions using a laboratory desktop computer. To maximize ecological validity, participants were told they would be browsing Instagram as they normally would, and therefore were not provided with a cover story. Participants were only provided a vague description of the study (i.e., how social media relates to personality), and were not provided information on the different conditions.

Participants then logged into their Instagram profile using the laboratory computer and were randomly assigned to one of three conditions. In the self condition, participants browsed only the posts that they themselves had previously uploaded. In the acquaintance condition, participants selected an acquaintance and browsed only the posts uploaded by this individual. An acquaintance was defined as an individual who is approximately the same age and gender, who posts relatively frequently, and someone who is not and has never been close friends with the participant (as browsing the content of close friends can have differential effects than browsing content from acquaintances or strangers; Lin and Utz, 2015; Liu et al., 2016). More specifically, participants were encouraged to choose a target that they knew from high school, but were not friends with then or friends with now. In the Instagram influencer condition, participants browsed only the posts uploaded by an influencer previously chosen by the researchers, with the influencers framed to the participants as strangers. The influencers were gender matched (one male,

one female) to participants and were young adults. The male and female influencers were matched in terms of content uploaded (e.g., photos of themselves in exotic destinations). The influencers were chosen after discussions with undergraduates to determine profiles that were an accurate representation of an Instagram influencer, and a pilot study ($n = 23$) assessing the feasibility of the procedure. It is important to note that the profiles were not chosen to deliberately represent a specific type of self-presentation (e.g., high levels of the beauty ideal); however, analyses suggest that participants perceived that the influencers engaged in highly positive self-presentation (see **Supplemental Materials**), likely due to the inherent nature of these profiles.

All participants browsed the assigned profile for 10 min, with instructions to browse the Instagram profile as they normally would, without interacting directly with the profile (e.g., leaving likes or comments). For all three conditions, participants were instructed to browse the content their browsing target uploaded to their main page (i.e., participants did not view content in Instagram stories). An experimenter who was blind to the study hypotheses monitored time. Participants then logged out of their account and returned to the online questionnaire to complete post-browsing assessments of state affect and self-perceptions, perceptions of the target profile they browsed, number of and types of posts viewed, and surveys assessing personality traits. The experimenter checked and cleared the Instagram search history after each participant to remove any digital traces and to ensure that participants did not view other websites (or visit other Instagram pages or features) during browsing. No instances of visiting other websites or other Instagram pages or features occurred, and a timer embedded in the survey revealed that no participants returned to complete survey measures when they were supposed to be browsing. Because of this, along with how participants placed their phones across the room, we can be reasonably confident that participants engaged in the assigned task.

Measures

State Self-Esteem

Both before and after browsing their assigned Instagram profiles, participants were asked to indicate on a 7-point scale (1 = Really bad, 7 = Really good) how they feel about themselves in the present moment as a measure of state self-esteem (Gross, 2009).

State Affect and Self-Perceptions

To assess well-being pre- and post-browsing, eighteen affect and self-perception items were adapted and modified from Gross (2009). All items utilized a 7-point scale (1 = I definitely do not feel this way right now, 7 = I definitely feel this way right now), and were given to participants both before and after browsing. Based on theoretical reasoning and an exploratory factor analysis conducted on the post-browsing items (see **Supplemental Materials** for analysis and full item list), four subscales were examined: positive affect (three items; happy, excited, calm; $\alpha_{post} = 0.67$), negative affect (four items; e.g., anger, irritated; $\alpha_{post} = 0.69$), interpersonal negativity (two items; envy, jealousy; $\alpha_{post} = 0.88$), and positive self-perceptions (six items; e.g., confident, valued; $\alpha_{post} = 0.92$). Two items, smart and physically attractive, were relevant to alternative aims of the study and with plans to be examined in future research. One item, embarrassed, was dropped after the factor analysis due to low loadings. It should be noted that items assessing interpersonal negativity were not added until the second semester of data collection due to an oversight ($n = 324$); however, given that the observed effects with this variable were generally large, we do not expect that this reduction in power influenced the findings.

Perceptions of Target

To examine if the acquaintances and influencers were perceived to engage in positive self-presentation, participants were asked to what degree six traits described the owner of the Instagram profile that they browsed: appealing to others, popular, confident, accepted, valued, and successful. Participants indicated their responses using a 7-point scale (1 = Definitely does not describe this person, 7 = Definitely describes this person). These results are provided in the **Supplemental Materials**. To put briefly, participants perceived the targets quite positively, for each the self (*M*'s range from 4.49 to 5.43), acquaintance (*M*'s range from 5.27 to 6.20), and influencer conditions (*M*'s range from 5.54 to 6.58), suggesting that the targets tended to engage in positive self-presentation.

Browsing Experiences

To examine if participants viewed similar content across conditions and as an additional check to ensure that participants engaged in browsing, participants estimated how many pictures they viewed during browsing in an open-ended response. Additionally, participants reported whether or not they viewed pictures of the profile owner, pictures of groups of people, pictures of scenery, captions, and comments.

SNS Feedback Seeking

Participants completed the 10-item Comparison and Feedback Seeking scale (Nesi, 2014; Nesi and Prinstein, 2015), which assesses the degree to which individuals engage in social comparison and elicit feedback from others through digital communication (e.g., "I use social media to get feedback from others on the things I send/post"; $\alpha = 0.90$). For the current research, the scale was modified to focus on SNSs; in the original version, the items focused on electronic interaction in general. The measure uses a five-point scale (1 = Not at all true, 5 = Extremely true). Although research on adolescents suggest that the social comparison and feedback seeking items of the scale load on the same factor (Nesi, 2014), previous research (Burnell et al., 2019) and an exploratory factor analysis conducted with the data used in the current research (using Maximum Likelihood estimation and Oblimin Rotation) suggested that the social comparison items and feedback seeking items are distinct in college students. Thus, we focused specifically on six feedback seeking items, as the moderation role of social comparison is well-established in previous studies (e.g., Vogel et al., 2015; Weinstein, 2017; de Vries et al., 2018).

Fear of Missing Out (FoMO)

Participants completed the 10-item Fear of Missing Out Scale (Przybylski et al., 2013), which measures an individual's anxiety over thoughts of others having more satisfying and rewarding experiences, and engagement in behaviors to stay knowledgeable of others' activities (e.g., "I fear others have more rewarding experiences than me"; $\alpha = 0.89$). The measure utilizes a 5-point scale (1 = Not at all true of me, 5 = Extremely true of me).

RESULTS

Table 1 presents descriptive statistics and zero-order correlations between baseline well-being and personality moderators. ANOVAs indicated that conditions did not differ from each other in pre-browsing well-being (p's > 0.060), nor did the conditions differ from each other for the moderators (p's > 0.245). Chi-square tests indicated that conditions did not differ for gender ($p = 0.182$), but did differ for race/ethnicity, $\chi^2(8, N = 405) = 16.41$, $p = 0.037$. Despite random assignment, Hispanic/Latinx participants were underrepresented, and White/Caucasian participants overrepresented, in the influencer condition. Results with demographic covariates are presented in the **Supplemental Materials**.

Effects of Condition on Post-browsing Reports

To examine how post-browsing reports of affect and self-perceptions differed between conditions, a series of ANCOVAs were run (**Figure 1**). All analyses were run controlling for the corresponding pre-browsing assessment of each variable; marginal means are reported in-text and in **Figure 1**. Post-browsing self-esteem significantly differed by condition, $F_{(2,399)} = 22.60$, $p < 0.001$, $MSE = 0.85$, $\eta_p^2 = 0.10$. Participants in the self condition reported higher self-esteem ($M = 5.88$, $SE = 0.08$) than those in the acquaintance ($M = 5.30$, $SE = 0.08$) and influencer ($M = 5.17$, $SE = 0.08$) conditions; the acquaintance and influencer conditions did not differ from each other ($p = 0.277$). Post-browsing positive affect significantly differed by condition, $F_{(2,400)} = 8.19$, $p < 0.001$, $MSE = 0.90$, $\eta_p^2 = 0.04$. Participants in the self condition reported higher positive affect ($M = 4.49$, $SE = 0.08$) than those in the acquaintance ($M = 4.17$, $SE = 0.08$) and influencer ($M = 4.04$, $SE = 0.08$) conditions; the acquaintance and influencer conditions did not differ from each other ($p = 0.263$). Post-browsing negative affect did not significantly differ by condition, $F_{(2,400)} = 0.53$, $p = 0.588$, $MSE = 0.38$, $\eta_p^2 = 0.00$. Post-browsing interpersonal negativity significantly differed by condition, $F_{(2,320)} = 28.65$, $p < 0.001$, $MSE = 1.33$, $\eta_p^2 = 0.15$. Participants in the self condition ($M = 1.32$, $SE = 0.11$) reported lower interpersonal negativity than those in the acquaintance ($M = 2.14$, $SE = 0.11$) and influencer ($M = 2.46$, $SE = 0.11$) conditions; the acquaintance and influencer conditions also significantly differed from each other ($p = 0.045$). Post-browsing positive self-perceptions significantly differed by condition, $F_{(2,400)} = 23.42$, $p < 0.001$, $MSE = 0.56$, $\eta_p^2 = 0.11$. Participants in the self condition reported greater positive self-perceptions ($M = 4.72$, $SE = 0.06$) than those in the acquaintance ($M = 4.20$, $SE = 0.06$) and influencer ($M = 4.15$, $SE = 0.07$) conditions; the acquaintance and influencer conditions did not significantly differ from each other ($p = 0.616$).

Within-Person Changes for Well-Being by Condition

To examine within-person changes in affect and self-perceptions, a series of multilevel analyses were conducted. Due to the nested nature of the data (two time points nested within each individual), multilevel modeling (MLM) was used with Restricted Maximum Likelihood Estimation. A random intercept was included to account for non-independence. Analyses were run examining changes in affect and self-perceptions within each condition, with the conditions dummy coded and the condition of interest the reference group. Time was effects coded (pre-browsing = −0.5, post-browsing = 0.5). Prior to the analyses reported below, analyses examined whether changes in affect and self-perceptions differed significantly across conditions, by testing whether the interaction between time and condition was significant. All changes within conditions significantly differed from each other (p's < 0.001), except

TABLE 1 | Means, standard deviations, and zero-order correlations of study variables.

	1	2	3	4	5	6	7
1. Pre_SE	–						
2. Pre_PA	0.56**	–					
3. Pre_NA	−0.50**	−0.39**	–				
4. Pre_IntNeg	−0.20**	−0.07	0.45**	–			
5. Pre_SP	0.62**	0.58**	−0.34**	−0.11*	–		
6. FS	−0.06	−0.05	0.14**	0.17**	−0.08	–	
7. FoMO	−0.15**	−0.05	0.24**	0.20**	−0.16**	0.55**	–
Mean	5.53	4.33	1.83	1.27	4.34	2.51	2.47
SD	1.24	1.19	0.88	0.71	1.21	0.99	0.89

SE, Self-esteem; PA, Positive Affect; NA, Negative Affect; IntNeg, Interpersonal Negativity; SP, Self-Perceptions; FS, Feedback Seeking; FoMO, Fear of Missing Out.
***$p < 0.01$; *$p < 0.05$.*

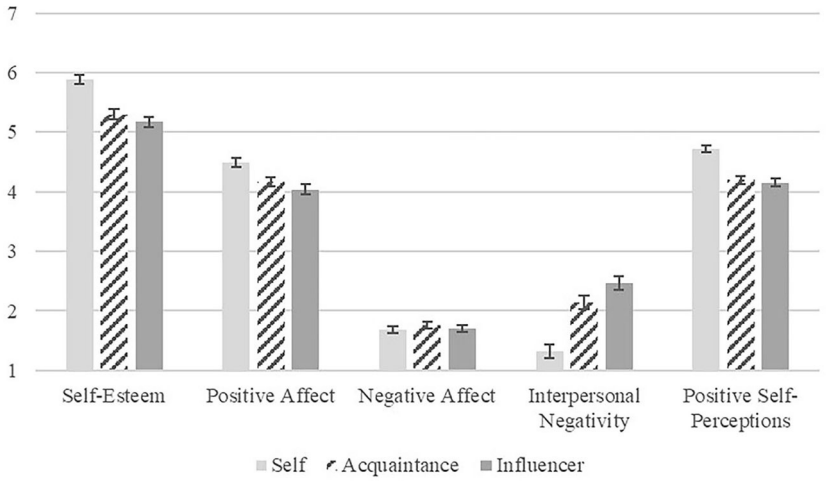

FIGURE 1 | Post-browsing marginal means by condition. Error bars represent standard errors.

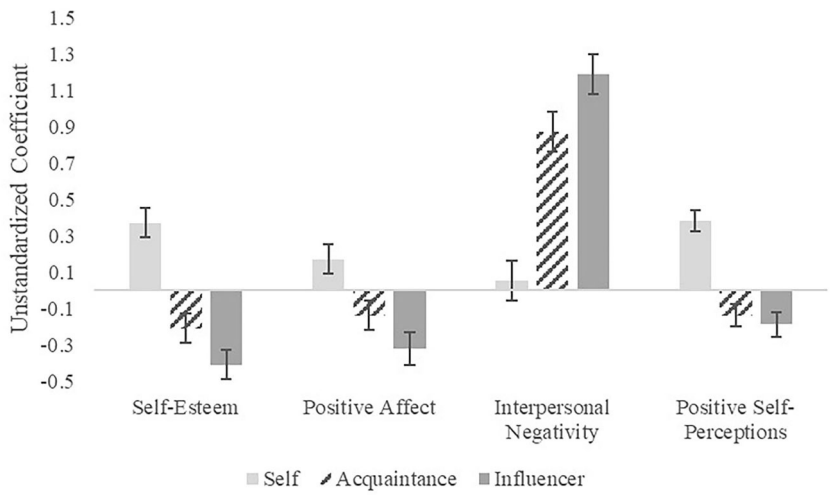

FIGURE 2 | Within-person changes in affect and self-perceptions by condition. Error bars represent standard errors.

for negative affect ($p = 0.762$); thus, negative affect was not examined further.

Results are shown in **Figure 2**. Participants in the self condition reported significant increases in self-esteem ($b = 0.37$, 95% CI [0.21, 0.53], $SE = 0.08$, $p < 0.001$, $d = 0.41$), and positive self-perceptions ($b = 0.38$, 95% CI [0.25, 0.50], $SE = 0.06$, $p < 0.001$, $d = 0.44$), as well as marginal increases in positive affect ($b = 0.17$, 95% CI [0.00, 0.33], $SE = 0.08$, $p = 0.051$, $d = 0.16$). There were no changes in interpersonal negativity, $b = 0.05$, 95% CI [−0.17, 0.26], $SE = 0.11$, $p = 0.654$, $d = 0.08$.

Participants in the acquaintance condition reported significant decreases in self-esteem ($b = -0.21$, 95% CI [−0.38, −0.05], $SE = 0.08$, $p = 0.010$, $d = 0.20$) and positive self-perceptions ($b = -0.14$, 95% CI [−0.27, −0.01], $SE = 0.06$, $p = 0.030$, $d = 0.20$), and significant increases in interpersonal negativity ($b = 0.87$, 95% CI [0.65, 1.08], $SE = 0.11$, $p < 0.001$, $d = 0.72$). There were no changes in positive affect ($b = -0.14$, 95% CI [−0.31, 0.02], $SE = 0.08$, $p = 0.094$, $d = 0.14$).

Participants in the influencer condition reported significant decreases in self-esteem ($b = -0.41$, 95% CI [−0.57, −0.24], $SE = 0.08$, $p < 0.001$, $d = 0.43$), positive affect ($b = -0.32$, 95% CI [−0.49, −0.15], $SE = 0.09$, $p < 0.001$, $d = 0.32$), and positive self-perceptions ($b = -0.19$, 95% CI [−0.32, −0.06], $SE = 0.07$, $p = 0.003$, $d = 0.26$), as well as significant increases in interpersonal negativity ($b = 1.19$, 95% CI [0.97, 1.42], $SE = 0.11$, $p < 0.001$, $d = 0.79$).

Moderation

MLM analyses were run examining feedback seeking and FoMO as moderators for within-person effects. The moderators were continuous and were grand-mean centered. Significant

interactions were probed using simple slope analyses, in order to determine effects at one standard deviation above and one standard deviation below the mean. Due to the large number of tests, the *p*-value was set to 0.01. Prior to running the analyses reported below, analyses were run to examine if moderation significantly differed across conditions, by testing whether the three-way interaction between time, condition, and each moderator was significant. There were no significant differences between conditions for positive affect or negative affect (*p*'s > 0.032), and therefore follow-up analyses were not run for either outcome. Additionally, there were no differences between condition for interpersonal negativity when feedback seeking was a moderator ($p = 0.014$).

For the self condition, the effects of browsing on positive self-perceptions were contingent on FoMO ($b = 0.20$, 95% CI [0.06, 0.33], $SE = 0.07$, $p = 0.004$) and feedback seeking ($b = 0.22$, 95% CI [0.09, 0.34], $SE = 0.07$, $p = 0.001$). Self-perceptions did not change for those lower in FoMO and feedback seeking (*p*'s > 0.062), but increased for those higher in FoMO ($b = 0.52$, 95% CI [0.35, 0.68], $SE = 0.08$, $p < 0.001$) and feedback seeking ($b = 0.59$, 95% CI [0.42, 0.77], $SE = 0.09$, $p < 0.001$). There was no significant moderation for self-esteem (*p*'s>0.061) or interpersonal negativity ($p = 0.686$).

For the acquaintance condition, the effects of browsing on self-esteem were contingent on FoMO ($b = -0.38$, 95% CI [−0.56, −0.19], $SE = 0.09$, $p < 0.001$) and feedback seeking ($b = -0.23$, 95% CI [−0.39, −0.08], $SE = 0.08$, $p = 0.004$). Self–esteem did not change for those lower in FoMO or feedback seeking (*p*'s>0.187), but decreased for those higher in FoMO ($b = -0.51$, 95% CI [−0.74, −0.29], $SE = 0.11$, $p < 0.001$) and feedback seeking ($b = -0.43$, 95% CI [−0.64, −0.21], $SE = 0.11$, $p < 0.001$). The effects on interpersonal negativity were contingent on FoMO ($b = 0.47$, 95% CI [0.22, 0.71], $SE = 0.12$, $p < 0.001$). Interpersonal negativity did not change for those lower in FoMO ($p = 0.018$) but increased for those higher in FoMO ($b = 1.21$, 95% CI [0.92, 1.51], $SE = 0.15$, $p < 0.001$). Effects on positive self-perceptions were contingent on FoMO ($b = -0.19$, 95% CI [−0.33, −0.04], $SE = 0.07$, $p = 0.010$), and feedback seeking ($b = -0.17$, 95% CI [−0.29, −0.05], $SE = 0.06$, $p = 0.005$). Self-perceptions did not change for those lower in FoMO or feedback seeking (*p*'s>0.632), but decreased for those higher in FoMO ($b = -0.29$, 95% CI [−0.47, −0.12], $SE = 0.09$, $p = 0.001$) and feedback seeking ($b = -0.30$, 95% CI [−0.46, −0.13], $SE = 0.08$, $p < 0.001$).

For the influencer condition, there was no moderation for self-esteem (*p*'s>0.081). Effects for interpersonal negativity were contingent on FoMO ($b = 0.33$, 95% CI [0.08, 0.57], $SE = 0.12$, $p = 0.009$). Interpersonal negativity increased for both those lower ($b = 0.93$, 95% CI [0.64, 1.22], $SE = 0.15$, $p < 0.001$) and higher in FoMO ($b = 1.51$, 95% CI [1.19, 1.84], $SE = 0.16$, $p < 0.001$), with the effect stronger for those higher in FoMO. The effect on positive self-perceptions was contingent on FoMO ($b = -0.28$, 95% CI [−0.42,−0.14], $SE = 0.07$, $p < 0.001$) and feedback seeking ($b = -0.20$, 95% CI [−0.32, −0.07], $SE = 0.06$, $p = 0.002$). For those lower in FoMO and feedback seeking, positive self-perceptions did not change (*p*'s > 0.756). Browsing decreased positive self-perceptions for those higher in FoMO ($b = -0.47$, 95% CI [−0.66, −0.28], $SE = 0.10$, $p < 0.001$) and feedback seeking ($b = -0.40$, 95% CI [−0.58, −0.22], $SE = 0.09$, $p < 0.001$).

Additional Analyses

Additional analyses are presented in the **Supplemental Materials**. First, analyses were run controlling for gender, race/ethnicity, number of posts viewed, whether scenery pictures were viewed, and whether comments were viewed. This was due to college women preferring Instagram more than men (Shane-Simpson et al., 2018), and differences across conditions in race/ethnicity, number of posts viewed, and whether scenery pictures were viewed. Specifically, those in the influencer condition viewed more posts than those in the self and acquaintance conditions, and those in the influencer condition viewed more scenery pictures than those in the acquaintance condition. Viewing comments did not differ across conditions (81% of participants in the self condition, 74% in the acquaintance condition, 79% in the influencer condition); however, we controlled for this because our interpretation of the results is influenced by the presence of and participants' attention to the comments. With these covariates, the effect of participants in the influencer condition reporting greater interpersonal negativity compared to those in the acquaintance condition was now marginally significant ($p = 0.078$). The moderation effect of FoMO on positive self-perceptions in the acquaintance condition was marginally significant with the more stringent *p*-value ($p = 0.011$). Otherwise, results remained the same.

Exploratory analyses assessed how the participant's Instagram posting and browsing frequency may moderate effects on well-being. No significant findings emerged. We also assessed how interpersonally-oriented perceptions (popularity, acceptance) of the browsing target may influence effects on well-being. This was of particular interest for the acquaintance condition, as targets higher in these perceived traits may have a qualitatively different type of profile, such as through accruing more likes and comments. Perceived popularity and acceptance were significant moderators for the self condition on positive self-perceptions. Increases in self-perceptions were strengthened for those who perceived themselves to be higher in popularity and acceptance. Analyses for the acquaintance condition were not significant with the more stringent *p*-value. Popularity was a significant moderator for the influencer condition on interpersonal negativity. Increases in interpersonal negativity were only observed for those who perceived the influencer as higher in popularity.

We examined if FoMO and feedback seeking interacted with each other in predicting changes in well-being, and if both moderators interacted with key demographic variables (age, gender, race/ethnicity) in predicting changes in well-being. None of these analyses were significant. Finally, due to how FoMO and feedback seeking emerged as significant moderators in the self condition, we examined if those higher in these traits may differ in the type of content they post and attend to when viewing

their own profiles, in terms of groups of people, scenery pictures, captions, and comments. Those higher in FoMO had greater odds of reporting viewing groups of people and marginally higher odds of reporting viewing comments, and those higher in feedback seeking had lower odds of viewing scenery pictures; analyses were otherwise not significant.

DISCUSSION

These findings generally support our hypotheses in that browsing one's own Instagram profile led to increased well-being and browsing others' profiles led to decreased well-being, for both acquaintances and Instagram influencers. The results suggest that many of these effects are contingent on emerging adults' dispositional levels of feedback seeking and FoMO.

Effects of Viewing One's Own Profile

Compared to pre-browsing, emerging adults who browsed their own profile reported small-to-moderate increases in self-esteem and positive self-perceptions. These results replicate previous research that has found that viewing and editing one's own Facebook page boosts self-esteem (Gonzales and Hancock, 2011; Gentile et al., 2012; Toma, 2013). People may experience self-affirmation after viewing the presumably positive events of their lives that they showcased online (Toma, 2013; Toma and Hancock, 2013). People may also experience positive reminiscing looking back at these positive events (Good et al., 2013), and may enjoy re-viewing positive feedback left by others (e.g., Burrow and Rainone, 2017). There were no significant findings observed for interpersonal negativity, perhaps because emerging adults are unlikely to experience fluctuations in envy and jealousy by looking at their own content.

The effects on positive self-perceptions were only observed for emerging adults higher in FoMO and feedback seeking. Perhaps those who are engrossed with online feedback seeking experience boosts in their positive self-perceptions when looking back at, presumably, the positive feedback they previously received. Moreover, perhaps those who fear that others are having more rewarding experiences than the self are appeased by looking, presumably, at their own positive life experiences. This highlights the transformative nature of SNSs such as Instagram, particularly in respect to visuality and quantifiability. Emerging adults who may be sensitive to others' evaluations of the self, or anxious about how their own social experiences compared to others, may find (temporary) relief looking back at their own content. The lack of significant findings for those lower in these traits could be because these individuals feel secure in their sense of self, and browsing their own profile does not necessarily affirm their positive self-image, at least in regards to positive self-perceptions.

Supplemental analyses examining emerging adults who viewed their own profile indicated that those higher in FoMO reported greater odds of viewing groups of people and marginally greater odds of viewing comments, whereas those higher in feedback seeking reported lower odds of viewing scenery pictures. It is possible that those higher in FoMO and feedback seeking have qualitatively different profiles (in terms of content uploaded and comments received) than those lower in these traits, or perhaps attend to different types of content and features when viewing their profile (e.g., those higher in FoMO may be more likely to look at comments compared to those lower in FoMO). Future research should systematically assess different types of Instagram content to see how those higher on these traits may differ in the types of content they upload. Future research can also adapt eye-tracking technology to examine if those higher in these traits visually attend to their own content differently than those lower in these traits.

Effects of Viewing the Profile of an Acquaintance

Compared to pre-browsing, emerging adults who browsed the profile of an acquaintance reported small decreases in self-esteem and positive self-perceptions, and large increases in interpersonal negativity. Perhaps self-esteem and self-perceptions decreased (whereas positive and negative affect were unaffected) because they are especially tied to one's overall sense of self. By viewing the content of a known acquaintance, emerging adults may be especially likely to evaluate their own sense of self in relation to this individual, and therefore detectable immediate changes may be limited to self-oriented domains rather than overall mood. Interpersonal negativity may have increased because viewing the positive self-presentation of others may trigger feelings that others are leading better lives (e.g., Chou and Edge, 2012).

Several moderation effects were observed. Specifically, decreases in state self-esteem and positive self-perceptions, and increases in interpersonal negativity, were only observed for those higher in FoMO (although notably, moderation for self-perceptions was at the threshold of significance when using a more stringent p-value). This is in line with previous research suggesting that negative effects of SNS browsing are generally limited to those who have a tendency to compare (Vogel et al., 2015; de Vries et al., 2018), and expands on these findings by focusing on a type of comparison tendency that is specifically socially-oriented. Perhaps those who have a tendency to fear that others are having more rewarding experiences feel particularly worse when viewing content that may confirm these fears, thus potentially engaging in harmful, upward social comparisons. Additionally, decreases in state self-esteem and positive self-perceptions were only observed for those higher in feedback seeking. Those who value receiving feedback on SNSs may be especially negatively affected when viewing the presumably positive feedback that others receive. Together, these findings suggest how Instagram can transform emerging adults' social experiences, particularly for those higher in their tendency to seek feedback and experience FoMO. For example, those higher in their tendency to seek feedback may be more sensitive to the quantifiable nature of Instagram, and compare their own received feedback to the feedback received by an acquaintance. Those higher in FoMO may be particularly affected by how the visual affordances of Instagram can easily portray others' positive social experiences (e.g., Underwood and Ehrenreich, 2017).

Effects of Viewing the Profile of an Influencer

Compared to pre-browsing, emerging adults who browsed the profile of an Instagram influencer reported small-to-moderate decreases in self-esteem, positive affect, and positive self-perceptions, and large increases in interpersonal negativity. These results generally mirrored the findings observed for the acquaintance condition, with the notable additional finding concerning positive affect. The Instagram influencers were especially perceived positively by participants, suggesting that these individuals engaged in particularly high positive self-presentation. Therefore, immediate effects may generalize to domains beyond those most relevant to one's sense of self. With that said, however, between-subject analyses suggested no robust post-browsing differences between the acquaintance and influencer conditions.

Additionally, decreases in positive self-perceptions only occurred for those higher in FoMO and feedback seeking. Again, this suggests that negative effects of browsing in certain domains may be limited to those who a) tend to perceive that others have more rewarding experiences than the self (and may engage in more upward social comparisons when browsing), and/or b) who have a tendency to elicit feedback from others on SNSs. For interpersonal negativity, it was observed that although interpersonal negativity increased for those both lower and higher in FoMO, these changes were especially pronounced for those higher in FoMO. Perhaps no browser is fully immune to experiencing feelings of envy and jealousy when browsing the highly positive accounts of Instagram influencers, with those who have a tendency to perceive that others have more rewarding social experiences especially affected. The tenets of the transformation approach may operate similarly but amplified when browsing the profile of an influencer compared to browsing the profile of an acquaintance, namely in terms of visuality (with influencers perhaps engaging in particularly highly positive self-presentation) and quantifiability (with influencers potentially accruing more feedback). The amplification of these components may be aided by publicness, as a fundamental goal for influencers is to obtain a larger following, which may be done by engaging in especially positive self-presentation, and may result in more feedback. Given that results were generally similar for acquaintances and influencers, future research is needed that better tests these tenets of the transformation approach, to determine if and when browsing influencers' profiles may have differential effects on emerging adults' psychological well-being compared to others' profiles.

Limitations and Future Directions

These findings should be considered in the context of several limitations. First, we omitted implementing a cover story to maximize ecological validity. We instructed participants to browse the Instagram profiles as they normally would, and a cover story (e.g., using a bogus memory task; Fardouly et al., 2015) may have diverted their full attention from browsing. Thus, some of our findings may have been influenced by demand characteristics. Moreover, although we aimed to maximize ecological validity, the study nonetheless took place in a laboratory setting and also involved browsing using a desktop computer, which may provide a different browsing experience compared to browsing Instagram using one's smartphone. Future research could supplement experimental designs with daily diary designs that can capture more naturalistic browsing experiences. Second, we opted for a repeated measures design to maximize power, and therefore we did not use a control group. Given that different effects were observed across conditions, we can be reasonably confident that our findings are a result of the manipulation and not due to the passing of time. Third, our Instagram influencer targets, although matched for content and age, were chosen somewhat arbitrarily. Before the study, we conducted discussions with undergraduates to find typical influencer profiles and further tested the chosen profiles in a pilot study. However, we did not quantitatively assess the degree to which the targets engaged in overall positive self-presentation or specific types of positive self-presentation (e.g., exemplifying the beauty ideal), which would have provided a more systematic approach to choosing profiles.

Additionally, future research could examine participants' personal connections with influencers as a potential moderator. The chosen influencers were posed as strangers to participants, and it is plausible that many would not normally follow these types of profiles, which may reduce ecological validity. To date, experimental examinations of browsing influencers' profiles are lacking, and we aimed to provide a foundation for future research by including this popular type of profile in our design. To further enhance ecological validity, future studies could have participants personally select an influencer to browse, which can increase personal relevance. Studies could also assess characteristics such as participants' perceived similarity to and likelihood to form a parasocial relationship with a given influencer, and test for moderation. It is possible that under some circumstances, the effects of browsing are positive. Specifically, for emerging adults who perceive a browsing target to be more similar to the self, they may be more likely to engage in assimilative comparisons (Collins, 1996), which elicits positive emotions including inspiration, admiration, and optimism (Smith, 2000). Perceived similarity with a given influencer is strongly correlated with forming a parasocial relationship with that influencer (Lou and Kim, 2019), suggesting that browsing the Instagram content of an influencer with whom one has a parasocial relationship may have positive effects.

In addition, the chosen acquaintances differed across participants, introducing variability in the participants' browsing experiences. It is plausible that characteristics of the browsing target (e.g., number of followers, number of likes and comments) further influence how well-being is affected from browsing, which future research should explore further. There was also variability within the self condition. In some circumstances, viewing one's own Instagram profile may have negative effects. For example, receiving few likes may negatively influence well-being (Hayes et al., 2016), and therefore viewing content that did not receive this positive feedback may be harmful. Browsing old content may reveal preserved negative content (e.g., cyberbullying; Underwood and Ehrenreich, 2017), and

some types of content that may have once been positive may now instead trigger negative memories (e.g., the demise of a close friendship; a romantic relationship breakup; Lukacs and Quan-Haase, 2015). Future research should examine if and when viewing one's own content may have negative effects on well-being.

More research is needed that assesses how closeness to the browsing target may influence effects on well-being. There is some evidence that browsing the SNS content of close friends can boost well-being (Lin and Utz, 2015; Liu et al., 2016). We did not include close friends as a condition in the current study due to our focus on acquaintances, whose content is more common on SNSs (Manago et al., 2012; De Meo et al., 2014), and to maximize power. Future research should systematically test how the effects of browsing content from close friends comparatively differs from browsing content from acquaintances and strangers.

We were also limited in our ability to examine gender and ethnic differences in the effects of browsing Instagram. The sample was largely female, and despite random assignment, Hispanic/Latinx participants and White/Caucasian participants were disproportionately represented across conditions. Supplemental analyses assessed gender and race/ethnicity as potential moderators for effects, with no significant findings observed. However, future research is needed that carefully recruits equal group sizes to appropriately test gender and race/ethnicity as moderators, in order to fully assess if moderation effects exist. For example, it is possible that significant moderation may emerge depending on if the race/ethnicity of the participant matches the race/ethnicity of the browsing target.

Our measures also had some limitations. We used brief assessments of positive and negative affect to reduce participant burden, although our items were adapted from previous research and a factor analysis supported our composites. Perhaps we observed few significant differences for these variables because our items may not have fully captured positive and negative affective states. Likewise, we utilized a single item to measure state self-esteem; although this has been previously done (Gross, 2009), the item may not have fully captured state self-esteem. Finally, although we assessed what types of content participants were exposed to in each condition (e.g., pictures with groups of people) and controlled for when there were differences in conditions (i.e., scenery pictures), more could be done to capture the diverse set of content that people post on Instagram, which can further enhance generalizability. These items were limited as they were designed to a) examine broad differences in viewing content across conditions, and b) serve as an extra check to ensure that participants engaged in browsing. Additionally, as the participants themselves reported on these categories, responses were subject to interpretation (e.g., whether scenery pictures include people). Future research should carefully assess different types of image content to examine how exposure to various content (e.g., viewing pictures of groups of people versus selfies) may moderate the observed effects.

Although we interpret our findings in the context of positive self-presentation due to the wealth of previous literature suggesting that images and feedback on SNSs are positive, we did not strictly quantify the extent to which this occurred, especially in terms of feedback (although perceptions of the browsing targets suggested that the targets did engage in positive self-presentation). Future research could explore the extent to which positive images and comments moderate effects on browsers' well-being, such as by implementing observational coding techniques. Importantly, Instagram is currently experimenting with hiding the number of likes when browsing others' content (Mosseri, 2019), which influences the extent to which feedback is displayed to browsers. Although this change was made after data collection for this study was complete and therefore does not influence our results, this has important implications for understanding how emerging adults may be influenced by browsing in the future, as effects on well-being may change. Finally, future research could also explore how viewing others' profiles may elicit positive effects. For example, there may be circumstances where positive effects on well-being occur through the elicitation of downward social comparisons, in which browsing targets are perceived to be worse off than the self. Alternatively, there could be browsing experiences that evoke feelings of optimism and inspiration (i.e., assimilative emotions; Park and Baek, 2018).

CONCLUSIONS

This study has three main implications. First, we echo calls from other researchers to consider different types and the content of SNS use, rather than broad assessments of total time spent online (Odgers and Jensen, 2020). Our study demonstrates that browsing one's own Instagram profile can have positive effects, whereas browsing others' profiles can have negative effects, with effect sizes generally small-to-moderate. Moreover, effects from browsing acquaintances' and influencers' profiles were fairly comparable. These small, negative effects further suggest that blanket statements that SNSs are harmful may not be accurate, and that even passive browsing, an activity that is commonly viewed as negative (Verduyn et al., 2017), may have positive effects. Notably, these statements are often targeted at youth (e.g., Twenge and Campbell, 2019). Our findings suggest that more nuanced investigations into the links between youth's social media use and well-being are needed. There is reason to believe that our observed findings may differ for adolescents, as their use of Instagram may be different from how college students use Instagram. For example, adolescents may be more sensitive to quantifiable indices of peer approval such as likes and comments (e.g., Nesi et al., 2018a,b).

Second, our findings highlight the need to consider personality traits when examining SNS effects. Negative effects from browsing others' profiles were generally limited to those higher in FoMO and feedback seeking, and therefore many users may not experience strong negative effects from browsing, at least in the assessed domains. This is in line with previous research that suggests that negative social media experiences may be amplified for those who are already poorly adjusted (Rideout et al., 2018). Third, for the self condition, boosts in positive

self-perceptions were only observed for those higher in FoMO and feedback seeking. These individuals are also the same as those particularly adversely affected by browsing others' profiles. Therefore, a certain subset of individuals may be susceptible to a cycle of experiencing especially positive effects from viewing their own profile, only to experience especially negative effects from viewing others' profiles. Ultimately, our findings suggest that different types of Instagram use can have differential effects based on the profile being viewed and the personality traits of users.

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found here: https://osf.io/czfuw/.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by The University of Texas at Dallas Institutional Review Board. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

KB, MG, and MU conceptualized the study. KB and MG collected the data. KB conducted the analyses and drafted the manuscript. MG and MU provided critical revisions for the manuscript. All authors approved of the final 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/fhumd.2020.585518/full#supplementary-material

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Corrigendum: Browsing Different Instagram Profiles and Associations With Psychological Well-Being

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In the original article, there was an error. The regression mean square values were incorrectly labeled as the mean square error values.

A correction has been made to the "Effects of Condition on Post-browsing Reports" section.

To examine how post-browsing reports of affect and self-perceptions differed between conditions, a series of ANCOVAs were run (Figure 1). All analyses were run controlling for the corresponding pre-browsing assessment of each variable; marginal means are reported in-text and in Figure 1. Post-browsing self-esteem significantly differed by condition, $F_{(2,399)} = 22.60$, $p < 0.001$, $MSE = 0.85$, $\eta_p^2 = 0.10$. Participants in the self condition reported higher self-esteem ($M = 5.88$, $SE = 0.08$) than those in the acquaintance ($M = 5.30$, $SE = 0.08$) and influencer ($M = 5.17$, $SE = 0.08$) conditions; the acquaintance and influencer conditions did not differ from each other ($p = 0.277$). Post-browsing positive affect significantly differed by condition, $F_{(2,400)} = 8.19$, $p < 0.001$, $MSE = 0.90$, $\eta_p^2 = 0.04$. Participants in the self condition reported higher positive affect ($M = 4.49$, $SE = 0.08$) than those in the acquaintance ($M = 4.17$, $SE = 0.08$) and influencer ($M = 4.04$, $SE = 0.08$) conditions; the acquaintance and influencer conditions did not differ from each other ($p = 0.263$). Post-browsing negative affect did not significantly differ by condition, $F_{(2,400)} = 0.53$, $p = 0.588$, $MSE = 0.38$, $\eta_p^2 = 0.00$. Post-browsing interpersonal negativity significantly differed by condition, $F_{(2,320)} = 28.65$, $p < 0.001$, $MSE = 1.33$, $\eta_p^2 = 0.15$. Participants in the self condition ($M = 1.32$, $SE = 0.11$) reported lower interpersonal negativity than those in the acquaintance ($M = 2.14$, $SE = 0.11$) and influencer ($M = 2.46$, $SE = 0.11$) conditions; the acquaintance and influencer conditions also significantly differed from each other ($p = 0.045$). Post-browsing positive self-perceptions significantly differed by condition, $F_{(2,400)} = 23.42$, $p < 0.001$, $MSE = 0.56$, $\eta_p^2 = 0.11$. Participants in the self condition reported greater positive self-perceptions ($M = 4.72$, $SE = 0.06$) than those in the acquaintance ($M = 4.20$, $SE = 0.06$) and influencer ($M = 4.15$, $SE = 0.07$)

conditions; the acquaintance and influencer conditions did not significantly differ from each other ($p = 0.616$).

The authors apologize for this error and state that this does not change the scientific conclusions of the article in any way. The original article has been updated.

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A Qualitative Analysis of Adolescent Responses to YouTube Videos Portraying Sexual and Gender Minority Experiences: Belonging, Community, and Information Seeking

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Sexual and gender minority youth are at risk for negative mental health outcomes, such as depression and suicide, due to stigma. Fortunately, sense of community, connection, and social support can ameliorate these deleterious effects. Youth express that most of their social support comes from peers and in-school organizations, but these sources require in-person interaction. Past research has identified social media sites as virtual and anonymous sources of support for these youth, but the role of YouTube specifically in this process has not been thoroughly explored. This study explores YouTube as a possible virtual source of support for sexual and gender minority youth by examining the ecological comments left on YouTube videos. A qualitative thematic analysis of YouTube comments resulted in six common themes in self-identified adolescents' YouTube comments: sharing, relating, information-seeking, gratitude, realization, and validation. Most commonly, adolescents shared feelings and experiences related to their identity, especially when they could relate to the experiences discussed in the videos. These young people also used their comments to ask for identity-related advice or information, treating the platform as a source of education. Results suggest that sexual minority youth's use of YouTube can be advantageous for social support and community, identity-related information, identity development, and overall well-being.

Keywords: connectedness, LGBTQ, YouTube, adolescence, gender identity, sexual orientation, sexual and gender minority, social support

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INTRODUCTION

Sexual and gender minority individuals are "individuals who identify as lesbian, gay, bisexual, asexual, transgender, two-spirit, queer, and/or intersex…or who do not self-identify with one of these terms but whose sexual orientation, gender identity or expression, or reproductive development is characterized by non-binary constructs of sexual orientation, gender, and/or sex" (NOT-O-19-139: Sexual Gender Minority Populations in NI-Supported Research., 2019). Put more simply, sexual and gender minorities are individuals who identify as anything other than straight or cisgender (someone whose gender identity matches their biological sex), or who engage in behavior outside of the gender or sexual binary (attraction and sexual activity between males and females). Sexual and gender minority youth are at risk for negative health outcomes. Youth with

these identities are exposed to excess stress due to stigma (Meyer, 2003). In terms of sexual or gender minority identity, these stressors can include external experienced stressors such as explicit discrimination, anticipated stressors such as the expectation of rejection, or internal stressors such as internalized homophobia. Sexual and gender minority adolescents experience higher rates of both victimization and mental health symptoms than heterosexual peers, including depressive symptoms, suicidal ideation, and even suicide attempts (Meyer, 2003; Wright and Perry, 2006; Kelleher, 2009; Kann et al., 2016; Sattler et al., 2017; Watson et al., 2019).

Support, belongingness, and community are critical for adolescents exploring their identities as they are protective against these negative outcomes. For example, peer and social support increases sexual and gender minority youths' confidence and self-esteem (Romijnders et al., 2017) and protects against the common early and dangerous alcohol and drug use among these youth (Kidd et al., 2018). Sexual and gender minority youth report many positive influences on their well-being, including peers, schools, and sexual and gender minority community involvement (Higa et al., 2014; Porta et al., 2017). These social support systems can ameliorate the effects of identity-related stress on psychological functioning (Meyer, 2003). Social evaluation theory suggests that when those with stigmatized identities are connected with a community of others with whom they identify, they are able to compare themselves more to that group rather than to an out-group, allowing them to avoid negative comparison due to stigma and improve well-being (Pettigrew, 1967 as cited in Meyer, 2003). This research and theory illustrate the importance of connection to community. However, these supports require and provide in-person or face-to-face interaction.

There are situations in which adolescents may not have access to such in-person support and need another way to connect with a community. Formative research shows that sexual and gender minority youth say that they are often driven online by feelings of isolation, stigmatization, and a lack of information (Steinke et al., 2017). This may be truer now more than ever, since the last four years after the election of Donald Trump as president has brought a resurgence of outward homophobia and discrimination against sexual and gender minorities. The present research explores the possibility that specific Internet-based communities can be an additional resource to fulfill the ameliorative role of community, support, and interaction by examining the ecological online environment. This source of support can be especially important in the case of statistically infrequent identities (Suzuki and Beale, 2006; Sherman and Greenfield, 2013).

The Internet has shown to be an important part of identity development and support for sexual and gender minority individuals. In one 2011 study, participants described the Internet as the most influential media source influencing their sexual orientation identity development (Gomillion and Giuliano, 2011). Often, sexual and gender minority individuals are unable to find information about their identities in the 'real' world, and therefore, turn to the Internet for information (Harper et al., 2016). In one study of gay and bisexual young men, participants expressed that the Internet fostered a connection to the gay community as well as facilitating the coming out process. The Internet also provides a certain level of anonymity to this process of identity exploration, allowing for individuals to express themselves freely and ask questions without risk of identification.

Even further, with the advent of sites that host user-generated content, like social media, the Internet landscape and its consumption have radically changed. In-depth interviews with sexual gender minority youth showed that they use social media to connect with others, express themselves, and access resources (Paceley et al., 2020). Social media are evolving at pace with evolving identities of young people (Bragg et al., 2018; Goldberg et al., 2020). Adolescents feel that they have more expansive and flexible definitions of their own identities, leading to more openness about pronouns, and acknowledgment of the fluid nature of gender and sexuality (Higa et al., 2014). This realization empowers young people to take control over their own identification and expression, but also perhaps renders traditional supports and interventions unable to adequately support the more diverse and expansive sexual and gender identities of youth. Fortunately, due to this ever-growing space, individuals are able to personalize their viewing and scrolling habits to seek out positive, reinforcing content about their identities. Research has shown that sexual and gender minority individuals sometimes turn to social media sites like Facebook to form relationships and community with those with common experiences, especially if they cannot find or access that type of support in person (Porta et al., 2017). The introduction of newer social media and user-generated content platforms has made it easier than ever to seek out such community. A 2017 study showed that the surveyed sexual and gender minority youth felt more comfortable communicating on social media rather than face-to-face, in order to eliminate the fear of discrimination or bullying (Lucero, 2017). Many sexual and gender minority youth express that the anonymity that some social media sites allow is a key factor in being able to explore and experience their identities (Fox and Ralston, 2016). They are able to detach from their offline lives and remove the risk of being exposed to their family and friends.

While a myriad of social media platforms are mentioned in previous studies on sexual and gender minority youth, YouTube stands out. YouTube is a video-sharing platform that allows users to upload, share, and comment on videos. For youth in general, the amount of time viewing video content on sites like YouTube has drastically increased (Rideout and Robb, 2019). From 2015 to 2019, the percentage of youth who say they watch online videos "every day" has more than doubled. Among 8- to 12-year-olds, daily video viewing has increased from 24 to 56%, and, among 13- to 18- year-olds, 34 to 69%.

YouTube is more than just a video hosting site; it is a platform "…at the intersection of media creation and social networking, providing young people a participatory culture in which to create and share original content while making new social connections" (Chau, 2010, p. 1). YouTube allows users to create their own content and consumers to seek out content that is relevant to them. This platform specifically is unique because its main purpose is facilitating the sharing of video

content and can serve as an alternate form of media that is solely in the consumers control, contrasting in this respect with mainstream media. Although many sexual and gender minority individuals have found positive models in mainstream media, such as television and movies (Gomillion and Giuliano, 2011), younger sexual and gender minority adolescents believe that these mainstream representations of non-traditional sexuality and gender identities are limiting and less diverse than their actual identities (McInroy and Craig, 2017). Those who create their own videos often use this platform to express their identity (Chau, 2010). Research shows that YouTube is a place for those with minority identities to give advice and form community through creating and posting original videos. For example, many YouTube videos created by transgender people about trans-specific content discuss family, bullying, dating, and transitioning, and serve as guidance and education for transgender viewers (Miller, 2017). Several sexual and gender minority adolescents have mentioned that they subscribe to the YouTube channels of sexual and gender minority people to learn more about their identity-specific issues and experiences (Fox and Ralston, 2016). One transgender participant mentioned that YouTube was a key factor in coming to terms with his trans identity.

While the Internet and social media do provide an outlet for these adolescents, the dangers of the Internet cannot be discounted. Regulations on internet access, such as the Children's Online Privacy Protection Act of 1998, which determined that websites cannot collect any information on children under age 13, aim to protect young people from the potential dangers of the internet (Uhls et al., 2014). Even teens on the internet are vulnerable to cyberbullying, sexual solicitation, predators, and scams (The Most Common Threats Children Face Online, 2020; Internet Safety, n.d.). Sexual and gender minority teens in particular have had negative experiences on interactive media, including harassment through private messages or bullying on social media (Fox and Ralston, 2016) and non-heterosexual teens experience cyberbullying almost twice as much as their straight peers (Hinduja and Patchin, 2020). This situation requires an important conversation about whether the risks outweigh the benefits for young people, especially gender and sexual minority teens, using such social media. Our study will open a conversation on this issue.

Small scale YouTube creators, like vloggers (video bloggers), have previously made a distinction between their channels and commercial channels that are owned and operated by large professional media corporations (Rotman and Preece, 2010). They believe that their ability to interact and share their own experiences creates a sense of community. The ability of YouTube to provide realistic and peer-provided information on sexual and gender minority identities and experiences is advantageous, as these representations may actually impact young people more than seeing celebrity or mainstream media representations that lack authenticity (Gray, 2009). In fact, disclosure of sexual and gender minority identity actually prompts disclosure of the commenters identity, as well as leaving comments and "likes" (Doyle and Campbell, 2020). Research has revealed the motivations for those who create videos and post on YouTube. However, the motivations of viewers who consume this content have been less explored. Our research begins to fill in this gap.

The motivation for exploring how sexual and gender minority adolescents use media in relation to identity development and support lies in the fact that adolescence is an incredibly important and complex time for these processes. Adolescence is a time when many biological, psychological, and social factors develop and peak in intensity, leading to exploration and curiosity regarding sexuality (Kar et al., 2015). During this time, young people are also socialized to exhibit and conform to certain gendered behaviors (Kornienko et al., 2016), an expectation that can influence their gender identity. Because of the multifaceted nature of this identity development during such a critical time, determining effective forms of social support is crucial.

Although previous studies allude to the use of YouTube as a resource, the ecological conversation in YouTube comments has yet to be explored; and no studies have focused solely on YouTube. In other words, we know little about the process by which YouTube becomes a resource. A qualitative design is an appropriate methodology to explore this process because it allows us to develop a foundational understanding of how young people use this platform by examining their natural behavior. The analysis will paint a rich, in-depth, and ecologically valid picture of how a sample of adolescents responds to YouTube videos on sexual and gender minority topics. This analysis can then provide a foundation for future research that examines the generalizability of the findings through a quantitative research design.

METHOD

Materials

YouTube Videos

The first author created a brand-new YouTube account (to avoid any results based on existing algorithms) and searched for relevant videos with a variety of search terms such as "being pansexual" and "transgender vlogs" (see **Table 1** for a list of video titles, search terms, and other information); there was no precedent for how to search for such videos in this context as previous studies are mostly self-report and interviews. Additionally, as the goal of qualitative research is to be formative and descriptive, these terms were utilized to result in a diverse selection of videos and topics. While the YouTube algorithm would not have existing history because the first author created a new account, it would eventually begin to curate content, resulting in very sexual and gender minority-focused results. To combat this, the first author did not choose videos based on their position in search results, but rather sifted through the results in order to create a sample of videos with a variety of sexual and gender minority-related topics. Videos included in the preliminary sample of videos resulted from these searches (chosen from the top of the results page, if possible, in order to find relatively popular videos) as well as videos provided by the YouTube algorithm as "suggested videos" on the site after using these search terms. The first author then viewed the videos, evaluating the content to meet the following five inclusion criterion:

TABLE 1 | Videos and associated information.

Video title (video number)	Sub identity	Search term	Number of Subscribers	Number of Views	Number of Comments
The 5 Stages of Bisexuality (1)	Bisexual	"Bisexual person of color" (suggested video)	12,100	189,079	971
What it feels like to be bisexual (2)	Bisexual	"Bisexual vlog" (suggested video)	77,300	16,101	255
The struggle of being pansexual (3)	Pansexual	"Pansexual vlog"	15,300	53,608	1,130
What NOT to say to a pansexual (4)	Pansexual	"Being pansexual"	617	20,256	542
Asexuality and Having Sex?! (A Conversation) (5)	Asexual	"Asexual vlog"	245,000	80,257	277
Asexual Childhood Signs (6)	Asexual	"Asexual vlog"	1,340	47,332	217
How I knew I was Nonbinary/Not a Trans Guy (7)	Nonbinary	"Non-binary trans vlog" (suggested videos)	1,330	42,332	483
Nonbinary and transitioning??? My Body Dysphoria (8)	Nonbinary	"Nonbinary"	348,000	36,732	300
Day of Gender Reassignment Surgery Vlog *EMOTIONAL* (9)	Transgender	"Transgender vlog"	13,300	92,137	379
How I Knew I Was Transgender (10)	Transgender	"Transgender vlog" (suggested video)	381,000	78,717	394

Video statistics were counted on March 4, 2020.

(1) video must have been published after November 9, 2016, date of Donald Trump's election as President (to control for the culture shift of this time where outward discrimination of minorities, including sexual and gender minority individuals, increased)
(2) video must have elicited at least 100 comments
(3) video must have been created by an individual (such as a vlog [video blog] or personal video) and not by a professional company (such as Buzzfeed or Refinery 29)
(4) video must include the creator discussing their experience relating to their own sexual or gender minority identity
(5) creator must spend the whole video speaking about their experience (for example, a long video with the experience briefly mentioned in a shorter segment would not meet the inclusion criteria for inclusion in the sample).

Most of the chosen videos portrayed white video creators. At least three of the creators of videos used in this study explicitly stated in their YouTube profiles that they serve as an educational and supportive account for sexual and gender minority individuals:

> "Hey everyone…I am 21 years old and agender. *THEY/THEM* This is an open community for people of all sexual orientations, romantic orientations, and gender identities. ♥ I make all kinds of different videos ranging anywhere from educational videos about different LGBTQ identities to vlogs of what's going on in my life and different things about me and things I've experienced through vlogs. I like to feature loads of other LGBTQ YouTubers and spread awareness and support throughout the LGBTQ community in order to unify us and help people feel welcome and valid!"
>
> "Hi… An Aussie LGBTQ+ youtuber discussing new taboo topics every Monday and Friday!…On this channel you'll find LGBTQ+ issues, topics of taboo, general life advice,… and songs I create about important issues (on occasion)!"
>
> "A channel devoted to bisexual empowerment, bisexuality and all things bisexual and mostly-straight, whether it's TV shows, movies, myths, tips for coming out or the latest scientific research."

Five sub identities as video topics were included in this study: the sexual orientations of (1) bisexual, (2) pansexual, and (3) asexual, and the gender identities of (4) non-binary and (5) binary transgender. These identities were chosen in order to capture information about identities that are less represented in media and to understand diverse sexual orientations and gender identities (GLAAD, 2019). The final sample of videos includes two videos per sub-identity, with a sample size of 10 videos.

Sample

YouTube Comments

Next, all of the top-level comments left on these 10 videos (no replies to comments were included) were imported into MAXQDA 2020 software from YouTube on March 4, 2020. One thousand randomly selected comments (100 from each video) were included in the final sample to allow for a comprehensive analysis across a variety of identities and types of videos using the comment, not the person, as our unit of analysis. The remaining comments not included in the final sample served as items for coding scheme development. This sample was intended for a mixed-methods content analysis using MAXQDA 2020 to explore common themes in the comments section of YouTube videos. While the MAXQDA software package, in some iteration, has been a well-used program for 3 decades, it has evolved to accommodate the upload of social media data directly into the program from the Internet, making it an effective platform for the analysis of YouTube comments.

TABLE 2 | Coding scheme with example quotes from overall samples.

Code	Example Quote from Overall Sample
Relating/ Likeness	"I can relate so hard to the fake celebrity crushes ahaha, I spent like hours picking them and thinking about specific things I like about them so that if someone asks I am prepared, ughh"
Realization*	"…I was never really able to describe what I was feeling and it was endlessly frustrating. Now I can more fully express myself and it's fantastic:)"
Validation*	"Thank you for this video, it made feel much better about myself"
Support	"i'm so happy for you sister that you had your surgery i cry i was so happy for you…"
Gratitude	"Thank you so much for this video, it helped me a lot! ♥"
Sharing*	"When I was a kid I dressed like a girl played with both "toys for girls" and "toys for boys." I liked pretending to be male characters from shows and movies…I honestly am scared..."
Negative	"I have had it with these transgenders, when is this "nonbinary" fad going to die out already?"
Information seeking*	"This is probably a stupid question, but do asexual people have a sexual preference?"

**Deductive codes.*

The overall sample of comments was searched for adolescent age-identifiers given within the comment in order to collect a sub-sample of comments written by self-identified adolescents. The codes assigned to them during the coding of the overall sample remained, and further analysis of more nuanced themes was conducted. Forty-three comments were written by self-identified teens and were the focus of the present qualitative analysis. However, the Findings section begins by situating these comments in the context of the total sample. The sample is meant to be looked at as a whole for sexual and gender minority identities, but will allow in a future quantitative paper, for analysis of differences between identities.

Coding Scheme Development

To develop a coding scheme, the first and third authors independently examined 50 different randomly selected comments (10 from each video, for a total of 100 comments) that were not to be included in the final sample. Some themes were derived deductively from existing literature and some were derived inductively from an exploration of said randomly selected comments. Researchers discussed themes they saw, operationalized the themes, and provided an exemplary quote for each theme. Then, researchers independently coded the same 50 randomly selected comments not included in the final sample (10 from each video) in order to establish 85% or higher inter-rater reliability. This process was repeated 3 times with newly selected comments in order to establish 85% inter-rater reliability. Throughout this process, the coding scheme was adjusted and pared down accordingly.

Table 2 presents the coding scheme. Note that all the coding categories had a positive valence except for one, which we called negative comments.

Coding

Once the final coding scheme was established, the first and third authors each independently coded the same 20% of the final sample (200 randomly selected comments) and reached an inter-rater reliability of 85.39% and a Kappa = 0.84, with eight individual Kappas ranging from 0.48 (moderate agreement; Landis and Koch, 1977) to 0.92 (almost perfect agreement; Landis and Koch, 1977). Finally, each researcher then independently coded half of the remaining final sample (400 comments each). Both coders were white, heterosexual females.

The overarching mixed-methods study (which included the adolescent-identified comments in the sample) did not involve contact with human subjects, and therefore, the Institutional Review Board did not require a board review. All comments used in the sample were public and in addition to most of the accounts themselves remaining anonymous, the identity of each commenter was kept anonymous by the lack of inclusion of any YouTube usernames in this paper. Any adolescent comments that mentioned age did not include other identifying information. Additionally, YouTube's Terms of Service includes comments as Content and explicitly states that users "grant each other user of the Service a worldwide, non-exclusive, royalty-free license to access your Content through the Service, and to use that Content (including to reproduce, distribute, modify, display, and perform it) only as enabled by a feature of the Service."

FINDINGS AND DISCUSSION

Overview and Quantitative Description

An analysis of the full sample of YouTube comments showed that there was a total of eight main themes found in the YouTube comments:

1. Sharing
2. Relating
3. Support for creators
4. Information seeking
5. Gratitude
6. Negative
7. Realization
8. Validation

All but two themes (Negative and Support for creators) were found in the smaller, adolescent subsample. In both the subsample of self-identified adolescent comments and the remaining comments, sharing and relating were the most common themes identified and the most common pair of themes found together in the same comment. In this self-identified adolescent sample, we see all but two of these main themes from the overall coding scheme (see **Table 3**). **Table 3** also shows that the rank order of mention for the subsample of comments for which the writer self-identified as adolescent matches the rest of our larger sample with two exceptions: negativity and support for creators. Because negative comments have important psychological meaning, this difference is discussed in the limitations section.

More nuanced themes and patterns that reflect the writers' lived experience are presented in the Qualitative Analysis section,

TABLE 3 | Prevalence of themes by sample.

	Adolescent sample	Percentage of total	Rest of sample	Percentage of total
Sharing	42	54.5%	502	44.0%
Relating	16	20.8%	236	20.7%
Information seeking	12	15.6%	92	8.1%
Gratitude	3	3.9%	91	8.0%
Realization	2	2.6%	12	1.1%
Validation	2	2.6%	11	1.1%
Support for creators	0	0%	150	13.1%
Negative	0	0%	48	4.2%
Totals	77		1142	

which follows. See **Table 1** for video numbers referenced as sources of quotes in the next section.

Qualitative Analysis

Theme: Sharing

Commenters frequently shared their identity-based experiences, both positive and negative, in their comments. Sharing was the most common theme in the sub-sample, identified in 41 of the 43 comments. This opportunity to connect and share with a community that has gone through similar experiences or struggles is advantageous. It is likely not an opportunity that many adolescents have, in person or within their own communities, especially if they live in geographic areas that do not have a large population of "out" sexual and gender minority people, or if they live with family and friends who are anti-sexual/gender minority.

Sometimes young people may just need a safe (i.e., anonymous) space to express their struggles, especially since concealing their identities can be harmful for their mental health (Meyer, 2003). This comment left by a twelve-year-old exemplifies this need to share what they are feeling:

> "I've been struggling with my sexuality for a year and a half probably (tho I've kinda always known I was different), I'm 12…" (video 2)

Additionally, adolescents may have positive milestones they would like to share about their identity development, as evidenced by this 16-year-old's comment:

> "…i have alot of fear of what i am and i spent alot of my live really hating myself for it but im slowly starting to want to embrace it" (video 1)

For some, the comments that adolescents leave on these YouTube videos could be the first time they admit that they are struggling with their sexuality or gender identity. This is illustrated by a comment by one 11-year-old:

> "I'm 11 years old and I think I may be asexual... for about 1 and a half years I am struggling to know if I'm asexual lesbian or straight." (video 6)

Several adolescents specifically shared their struggles of being torn between their identity and the beliefs of their families. Homophobic family members present a unique challenge for young individuals vs. adults, as they are likely living with these family members and depending on them to meet their basic needs. They may be scared to come out to their families for fear of rejection or even punishment (Aranmolate et al., 2017). This collective hardship that sexual and gender minority youth face may prompt adolescents to share their struggles with others who may have experienced the same thing in hopes of making connections and getting advice for how to proceed. The anticipation of their families and parents not accepting their identities could prompt teens to form another community so they feel a sense of belonging that they do not have at home. This need for kinship is illustrated by the concept of "chosen family," a common social grouping in the lives of sexual and gender minority individuals, made up of friends, because of the lack of support from their family of origin (Hull and Ortyl, 2019).

The fear of abandonment can keep a young person from living their full identity and also cause negative health outcomes (Ryan et al., 2009). A bisexual high schooler said:

> "i live with my mother who i know would not be accepting of it at all and the fact that i cant come out to my family makes it very hard for me to want to come out to anyone else…" (video 1)

Another bisexual teen said:

> "I'm nervous. My parents don't support pride, bisexuals, gays, lesbians, etc. I don't know what to do....I'm a bi teen…I'm so scared to tell my family and very close friends. I'm not gonna tell them at all." (video 1)

One 17 year old described their experience of this type of rejection:

> "My mom kinda understands but I'm concerned she views me in the same way. The rest of my family has practically abandoned me" (video 10)

Psychological stress relating to sexual identity can lead to negative mental health outcomes like depression, self-harm, and suicide (Aranmolate et al., 2017). Having a space to share with and learn from like-minded or like-identity people could improve well-being and reduce the risk for these negative outcomes. Some adolescents expressed that simply viewing these YouTube videos helped them feel better and, in some cases, saved their lives. One 16-year-old reflected on their experience learning to accept themselves and the role that YouTube played in that process:

> "Three years ago. I had just come to terms with being transgender. I was 13. I spent an entire night watching all your videos. I slept through my alarm and missed the bus for school the next day. But at least I knew that I would be okay." (video 10)

A 14-year-old explained how watching YouTube videos possibly saved their life:

> "Watching your videos gave me the want to come out, it gave me hope for the future because as a small thirteen-year-old, I didn't think I would live to graduate high school." (video 10)

Theme: Relating

Another type of sharing that adolescents engaged in was relating. In these comments, the writer directly addressed and related to a specific concept or experience from the video rather than just sharing their general experience. This was the second most common theme in the adolescent sample. Relating to both difficult and positive experiences that they see in the videos can help them feel like they belong. Feeling the connection of going through a similar event or having similar thoughts could allow a young person to feel better about their situation. In response to an asexual creator explaining how they always felt the need to fit in and pretend to act like everyone else when they were young, an 18-year-old related:

> "I'm 18 and I still feel the need to be like everyone else… I hope one day I actually do come to terms with my sexuality, and stop pretending…" (video 6)

One bisexual creator discussed that some of her friends told her that her bisexuality was just a phase and how she had to explain that it wasn't. A 13-year-old says that they had a similar experience:

> "I'm 13 and just came out as bi… someone at school said it was a phase and I said "Yeah what phase lasts 13 years, I mean, other than your stupidity"…" (video 2)

Theme: Information-Seeking

Along with learning from these videos, many adolescents explicitly asked questions or for advice based on the content in the video. Information-seeking was the third most common theme in the adolescent sample. Sexuality or gender-identity related information, that they may not be able to get from other sources, could promote both physical and mental well-being for adolescents. Some young people may not know any other sexual and gender minority individuals and therefore don't have anyone they can ask these questions to personally. YouTube creates a space for sexual and gender minority youth to access videos that address these issues and ask questions to those with similar identities. Three teens (12, 13, and "teen," respectively) asked questions about how to know what their identity might be:

> "Do you think that 13 is too young to know if you are asexual?" (video 6)
> "Is 12 too young to be ace/aro? I feel like around this time people are really starting to understand more and grow up, but I feel like people will judge me for being ace and aro at this age.. What do you think?" (video 6)
> "i have a question: so i'm a closeted teen, who is also bisexual. i have a crush on this girl, and like i'm not fully gay. but i recently had a boyfriend a few months ago, but i'm not fully straight. how does that work? am i gay if i have a girlfriend? or am i straight if i have a boyfriend? or am i just in a gay/straight relationship. being bisexual is definitely so confusing!" (video 2)

Video creators that show that there is the opportunity to thrive after overcoming what many sexual and gender minority adolescents themselves are currently afraid of can ease anxiety and create an environment where young people can ask questions they are typically afraid to ask. This can reduce worry and promote wellbeing. One young trans teen expressed that they were scared to come out to their family and asked for advice on how to do so:

> "How do you come out as trans to your parents and you're a young teen?:D I really need help with this, I'm just terrified." (video 10)

Theme: Gratitude

These adolescents often expressed gratitude to the video creator in their comments. Sometimes the gratitude was just for making the video, but other times it was explicitly thanking the creator for helping them in general, without specifying how exactly the creator helped. However, the commenters often shared hardships that they went through prior to expressing gratitude in their comments, which suggests resolution after watching the video. Here, a 13-year-old illustrates this gratitude:

> "I am 13, I was also confused about my gender but you helped me!!!" (video 10)

Theme: Realization and Validation

Adolescents expressed that sometimes watching these YouTube creators talk about their own sexual and gender minority identity helped them in a more specific way, by helping to put a name to their identity or clarifying their feelings, as well as helping the adolescent feel good about their identity. Those who are unsure of their identity actually experience similar amounts of discrimination and mental health symptoms as sexual and gender minority-identifying adolescents (Kann et al., 2016). Additionally, an adolescent who discovers a community of similarly-identifying individuals who share similar feelings and experiences can gain a sense of belonging. A transgender 14-year-old spoke directly to the YouTube creator when describing how the process of realizing that they were transgender from watching the creator's video was "alleviating":

> "I found your video from Buzzfeed and that was so revolutionary for me. I had been going through a spill of trying to figure out my sexuality because I didn't know you could have a gender identity, I thought that what you were born as was what your gender was and trying to figure out my sexuality was alleviating... in a way… The whole day I kept thinking about that video and I remember when I finally realized why I was freaking out about that video so much. I finally realized that I am transgender…" (video 10)

Another commenter relayed this powerful account of the moment they realized that they were bisexual as a teen.

> "…my realization moment was the moment I had a word for it. it was the summer before seventh grade and I was watching a YouTube video of someone coming out as bisexual. they explained what it was and what it meant to be bisexual and it hit me like a ton of bricks" (video 1)

A bisexual 11-year-old shows that watching these YouTube videos can both lead to discovery as well as acceptance of oneself:

> "Thank you so much, you have helped me discover my sexuality and taught me to be me and to love myself!" (video 2)

CONCLUSIONS AND IMPLICATIONS

This ecological conversation in the form of YouTube comments corroborates previous self-report evidence that young people use YouTube to form community and assist with identity development (Fox and Ralston, 2016). These new results give us insight about how to support adolescents who are exploring their sexual and gender identities; their comments imply that these teens are looking for information and community. Wuest (2014, p. 31) captures this idea by saying,

> "…the use of YouTube…remains significant in its reflection of wider issues of queer youth's place in the mainstream, through understanding the support structures that queer youth build for themselves in a community of like-minded peers can help make clear what potential there is in mainstream culture, and specific need to be addressed within this…"

The ability to focus on adolescent comments on YouTube is a rare one. Because of the nature of YouTube, one is not able to access the demographic information of a user, unless the user volunteers that information either on their account profile or in their comment. Fortunately, many of the adolescents included their ages in their comments and allowed us to analyze an adolescent sample. It may seem surprising that this sample included many 11-and-12-year-old commenters, while YouTube terms of service require a user to be at least 13 years of age. However, in 2014, 23% of children under 13 reported having a social media site (Uhls et al., 2014). The presence of 11- and 12-year-olds in this sample implies that feelings and concerns about possibly having a sexual or gender minority identity often start quite young.

These results also suggest the importance of websites that promote user-generated content and community, especially during situations and times when in-person supports are not available. While this sample of comments was left before the onset of the current COVID-19 pandemic, this opportunity to connect online may be even more important during current times when COVID-19 has forced many adolescents out of school and into a more isolated environment, perhaps with unsupportive families and challenging home lives. These new circumstances could lead to a loss of in-person supports such as Gay Straight Alliance clubs or school counselors; they may be able to be replaced with less formal virtual supports such as YouTube communities.

LIMITATIONS AND FUTURE DIRECTIONS

Several limitations exist within this study. The comments included in this analysis were limited to comments in which adolescents self-identified as such. Other teens may have commented on the videos, and expressed other themes, but we cannot identify them due to their lack of self-identification. Since we do not have official demographic information about these commenters and the Internet allows for anonymous activity, one concern would be that those who self-identified as adolescents may not be truthful about their ages. However, research shows that teens who lie about their ages on the internet often portray their age as older (Madden et al., 2013), so it is unlikely that teens would portray their ages as younger in these YouTube comments. Additionally, this concern about self-reported age is no different from accepted survey methodology in which respondents are given anonymity and self-report their age.

Because this is a small sample size, common in qualitative research, we are not able to generalize these results to all sexual and gender minority adolescents. However, we also have no reason to believe that our sample is not representative. And indeed, the dominant themes closely resemble the thematic foci of the rest of the sample.

The most psychologically important difference is the absence of negative comments in the adolescent sample, alongside their presence in the sample as a whole. One hypothesis concerning the lack of negative comments in the adolescent sample is that, because of the social change regarding views about the sexual and gender minority community, individuals in this younger generation are more accepting and tolerant of sexual and gender minorities because they were raised during a time where these identities, and for example, same-sex marriage, are accepted (A Brief History of Civil Rights in the United States, 2020), or even ordinary. However, another possibility is that youth who identify themselves in comments feel more supported by the content. A future study in which the unit of analysis is participant rather than comment will be able to decide between these interpretations.

We do not know whether there are comments in the sample written by adolescents who did not mention their age. Nonetheless, the presence of negative comments anywhere in the comment population can be read by others. This situation leads us to conclude that adolescents can be exposed to negative comments about alternative gender and sexual identities when and if they read what others write. However, negative comments are very much in the minority, even where the age of the writer is unknown. Future research, using either survey or experimental methodology, can explore the psychological impacts of a small number of negative comments, as well as the psychological impacts of a large number of positive comments.

Regarding intersectionality, the creators in the videos chosen for this study, as well as the coders, lack diverse representation. Most of the creators in the videos were white, which could limit the diversity in the viewers and commenters, leading to

results that are skewed by race or ethnic identity. Additionally, the two researchers who coded the YouTube comments both identify as cisgender (those who feel their gender matches their biological sex) women. Because the coders do not identify with the communities on which this study is based, there are certain nuances that were likely missed during the coding process.

These limitations are expected because of the nature of the data and methodology, but these qualitative results serve as a starting point for further exploration of online communities of youth. Quantitative studies with larger sample sizes will be more generalizable and representative and can build on the foundation of these qualitative results. Future research should have sexual and gender minority youth play a part in the research, with involvement from researchers belonging to the sexual and gender minority community, in order to explore the culture of the online sexual and gender minority community more deeply. Using a sample of sexually-, gender-, and racially-diverse youth in which researchers can identify all of those factors can provide a rich and intersectional account of how and why such online communities exist.

DATA AVAILABILITY STATEMENT

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

AUTHOR CONTRIBUTIONS

JL was responsible for study conception, data collection, coding scheme development, analysis and interpretation of data, and manuscript drafting and preparation. PG was responsible for study conception, reliability processes, and manuscript editing and feedback. JS was responsible for coding scheme development, analysis and interpretation of data, and manuscript drafting and preparation. All authors contributed to the article and approved the submitted version.

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Centennials, FOMO, and Loneliness: An Investigation of the Impact of Social Networking and Messaging/VoIP Apps Usage During the Initial Stage of the Coronavirus Pandemic

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The current COVID-19 pandemic has had obvious, well-documented devastating effects on people's physical health. In this research, we investigate its potential effects on people's mental health. Many people have experienced social isolation, as countries attempt to stem the spread of the disease through confinement and other forms of social distancing. Intuitively, such social isolation may increase feelings of loneliness, and people may take logical steps to reduce their feelings of social isolation and loneliness. One route is through the use of social networking apps (e.g., Facebook, Instagram) and messaging and VoIP apps (e.g., WhatsApp, iMessage). In this research, we investigate the effects of pandemic-induced social isolation on social networking and messaging apps, and potential related effects on loneliness. We surveyed young adults ($N = 334$) who are part of the Centennial cohort (born after 1995) from three different countries (Italy, Argentina, UK) and obtained their screen time usage data over a 4-week period starting from mid-March 2020. This sampling procedure allowed us to obtain data from respondents who were experiencing different degrees of mandated social isolation (lockdowns), which enabled us to determine whether social network and messaging app usage increased as a function of social isolation, and to test potential effects on levels of loneliness. Results showed that only social network usage increased in the initial stage of confinement as a function of lockdown initiation. Additionally, social network app usage was associated with increased feelings of loneliness, and this relation was mediated by fear of missing out (FOMO). In contrast, messaging app usage was associated with decreased feelings of loneliness, and was unrelated to FOMO. These results suggest that technology may be useful for mitigating the impact of loneliness during social isolation but that it is necessary to promote usage of messaging and VoIP apps, rather than social networking apps, because they are directly associated with decreases in loneliness without increasing FOMO.

Keywords: COVID-19, loneliness, social network, messaging apps, fear of missing out, centennials

INTRODUCTION

As COVID-19 rapidly spread, reaching pandemic levels by early March 2020 (www.who.int), many regional and national governments quickly instituted various measures to mitigate the spread within communities. Along with urgings and mandates to social distance, wear masks, and employ good personal hygiene, mandates requiring social isolation, such as school and business closures, and shelter-in-place requirements, or "lockdowns," were also widely instituted. Although the positive effects of such social isolation on physical health (avoiding the disease) are now quite apparent, we are only beginning to understand its potential negative effects on mental health. Even before the pandemic and its associated forced social isolation, research suggested that feelings of loneliness were on the rise, to the point of reaching what some referred to as epidemic levels (The Harris Poll, 2016; Noack, 2018; Twenge et al., 2019). Moreover, some research also suggests that the increase in loneliness may be particularly acute for young people, who experience greater changes in loneliness over time in their younger years (Beam and Kim, 2020; Fried et al., 2020), which are linked to the social reorientation period of adolescence (Goossens, 2018).

Clearly, increasing social isolation via lockdowns seems likely to exacerbate an already serious problem for both children and adults. However, one particular factor that may potentially mitigate increased loneliness following forced social isolation is the use of digital communication technologies, such as WhatsApp, Skype, and Zoom, as well as the use of social networks, such as Facebook, Instagram, and Twitter. For example, Banskota et al. (2020) suggest that smartphone applications (apps) that facilitate social communication may help older people stay connected with others, potentially lessening the impact of social isolation on feelings of loneliness. Given that younger people are the most frequent users of such technology, the positive effects of social communication technology may be even greater for them.

Despite the intuitive appeal of this reasoning, a growing body of research suggests that just the opposite may be true: the use of social media technology may actually increase feelings of loneliness, and associated feelings, in young people (e.g., depression, anxiety, low self-esteem, etc.; Kalpidou et al., 2011; Brooks, 2015; Vannucci et al., 2017; Sampasa-Kanyinga et al., 2018; Craig et al., 2020). Our research addresses these questions. In particular, we investigate the effects of forced social isolation brought on by the COVID-19 pandemic on feelings of loneliness in young adults, with a specific focus on the interrelations between social networking apps, messaging and VoIP apps, loneliness, and fear of missing out (FOMO). We tested the interrelations in a multi-country sample (Argentina, Italy, UK) in which the countries initiated social isolation lockdowns at different points over a 4-week period, allowing us to assess the effects of the lockdown on social media usage relative to pre-lockdown periods. In addition, we obtained objective measures of smartphone usage time by having participants upload their smartphone's screen time usage reports, thereby minimizing reporting problems common to self-reports.

CONCEPTUAL BACKGROUND

Loneliness

Loneliness is defined as an aversive state that arises from the perception that one's social relationships are deficient (Perlman and Peplau, 1981; Russell et al., 1984; Baumeister and Leary, 1995; Hawkley and Cacioppo, 2010). The perception component of the definition is critical, and indicates that loneliness is a *subjective* experience, and is independent of objective isolation. People who are socially isolated may not feel lonely, and people who have many social connections may nevertheless feel lonely. In other words, it is not so much about the quantity of social connections, but their quality.

The distinction may explain why recent findings related to loneliness following COVID-19-related forced isolation have differed for younger and older adults. For example, in one study that assessed loneliness as a function of number of days following an initial lockdown in a general population sample, self-reported loneliness actually decreased in the first 30 days of the lockdown, before increasing quickly after the first 30 days (Zhang et al., 2020). Possibly, for older adults not living alone, the chance to have quality time with family members may have increased social connectedness. However, recent studies of adolescents and young adults find that adolescents and young adults report suffering significant psychological problems during the COVID-19 pandemic, including depression, anxiety, and loneliness (Varga et al., 2016; Chen et al., 2020; Ellis et al., 2020; Liang et al., 2020). Thus, it may be the case that, unlike older adults, adolescents and young adults may still feel a lack of satisfying social connections even when living with family members.

Developmental processes may also make younger people more vulnerable to feelings of loneliness. Adolescence is a period in which younger people are developing self-identities, and are particularly sensitive to social interaction cues and peer interaction (Orben et al., 2020). Teenagers in normal (non-pandemic) times tend to spend more time with their friends and romantic partners than with their families, and are particularly sensitive to peer rejection (Knoll et al., 2015). Moreover, identity development is associated with changes in social behaviors because social goals change (van den Bos, 2013), a process referred to as social reorientation (Nelson et al., 2005). This model suggests that social goals change during development, so that adolescents are more motivated to seek certain social experiences with their peers (Nelson et al., 2016; Magis Weinberg, 2017), and the process of social reorientation is one of the most salient changes during adolescence (Nelson et al., 2005).

A recent review (Goossens, 2018) suggests that feelings of loneliness tend to be prevalent during adolescence, and that this relationship could be explained by the evolutionary theory of loneliness (Hawkley and Cacioppo, 2010) and the processes of social reorientation characteristic of this developmental period. The theory states that loneliness activates two opposing motives: social re-connection and self-preservation. The self-preservation motive causes lonely individuals to be hypervigilant to social threats, which may lead to worry about and even mis-interpretation of social interactions. Neurological studies further support this reasoning (Somerville, 2013). The regions of the

brain that that are activated in response to loneliness are ones that are particularly active during adolescence (Vijayakumar et al., 2017). These developmental differences are also related to reactions to social rejection. At very early ages, children read the social keys of rejection and inclusion. However, the affective responses to these experiences are more exaggerated during adolescence due to an increase in the activity of brain regions that are related to the feeling of loneliness and a decrease in the activity in areas that regulate reactions. In other words, different regions of the brain develop at different times (Somerville et al., 2010). Moreover, the regions related to emotions and reactions develop earlier than regions related to behavior control and emotional regulation. This temporary imbalance in brain development could explain the stronger reaction that adolescents might have to the perception of social rejection, making them more vulnerable to perceived loneliness (Goossens, 2018).

In sum, young people appear to be vulnerable to feelings of loneliness, and pandemic lockdowns may exacerbate the situation by limiting social connection. One potential remedy to pandemic-induced social isolation is the use of digital forms of social interaction, such as social networks (e.g., Facebook) and other digital communications (e.g., WhatsApp), and this is true for both older (Banskota et al., 2020) and younger people (Orben et al., 2020). We address this possibility in the following sections.

Social Network Apps Usage and Loneliness

For young people in particular, who are voracious consumers of social media, both the number of social contacts and the frequency of social contacts may increase exponentially through social media compared to face-to-face interactions, which may reduce feelings of loneliness and lack of social connection. However, research both pre-pandemic and since the pandemic's inception seems to suggest the opposite. Recent pre-pandemic studies of adolescents (Barry et al., 2017; Twenge et al., 2019) and young adults (Primack et al., 2017) both found positive relations between loneliness and social media usage. Experimentally manipulating (restricting) social network usage produced similar findings. For example, Hunt et al. (2018) experimentally manipulated social network usage for college undergraduates over the course of 3 weeks. They found that participants in the experimental group, which limited their usage of social media (Facebook, Snapchat, Instagram) to 10 min, per platform, per day, reported lower levels of loneliness, compared to the control group which used the social media platforms as they normally would. The reasoning is that even though social media may increase the quantity of social contacts and interactions, the quality of contacts and interactions may actually decrease. That is, the lower-quality social media interactions may replace or crowd-out more high-quality in-person interactions.

Research since the pandemic's inception also finds that social media use may have negative effects on the mental health of young people. For example, a study of Canadian adolescents found that social media use increased after the inception of the pandemic relative to pre-pandemic usage. In addition, social media use after the pandemic began was positively correlated with depression, but social media use before the pandemic was not (Ellis et al., 2020). However, social media use was not related to self-reported loneliness.

Although the research just reviewed generally finds positive relations between social media usage and loneliness, other research has found negative relations in certain contexts. Pittman and Reich (2016) compared different kinds of social networks (image-based vs. text-based) and their impact on variables such as loneliness, happiness, and life satisfaction. They found that participants' postings on image-based platforms (e.g., Instagram, Snapchat), which they characterized as more intimate than text-based platforms (e.g., Twitter, Yik Yak), were associated with decreased feelings of loneliness and increased happiness and life satisfaction, but posting on the text-based platforms was unrelated to loneliness, happiness, and life satisfaction.

Other research has investigated how social media platforms are used, and whether type of usage affects loneliness. Perhaps unsurprisingly, positive attitudes toward social media platforms such as Instagram and Twitter are associated with lower levels of loneliness (Pittman, 2015). More interesting is the finding that how young people use the social media platforms appears to matter. Creating and consuming content, observation, and social interaction on Instagram are associated with lower levels of loneliness (Pittman, 2015; Yang, 2016). However, sharing content is associated with higher levels of loneliness. Thus, it appears that more passive activities such as interacting and observing may decrease feelings of loneliness, whereas more active–but *noninteractive*–activities such as sharing content may increase feelings of loneliness.

Summarizing, although research on the relation between social media usage and loneliness has not always been consistent, the predominant view seems to be that, overall, social media usage for adolescents and young adults is positively correlated with loneliness because of its noninteractive nature.

Messaging and Voice Over IP (VoIP) Apps Usage and Loneliness

One potential explanation for the inconsistencies found between social network usage and loneliness might be that interactive messaging and Voice over IP (VoIP) apps, such as WhatsApp or iMessage, are commonly examined together with less interactive social networking apps such as Facebook or Instagram. For example, research on problematic smartphone use typically focuses on the negative consequences of seeking social reassurance without clearly distinguishing between active bi-directional communication and passive checking on what is happening in one's social network (Elhai et al., 2017, 2020). Furthermore, when examining the items used in scales that are commonly used to measure smartphone problematic use, such as the smartphone addiction scale (Kwon et al., 2013; Harris et al., 2020) or the smartphone addiction inventory (Pavia et al., 2016), it is clear that most of the negative consequences found in studies that use them are driven by social networking app usage rather than communication app usage (e.g., "Constantly checking my smartphone so as not to miss conversations between other people on Twitter or Facebook."). Additionally, these inconsistent effects are found in pre-pandemic contexts when smartphone usage, in terms of both social networking and messaging apps, interferes

with face-to-face interactions (e.g., "I find myself indulged on the smartphone at the cost of hanging out with friends."). Our research addresses these issues by examining smartphone app usage in a specific setting when there is virtually no face-to-face interaction to be disrupted (the COVID-19 pandemic setting) and by distinguishing between social networking apps and communication apps.

We posit that because of their interactive nature, messaging and VoIP app usage will be associated with reduced feelings of loneliness, results that are opposite of those for social networking app usage. Although there is scarce pre-existing literature that distinguishes between the two, we can base our prediction on research examining different typologies of social network usage that has focused on differentiating between the effects of interactive and noninteractive social network use. For example, Burke et al. (2010) distinguished between two types of activities: consumption and direct communication. Consumption refers to observing friends' conversations with others, their status updates, and their "likes." Direct communication refers to direct interactions, such as photo tagging and messaging, between focal users and their friends. Direct communication is positively associated with relationship quality, and specific direct communications such as one-on-one chat sessions are associated with lower levels of loneliness and depression. In contrast, consumption is negatively associated with social capital and increases in feelings of loneliness.

Yang (2016) also argues that the likely cause of inconclusive findings on the link between social network usage and loneliness depends on the type of social networks usage, which can be classified into three categories: passive, active, and interactive. Passive activities are ones in which users consume or browse the content of the social network (e.g., scrolling), and these activities typically increase loneliness and decrease well-being. Active usage refers to the production of content that is not targeted to anyone in particular (e.g., updating the status of one's social network without tagging a friend), and preliminary findings relate it to higher levels of loneliness. Finally, social network activities can be interactive, meaning that users can interact and socialize directly with other users (e.g., sending direct messages), and these activities have been shown to be the only ones that are negatively correlated with loneliness. Yang (2016) further argues that even though social networks could be a channel to find support from other people, many times indirect communication hinders the ability of users to respond to content that has not been addressed specifically to them, which would not be the case if users would engage in interactive rather than merely active activities.

In sum, when there is direct communication between focal users and their friends, and when digitally mediated communication is interactive, loneliness and its associated negative consequences are attenuated, whereas when the communication is indirect, such as when focal users only observe the interaction that is taking place in their network, feelings of loneliness increase. In the present research, we focus on smartphone apps usage, and given that we are interested in determining its effect on users' loneliness, we distinguish between applications that are interactive by definition, such as WhatsApp or iMessage (i.e., messaging/VoIP communication apps), and applications that are designed to foster active and passive–but not necessarily interactive–usage, such as Facebook and Instagram (i.e., social networking apps). Furthermore, we posit that the use of messaging and VoIP apps will be associated with reduced feelings of loneliness, whereas the use of social networking apps will be associated with greater loneliness.

Social Network Usage, Fear of Missing Out (FOMO), and Loneliness

The research we have reviewed thus far suggests a robust positive relation between social network usage and loneliness, which raises the critical question of what drives this presumed effect? Given that the difference between the consequences of messaging apps and social networking apps is likely to be determined by their interactive and noninteractive nature, it is plausible that the negative consequences of noninteraction are driven by a perceived lack of inclusion. Specifically, when focal users observe other members of their network interacting with each other, they may feel left out of the social interaction they are passively observing. In turn, this distress might prompt them to actively share content with their network, but, if they do not get a response, they may feel even worse.

One factor that relates to feelings of being left out is *fear of missing out*, commonly referred to as FOMO. Przybylski et al. (2013, p. 1841) describe FOMO as "a pervasive apprehension that others might be having rewarding experiences from which one is absent," and manifests as a "desire to stay continually connected with what others are doing." Given that social networks specifically enable users to stay connected with what others are doing, then it is likely that social network usage and FOMO would be positively correlated, and several studies support this reasoning. For example, social network addiction is positively related to FOMO (Franchina et al., 2018; Gezgin, 2018), and this relation is mediated by feelings of envy (Yin et al., 2019). Similarly, Dempsey et al. (2019) found that scores on a Facebook addiction scale were positively correlated with social anxiety and negatively correlated with life satisfaction in a sample of college undergraduates, and this relation was mediated by FOMO. Specifically, Facebook addiction positively predicted FOMO, which in turn was associated with higher levels of social anxiety and decreased life satisfaction.

The positive relation between social network usage and FOMO is not only confined to problematic (addictive) social network usage, frequency of social network usage in general is also positively correlated with FOMO (Varga et al., 2016; Yin et al., 2019; Serrano, 2020). For example, Buglass et al. (2017) found that social network usage was positively associated with decreased self-esteem, and this relation was mediated by FOMO. However, it is important to note that these presumed effects of social network usage primarily apply to passive usage (e.g., scrolling), as opposed to active usage (e.g., uploading content). Although not all use of social networking apps is passive, researchers have argued that most of the features that make up their design, such as content personalization, notifications and alerts, as well as content that expires after a set amount of time (e.g., Instagram stories displayed only for 24 h), do encourage

compulsive checking that triggers and sustains feelings of FOMO (Alutaybi et al., 2018, 2020). One explanation for these relations is that social network use exacerbates FOMO because social media users can modify the way other people see their profiles, and social media users strive to present a perfect image of who they are for self-presentation and impression management (Crabtree and Pillow, 2018). Activities such as censoring, exaggerating, or even lying about people's lives through the creation of online content could produce FOMO, which in turn would make others uncomfortable or envious (Jordan et al., 2011; Chou and Edge, 2012; Berezan et al., 2020). In fact, research suggests that heavy social media users are more likely to display high levels of FOMO because of their constant monitoring of what their friends are doing (Buglass et al., 2017).

FOMO has also been linked to higher levels of loneliness. For example, Barry and Wong (2020) found that FOMO positively predicted loneliness, and this relation held for both teenagers and adults, and also held for both FOMO with close friends and with family members. In another study, frequency of social media usage was positively associated with both FOMO and loneliness (Barry et al., 2017). Bernard (2020) found similar relations, and also found that loneliness and FOMO were positively correlated. One explanation for these interrelations among social network usage, FOMO, and loneliness is that individuals engage in social comparisons based on the information they see on social networks, which triggers the belief that their friends are getting involved in some event and are happier, which then evokes feelings of envy and loneliness. They are likely to feel some kind of envy from their peers, feel less connected, and suffer the fear of being left out (Wang et al., 2019; Yin et al., 2019).

OVERVIEW OF THE RESEARCH

The current research had several objectives. Broadly, we wanted to determine the extent to which pandemic-induced forced isolation is associated with increased social network usage, and whether social network usage in turn is associated with certain aspects of mental health, with a particular focus on young people. Thus, we restricted our study to an age cohort commonly referred to as Centennials, or Generation Z, which is roughly those born after 1995. This age cohort is the first generation that has never known a world without the internet, and according to global surveys conducted before the pandemic, is the most frequent user of social network worldwide. For example, as of 2019, the average daily social network usage of internet users worldwide amounted to 136 min a day (DataReportal, 2019), with Centennial users averaging 175 min a day (GlobalWebIndex, 2019), of which 95% is spent on mobile devices rather than on personal computers or laptops (Statista, 2019).

First, we wanted to determine whether pandemic-related forced isolation (lockdowns) relates to social network usage. We expect that social networking app usage and communication app usage will increase during lockdowns relative to pre-lockdown usage levels, then will stabilize over time. Second, in terms of social network usage effects on aspects of mental health, we focused specifically on FOMO and loneliness. Based on theory and previous research, we test a conceptual model in which social network usage positively predicts FOMO, which in turn positively predicts loneliness. Modeling FOMO as the mediator is consistent with previous research (Buglass et al., 2017; Dempsey et al., 2019). Although our model implies theoretical causal relations, we acknowledge that not only can our cross-sectional data not determine causality, but also that the relations between all three variables are likely bi-directional. However, modeling social network usage as the independent variable is consistent with experimental findings that limiting social network usage reduces loneliness (Hunt et al., 2018). Finally, we looked at the relationship between messaging and VoIP apps with FOMO and loneliness to test whether they do indeed have opposite influences compared to social networking apps. To do so, we test a model in which communication apps have a direct negative relationship with loneliness that is not mediated by FOMO, as it is in the case of social network apps.

MATERIALS AND METHODS

Sampling Plan, Participants, and Procedure

On April 9th, 2020, we launched an online survey across three countries in which shelter-in-place orders where enforced at different times (see **Figure 1**): Italy (initiation of shelter-in-place March 11th), Argentina (March 20th), and the United Kingdom (March 23rd). Data for Italy, and the UK were collected on Prolific Academic; data for Argentina were collected with a sample of students. We stopped data collection on April 12th because, starting from the following day, participants could no longer provide information on Week 1 because iOS devices only display 4 weeks of data at any given time. As **Figure 1** shows, screen time data collected corresponds to periods of enforced nationwide lockdowns (or not), depending on the country of focus. In particular, data from Week 1 were fundamental because it enabled us to compare before and after lockdown usage for two countries (UK and Argentina).

Using different countries with different shelter-in-place starting points enabled us to test more accurately whether the imposed isolation is associated with increased social networking and messaging/VoIP apps usage. Initially, we also collected data from a fourth country, the United States. However, a lack of a coordinated national response made it difficult to test our hypotheses given the variability of lockdown measures enforcement at both the state level and county level (please refer to **Supplementary Material** for more information on US lockdown enforcement and related secondary data). Thus, we decided to focus on the three countries that enabled us to test our hypotheses with a clear-cut time frame of lockdown enforcement. All data we collected, including the US sample, are available at https://osf.io/29ks6/?view_only=992f678baee14621b7dcac44c2b1f457.

Because our research was focused on younger adults, and one of our objectives was to obtain more objective measures of time spent on social media usage, we restricted participation to participants who were born after 1995 and had an iOS

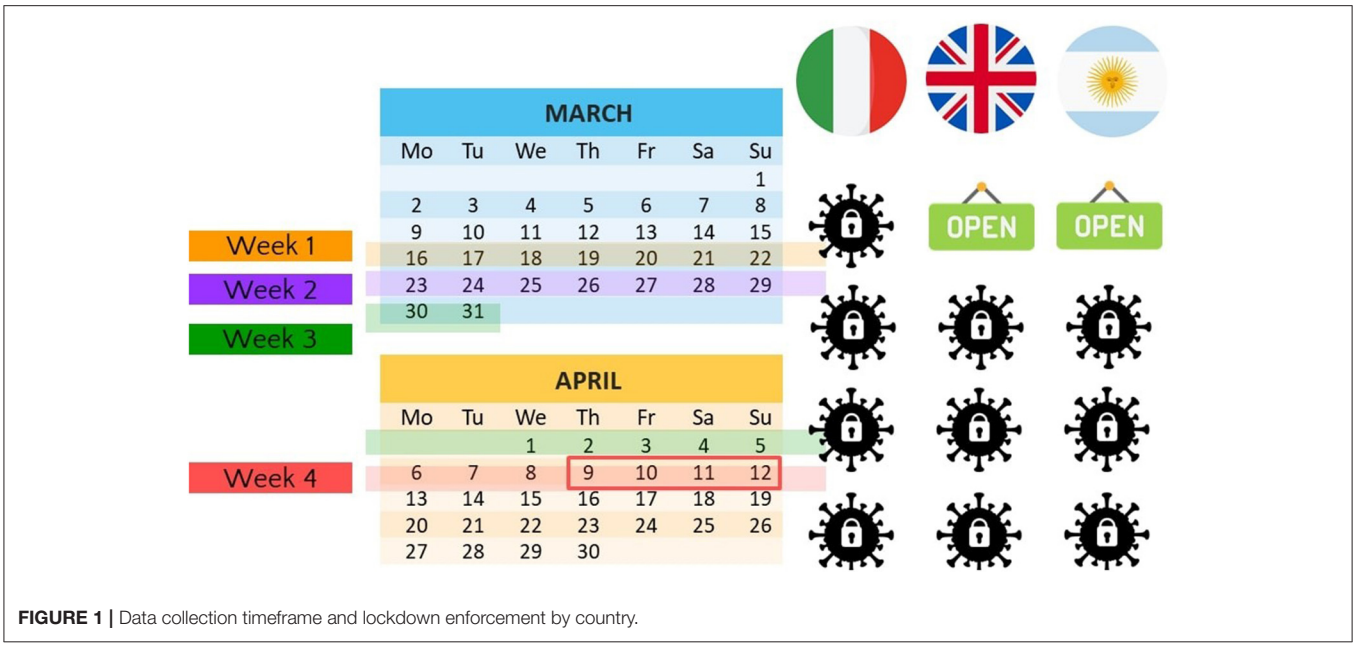

FIGURE 1 | Data collection timeframe and lockdown enforcement by country.

smartphone, which allowed us to measure screen time usage from screenshots (see **Figure 2**). Our final sample comprised 334 respondents (M_{age} = 21.50 years, SD = 2.03, 30.20% men), with the breakdown by country as follows: Italy (n = 89, M_{age} = 22.17, SD = 1.89, 39.33% men), UK (n = 149, M_{age} = 21.04, SD = 2.16, 26.17% men), and Argentina (n = 96, M_{age} = 21.52, SD = 1.77, 28.12% men). All participants provided informed consent.

The study consisted of two parts. First, participants uploaded screenshots of their phone's screen time weekly report for the 4 weeks they had available on their devices (Week 1: March 16th to 22nd; Week 2: March 23rd to 29th; Week 3: March 30 to April 5th; Week 4: April 6th to April 12th). Participants then completed a survey that measured the focal constructs. The survey was completed between April 9th and 12th, which corresponded to the middle and final part of Week 4. Thus, it is important to note that smartphone data usage collected in Week 4 varies in completeness depending on which day the participant took the survey. For example, if a participant took the survey on April 9th (Thursday of Week 4), her data for Week 4 will be incomplete, compared to another participant who took the survey on April 12th (Sunday of Week 4). Therefore, as we will explain in the Results section, when analyzing the relationship between our survey data (collected on Week 4) and social network usage, we will use smartphone data from the first 3 weeks because they provide comparable data for all participants regardless of the day on which they took the survey.

Measures

The focal constructs we measured in Week 4's survey were FOMO, loneliness, personality traits, and demographics, in that order. All constructs were measured along 5-point scales, except for the personality variables, which were measured along 7-point scales, and composite variables for each construct were computed by averaging across item scores for each scale. All items for each scale are provided in the **Supplementary Material**. We measured loneliness with the 8-item short version of the revised UCLA Loneliness Scale (Hays and DiMatteo, 1987; $\alpha = 0.82$). We measured personality traits with the 10-item TIPI scale, which is comprised of five factors (extroversion, emotional stability, openness to experience, agreeableness, and conscientiousness; Gosling et al., 2003). The personality traits were included to serve as covariates, because research has shown that they are related to social media use (Montag et al., 2015; Nowland et al., 2018; Kircaburun et al., 2020). We measured FOMO with a 3-item measure adapted from the original scale 10-item scale (Przybylski et al., 2013) to reflect COVID-specific circumstances. Specifically, we asked participants to rate their agreement with three statements ("I'm worried my friends will have video chats without me," "I wonder if I spend too much time on my phone trying to keep up with what is going on," "When I have a good time it is important for me to share the details online (e.g., updating status)," along a 5-point scale (1 = strongly disagree, 5 = strongly agree). The three items were selected to reflect the different components of FOMO (worry that others are having experiences without them and the desire to stay continually connected to what others are doing). The Cronbach's alpha was low (α = 0.39), which may partly reflect the small number of items. The inter-correlations were relatively uniform and all corrected item-total correlations exceeded the accepted cut-off of 0.30 (Nunnally, 1994), so we retained all three items for analyses.

Screen Time Usage Measures

After the data were collected, we coded smartphone screenshots so that we could pair survey responses with smartphone usage data. From the screenshots, we extracted and coded: (1) total time spent using the phone (e.g., total weekly screen time), (2) usage time of different app categories (e.g., Social Network, Productivity), and (3) usage time of single apps installed (e.g.,

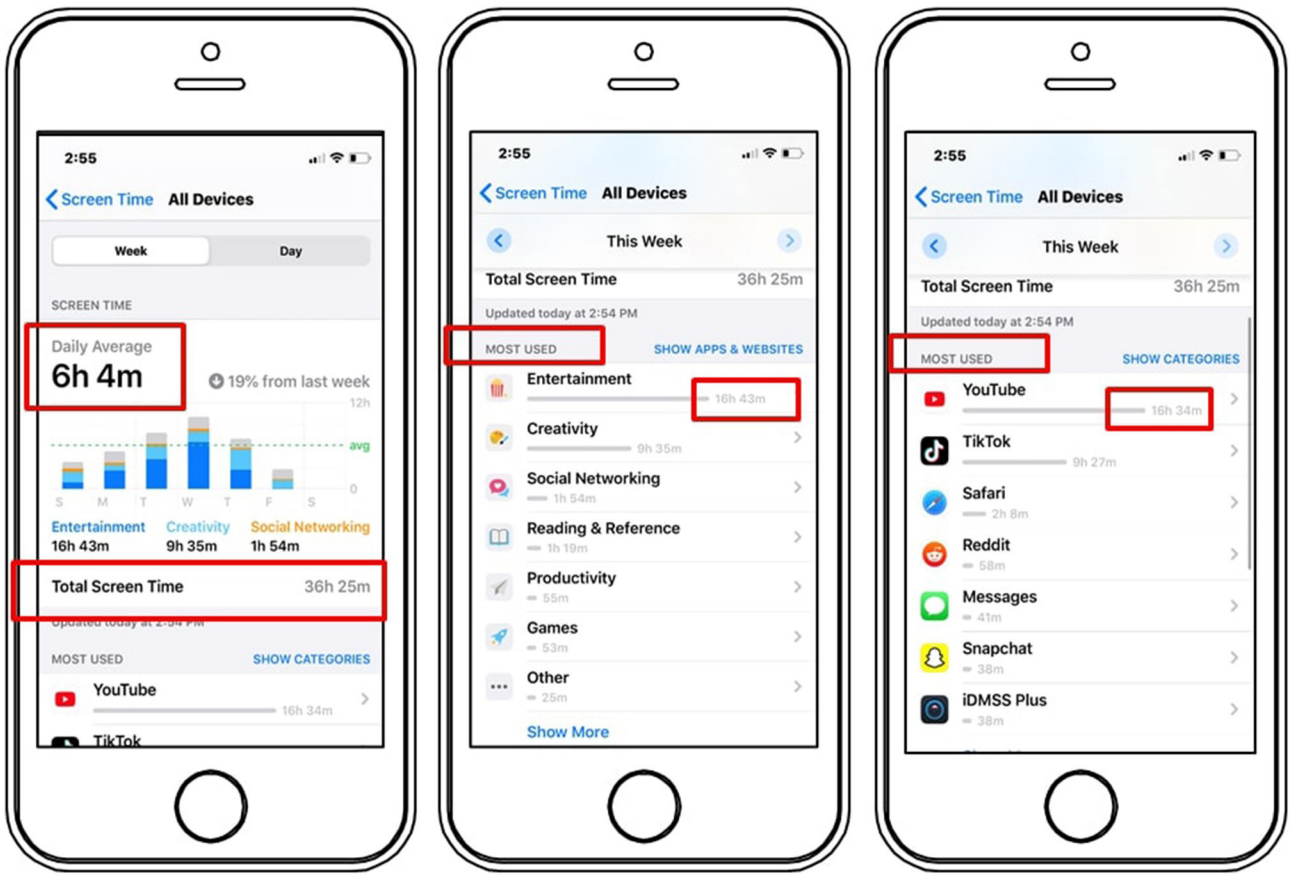

FIGURE 2 | Example of weekly smartphone data coding.

Instagram, WhatsApp). We also coded whether participants had set usage limits for some of their apps (0 = no limits set, 1 = limits set). In addition, given that in our hypothesized relationships we distinguish social networks from communication apps, we computed two additional variables by summing all single social network apps (e.g., Facebook, Instagram, Snapchat, TikTok) and all messaging and VoIP apps (e.g., WhatsApp, iMessage, Zoom, Facebook Messenger), rather than relying on what iOS reports as "social network category," because the latter includes both types of apps. (For more information on how Apple developers are prompted to classify apps by category, please see https://developer.apple.com/app-store/categories/.).

RESULTS

Demographic information by country and descriptive statistics for the main variables are provided in **Tables 1**, **2**. As **Table 2** shows, there were country differences regarding scores on several of the variables. However, these differences did not fundamentally affect the relations between the variables. Thus, we collapsed the data across country for the critical hypothesis-testing.

Social Network and Messaging Apps Usage as a Function of Lockdown Initiation

We first tested whether social network usage increased based on whether a nationwide lockdown was initiated during the weeks we collected data for the different countries we sampled. Note that, as mentioned in the data collection procedure description, because participants took the survey between April 9th and 12th, we did not use data for Week 4 because not all participants had the same volume of data (i.e., some had 3 days, some had four). Thus, we compared social network usage between the first 3 weeks of complete smartphone data. To do so, we conducted a two-way mixed-model ANOVA using the lme4 R package (Bates et al., 2014), with weekly average usage as a within-subjects factor and country of residence as a between-subjects factor. As expected, the main effect of week of usage on social network usage was significant [$F_{(2,527)} = 24.91$, $p < 0.001$, $\eta 2 = 0.08$)]. Participants' spent less time on social network apps in the earliest week recorded compared to the subsequent 2 weeks when the pandemic evolved and lockdowns began to be enforced in more countries (see **Table 3**, panel A).

The main effect of country was also significant [$F_{(2,300)} = 8.59$, $p < 0.001$, $\eta 2 = 0.05$)]. Participants from Italy spent significantly less time on social networks (∼4–6 h less per

TABLE 1 | Sample demographic information and descriptive statistics by Country.

	Argentina ($n = 96$)	Italy ($n = 89$)	UK ($n = 149$)	Overall ($n = 334$)
Age				
Mean (SD)	21.5 (1.77)	22.2 (1.89)	21.0 (2.16)	21.5 (2.03)
Median (Min, Max)	22.0 (18.0, 25.0)	22.0 (18.0, 26.0)	21.0 (18.0, 26.0)	22.0 (18.0, 26.0)
Gender				
Female	69 (71.9%)	53 (59.6%)	109 (73.2%)	231 (69.2%)
Male	27 (28.1%)	35 (39.3%)	39 (26.2%)	101 (30.2%)
Other	0 (0%)	1 (1.1%)	1 (0.7%)	2 (0.6%)
FOMO				
Mean (SD)	2.20 (0.812)	2.21 (0.809)	2.47 (0.740)	2.32 (0.789)
Median (Min, Max)	2.17 (1.00, 4.33)	2.00 (1.00, 4.33)	2.67 (1.00, 5.00)	2.33 (1.00, 5.00)
Loneliness				
Mean (SD)	2.05 (0.490)	2.49 (0.620)	2.52 (0.610)	2.38 (0.615)
Median (Min, Max)	2.00 (1.00, 3.25)	2.38 (1.38, 4.63)	2.50 (1.25, 5.00)	2.25 (1.00, 5.00)
Personality Trait - Extroversion				
Mean (SD)	4.95 (1.29)	3.44 (1.63)	4.32 (1.49)	4.27 (1.58)
Median (Min, Max)	5.00 (1.00, 7.00)	3.00 (1.00, 7.00)	4.50 (1.00, 7.00)	4.50 (1.00, 7.00)
Personality Trait - Emotional Stability				
Mean (SD)	3.86 (1.35)	4.21 (1.46)	4.12 (1.42)	4.07 (1.41)
Median (Min, Max)	3.50 (1.00, 7.00)	4.50 (1.50, 7.00)	4.00 (1.50, 7.00)	4.50 (1.00, 7.00)
Personality Trait - Openness to Experience				
Mean (SD)	5.11 (1.07)	4.84 (1.17)	4.82 (1.09)	4.91 (1.11)
Median (Min, Max)	5.50 (2.50, 7.00)	5.00 (2.00, 7.00)	5.00 (1.50, 7.00)	5.00 (1.50, 7.00)
Personality Trait - Agreeableness				
Mean (SD)	4.80 (0.975)	4.84 (1.05)	4.83 (1.17)	4.82 (1.08)
Median (Min, Max)	4.50 (2.50, 7.00)	5.00 (2.50, 7.00)	4.50 (1.50, 7.00)	4.50 (1.50, 7.00)
Personality Trait - Conscientiousness				
Mean (SD)	5.19 (1.22)	5.15 (1.26)	5.02 (1.35)	5.10 (1.29)
Median (Min, Max)	5.25 (2.00, 7.00)	5.50 (2.00, 7.00)	5.50 (1.50, 7.00)	5.50 (1.50, 7.00)
Average Weekly Social Networking Apps Usage (3 weeks, hours)				
Mean (SD)	23.5 (10.0)	18.0 (10.9)	24.9 (13.8)	22.7 (12.3)
Median (Min, Max)	23.6 (0.0583, 48.4)	17.8 (0, 50.4)	23.0 (0, 64.1)	21.3 (0, 64.1)
Missing	2 (2.1%)	9 (10.1%)	15 (10.1%)	26 (7.8%)
Average Weekly Messaging and VoIP Apps Usage (3 weeks, hours)				
Mean (SD)	14.0 (6.57)	11.6 (7.81)	5.42 (4.72)	9.65 (7.29)
Median (Min, Max)	12.6 (0.778, 29.3)	9.97 (0.983, 47.7)	4.15 (0, 28.0)	8.46 (0, 47.7)
Missing	2 (2.1%)	9 (10.1%)	15 (10.1%)	26 (7.8%)

week) compared to those from the other two countries (see **Table 3**). More direct to our hypothesis, the interaction between week and country was marginally significant [$F_{(4,526)} = 2.22$, $p = 0.066$, $\eta 2 = 0.02$)]. To decompose the interaction, we conducted planned comparisons of social network usage within country between the different weeks (see **Table 3**, panel C). For Italy, as expected, no differences between weekly social network usage were found because all 4 weeks of data collected corresponded to a nationwide enforced lockdown that was already in place since March 11th. However, for Argentina and UK participants, social network usage was significantly lower in the pre-lockdown week (Week 1) compared to the following 2 weeks when a nation-wide lockdown was in place.

Next, we tested whether messaging increased based on lockdown initiation. We again conducted a two-way mixed-model ANOVA, with weekly average usage as a within-subjects factor and country of residence as a between-subjects factor. In particular, we found a main effect of week on usage of messaging and VoIP apps [$F_{(2,532)} = 9.67$, $p < 0.001$, $\eta 2 = 0.04$)]. Participants' spent increasingly more time using those apps as weeks went by (see **Table 4**, panel A), even if substantially less (roughly half the number of hours) compared to social networking apps.

The main effect of country was also significant [$F_{(2,304)} = 57.17$, $p < 0.001$, $\eta 2 = 0.28$)], with large differences in messaging and VoIP apps usage. Participants from the UK spent significantly less time using these apps compared to

TABLE 2 | Main variables, descriptive statistics and correlations.

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Loneliness	2.38	0.62										
2. Social networking apps usage	22.67	12.32	0.10									
3. Messaging and VoIP apps usage	9.65	7.29	−0.30***	−0.08								
4. FOMO	2.32	0.79	0.26***	0.19***	−0.03							
5. Extroversion	4.27	1.58	−0.55***	0.04	0.10**	0.04						
6. Emotional stability	4.07	1.41	−0.35***	−0.08	0.04	−0.22***	0.04					
7. Agreeableness	4.82	1.08	−0.15**	−0.03	−0.02	−0.11*	−0.04	0.20***				
8. Openness to experience	4.91	1.11	−0.33***	−0.13*	0.16**	−0.03	0.36***	0.14**	0.05			
9. Conscientiousness	5.10	1.29	−0.14**	−0.14*	0.09	−0.12**	0.02	0.18***	0.10**	0.06		
10. Age	21.48	2.03	−0.03	−0.25***	0.20***	−0.08	−0.09	0.12*	0.03	0.02	0.07	
11. Gender	0.30	0.46	−0.02	−0.00	−0.02	−0.15**	−0.15**	0.21***	−0.15**	−0.07	−0.00	0.05

*M and SD are used to represent mean and standard deviation, respectively. Gender is coded as 1 = Male; 0 = Female/Other. *indicates $p < 0.05$. **indicates $p < 0.01$ ***indicates $p < 0.001$.*

TABLE 3 | Mixed-model ANOVA results for social networking app usage.

Estimated Marginal Means (A) Mean (SE)		Estimated Marginal Means (B) Mean (SE)		Estimated Marginal Means (C) Mean (SE)			
Week 1	19.9 (0.77)[a]	Argentina	23.3 (1.23)[a]		Argentina	Italy	UK
Week 2	22.8 (0.76)[b]	Italy	18.0 (1.33)[b]	Week 1	21.0 (1.37)[a]	16.7 (1.48)[a]	22.0 (1.15)[a]
Week 3	23.3 (0.76)[b]	UK	24.7 (1.03)[a]	Week 2	25.0 (1.34)[b]	18.3 (1.45)[a]	25.2 (1.13)[b]
				Week 3	24.0 (1.33)[b]	18.9 (1.45)[a]	27.0 (1.12)[b]

Means sharing the same superscript are not significantly different from each other.

TABLE 4 | Mixed-model ANOVA results for messaging and VoIP app usage.

Estimated Marginal Means (A) Mean (SE)		Estimated Marginal Means (B) Mean (SE)		Estimated Marginal Means (C) Mean (SE)			
Week 1	8.24 (0.34)[a]	Argentina[a]	13.9 (0.59)		Argentina	Italy	UK
Week 2	8.88 (0.33)[a]	Italy[b]	11.55 (0.64)	Week 1	12.70 (0.73)[a]	11.25 (0.79)[a]	4.77 (0.62)[a*]
Week 3	9.58 (0.33)[b]	USA[c]	4.73 (0.57)	Week 2	13.67 (0.71)[b]	11.51 (0.77)[a]	5.80 (0.60)[a*]
		UK[c]	5.42 (0.50)	Week3	15.34 (0.71)[c]	11.89 (0.77)[a]	5.66 (0.60)[a]

*Means sharing the same superscript are not significantly different from each other; *p = 0.084.*

participants from Argentina and Italy (see **Table 4**, panel B). In addition, similar to what we found for social networking apps, the interaction between country and week was also significant [$F_{(4,531)} = 2.59, p = 0.036, \eta 2 = 0.02$)]. We expected participants' usage of messaging and VoIP apps to increase significantly between Week 1 and Week 2 in Argentina and in the UK, given that a nationwide lockdown was announced at the end of Week 1 in both countries. As predicted, usage of messaging and VoIP apps increased marginally significantly following lockdown enforcement (from Week 1 to Week 2) in the UK ($p = 0.084$), whereas it remained constant in Italy, where the nationwide lockdown was already in place before data collection began (see **Table 4**, panel C). In Argentina, we also found that usage increased between Week 1 and Week 2 as expected, but usage kept increasing in Week 3 as well, and thus cannot be solely explained by lockdown enforcement.

Social Network Usage, Loneliness, and FOMO

Next, we tested our mediation model in which social network usage is positively associated with loneliness, and this relation is mediated by FOMO: social network usage is positively related to FOMO, which in turn is positively related to loneliness. We tested this mediation using the Lavaan R package (Rosseel, 2012) with 5,000 bootstrapping samples. As depicted in **Figure 3**, the dependent variable (Y) is participants' levels of loneliness, the independent variable (X) is social network usage, and the mediating variable (M) is participants' levels of FOMO.

The path estimates support the hypothesized model (see **Table 5**). Participants' average social network usage of the previous 3 weeks is positively correlated with their FOMO measured during the fourth week (path a in **Figure 3**: $b =$

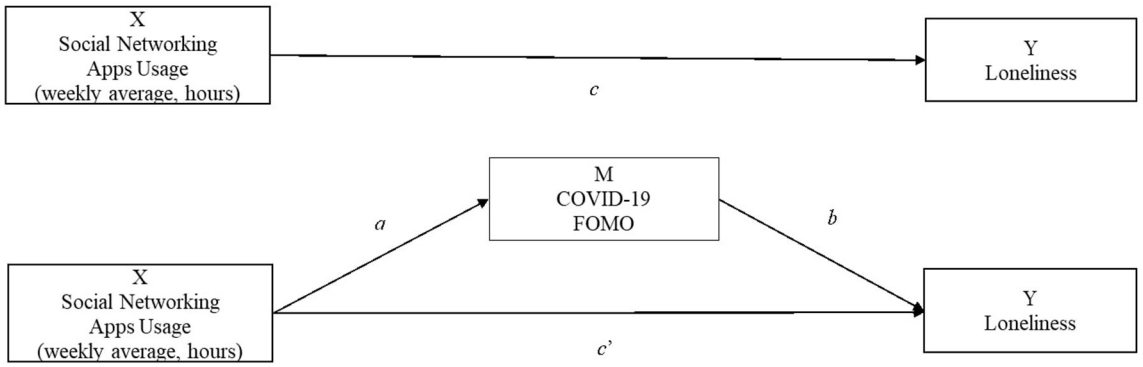

FIGURE 3 | Mediation model with social network app usage as predictor.

0.012, SE = 0.004, 95% CI [0.004, 0.020]), and participants' level of FOMO is positively correlated with their level of loneliness (path b in **Figure 3**: $b = 0.20$, SE = 0.05, 95% CI [0.113, 0.280]). The direct relation between social network usage and loneliness is not significant (path c': $b = 0.003$, SE = 0.001, 95% CI [−0.004, 0.009]), whereas the indirect effect is ($b = 0.002$, SE = 0.001, 95% CI [0.001, 0.005]). These result support the mediation hypothesis. Finally, adding country fixed effects, personality scores and gender as covariates in the model did not change any fundamental relations (all tested models can be found in **Supplementary Material**).

Messaging and Voice Over IP (VoIP) Apps Usage, Loneliness, and FOMO

To test our hypothesis that communication apps fostering a more direct form of peer-to-peer communication (e.g., WhatsApp, iMessage) will reduce loneliness while not increasing FOMO, we ran the same mediation model using the weekly average of the sum of all messaging apps as the independent variable (see **Figure 4**). The path estimates confirmed the hypothesized effects (see **Table 6**). Contrary to what we found using social networking usage as the independent variable, with communication apps, we found no indirect effect through FOMO ($b = -0.001$, SE = 0.001, 95% CI [−0.003, 0.002]), and we found a negative direct effect of communication apps usage on participants' feelings of loneliness (path c′ in **Figure 4**: $b = -0.02$, SE = 0.006, 95% CI [−0.035, −0.012]).

DISCUSSION

To our knowledge, this is the first empirical study to investigate the potential effects of physical isolation following COVID-19 lockdowns on Centennials' social network usage and feelings of loneliness. In particular, we collected smartphone screen time data to test whether social network usage increased during period of enforced physical distancing (lockdowns) compared to regular usage when restrictions were not in place. By comparing pre-lockdown and post-lockdown usage between countries who enforced it within our data collection period (i.e., Argentina, UK), and countries that already had it in place (i.e., Italy), we found that social network usage did increase once a nation-wide lockdown was enforced. Messaging and VoIP apps usage also increased, but seemed not to be determined solely by lockdown enforcement.

We also investigated whether increased social network usage was associated with increased of loneliness. Previous research conducted with a Canadian sample provided initial evidence that (self-reported) usage of social media increased during the pandemic, and that it correlated positively with depression but not with loneliness (Ellis et al., 2020). We add to this research by showing that social networking usage is indeed associated with higher levels of loneliness, but that the relationship is fully mediated by increased FOMO. We also offer some evidence that not all screen time has negative consequences. In fact, we show that usage of messaging and VoIP apps (e.g., WhatsApp) may help reduce feelings of loneliness because it does not influence individuals' FOMO.

Summarizing, we found that lockdown initiation affected social network app usage but not messaging and VoIP apps usage. Messaging apps usage differed markedly between countries, but even in countries that seemed to be heavy users, the number of weekly hours spent using these apps were substantially lower compared to hours spent on social network apps. Given that we showed that the latter may have a detrimental effect on young adults' mental health because of its positive correlation with both FOMO and loneliness, a possible intervention is to encourage the use of messaging and VoIP apps, while discouraging passive social network usage, during periods of physical isolation. Previous research has shown that mental well-being can be enhanced with socio-technical approaches aimed at reappraisal of FOMO (e.g., self-talk, checklists; Alutaybi et al., 2020), as well as cognitive reappraisal of time spent alone (e.g., reappraise their time alone as solitude rather than loneliness; Rodriguez et al., 2020). Thus, public policy interventions encouraging young adults to adopt approaches that help them manage negative experiences such as FOMO or perceived isolation could greatly help reduce their negative consequences on mental health,

TABLE 5 | Mediation results for social network usage as predictor.

Model-Path Estimates				
	Coefficient	**SE**	**z**	***p***
a	**0.012**	**0.004**	**3.150**	**0.002**
b	**0.197**	**0.042**	**4.639**	**0.000**
c	0.005	0.003	1.532	0.125
c′	0.003	0.003	0.783	0.434
Indirect Effect (with Bootstrap 95% Confidence Interval and Standard Errors)				
	Effect	**LL 95%CI**	**UL 95% CI**	**SE**
X → M → Y	**0.002**	**0.001**	**0.005**	**0.001**

5,000 bootstraps. Bolded paths are significant.

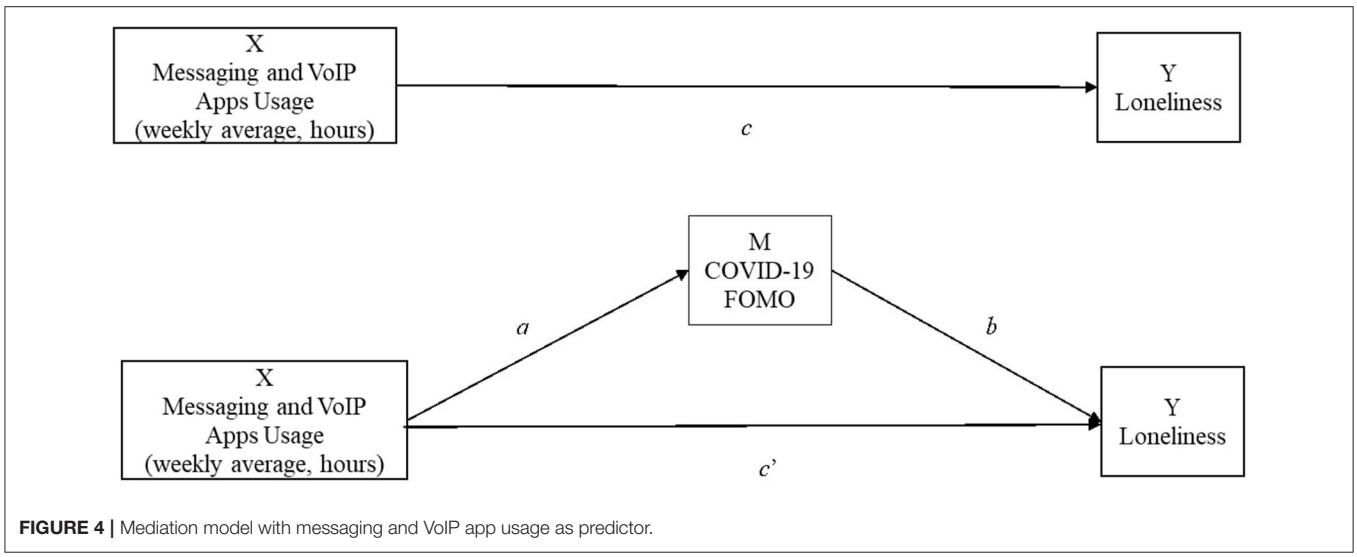

FIGURE 4 | Mediation model with messaging and VoIP app usage as predictor.

TABLE 6 | Mediation results for messaging and VoIP apps as predictor.

Model-Path Estimates				
	Coefficient	**SE**	**z**	***p***
a	−0.003	0.006	−0.526	0.599
b	**0.199**	**0.039**	**5.050**	**0.000**
c	**−0.024**	**0.006**	**−4.114**	**0.000**
c′	**−0.024**	**0.006**	**−4.052**	**0.000**
Indirect Effect (with Bootstrap 95% Confidence Interval and Standard Errors)				
	Effect	**LL 95%CI**	**UL 95% CI**	**SE**
X → M → Y	−0.001	−0.00	0.002	0.001

5,000 bootstraps. Bolded paths are significant.

especially in highly stressful situations that trigger a compulsive use of technology.

Our research has important limitations that should be noted. First, even though the Gen Z demographic has been shown to mainly use social networking sites via their mobile devices, screen time data was collected only on smartphones, and participants could have accessed social networks from desktop or laptop computers as well. Second, based on iOS screen time data, we were unable to distinguish between social network posting/commenting and social network browsing. The two have been shown to have opposite effects on well-being and coping (Yang et al., 2020), and future research would profit from untangling these behaviors, and with data other than self-report. Third, this survey was completed at the beginning of April, and there is no baseline for comparison of pre-pandemic loneliness levels. However, we examined the impact of smartphone usage that was recorded by the device 3 weeks before participants reported their levels of loneliness.

Another limitation is that our sample is predominantly female. Recent research suggests that women may be more lonely than men (Rönkä, 1986; Beutel et al., 2017). Moreover, loneliness is often associated with factors that affect women more negatively than men, such as infertility (Jirka et al., 1996; Repokari et al., 2007) or living without a partner (Beutel et al., 2017). Thus, even though our results remain unchanged when adding gender as a covariate, the magnitude of some findings may be greater than would be observed in populations in which gender is more balanced.

An additional issue that limits the interpretation of our findings is that we did not collect information about the pre-pandemic in-person social networks of the participants, which could have been useful to see how the lockdown affected in-person compared to digital social networks. That said, research suggests that digital social networks normally mirror in-person social networks, because online tools are usually used to strengthen different aspects of people's offline connections (Subrahmanyam et al., 2008) and offline identities (McMillan and Morrison, 2006). Additionally, even though we do not have the specifics of their offline social relationships before or during the pandemic, we obtained their screen time usage data over a 4-week period that provided information about how they used digital social networks before lockdowns. Nevertheless, when interpreting the results of this study, it is important to consider that both online and offline dimensions of social networks are fundamental (Kwak and Kim, 2017), and we lack information regarding one of those.

Finally, this research only proposed a possible intervention that might need to be further explored in a post-pandemic context. It is be plausible that usage of messaging and VoIP apps increase FOMO when messaging competes with real-life events.

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found below: https://osf.io/29ks6/?view_only=992f678baee14621b7dcac44c2b1f457.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

EF: research design, data processing, and manuscript writing. LS: manuscript writing and revision. MD: data collection and processing. All authors contributed to the article and approved the submitted version.

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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.2021.620739/full#supplementary-material

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Media Literacy, Social Connectedness, and Digital Citizenship in India: Mapping Stakeholders on How Parents and Young People Navigate a Social World

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The ubiquity of digital and social media has led to considerable academic debate regarding their role in the lives of children and adolescents. The Global North, especially United States and Europe, has largely led this discussion in matters of research methods and approaches, as well as on conversations around screen time, wellbeing, media literacy, and digital citizenship. However, it is not clear to what extent and how these Anglo-Eurocentric approaches to digital literacy and social connectedness translate to the various local realities of the Global South, where increasing numbers of young people have either direct or indirect access to social media and the internet, but occupy very different social contexts. In India, for instance, low cost mobile phones, cheap data plans, and vernacularization of content have furthered access cutting across socioeconomic strata. What specific research priorities might emerge in this context? Which methods can be employed to study these issues? How can we contextualize existing knowledge to help support young people and their parents maximize the benefits of this digital/social world even as we take into account the nuances of the local? In this paper, we mapped local stakeholders and shared insights from in-depth personal interviews with community leaders from civil society, research and advocacy as well as professionals working with young people and parents in India as their work addresses some of these important questions. A thematic analysis of interview data helped the researchers scope out issues like lack of child-centered-design, dearth of knowledge about the opportunities and risks of social media among parents, and confusion on how to navigate this digital/social world. Suggestions about children's wellbeing, including what parents could do about this, the possibility of and the problems with regulation, and the need to focus on how parents can foster trust and a meaningful connection with young people that would frame their engagement with technology are made. Future research should consider these relationships within the new context of the COVID-19 pandemic and related issues such as degrees of digital connectivity and access, social isolation, virtual schooling, and parents working from home.

Keywords: India, digital citizenship, social connectedness, parent-child communication, children, young people, social media, media literacy

INTRODUCTION

The rapid spread of digital/social media has led to considerable academic debate regarding their role in the lives of children and adolescents. The Global North, especially United States and Europe, has largely led this discussion in matters of research methods and approaches, conversations around screen time, wellbeing, media literacy, and digital citizenship (Ellison et al., 2007; Best et al., 2014; Livingstone, 2014; Frau-Meigs et al., 2017; Vlaanderen et al., 2020). Prior literature in the Global North on media literacy, social connectedness, and digital citizenship, especially with regard to parent-child relationships, has mostly focused on topics such as online risks (Staksrud et al., 2013; Livingstone, 2014; Livingstone et al., 2017), health and wellbeing (McDool et al., 2020; Best et al., 2014; Ellison et al., 2007; Valkenburg et al., 2006), creative expression (Subrahmanyam et al., 2020; boyd, 2008; Hogan, 2010; Lenhart et al., 2015), education and learning (Bennett et al., 2008; Burn et al., 2010; Friedman and Friedman, 2013), digital safety (Ringrose et al., 2013; Livingstone et al., 2014; Marwick and boyd, 2014), and parental mediation (Tripp, 2011; Duggan et al., 2015; Kalmus et al., 2015; Livingstone and Blum-Ross, 2020). However, it is not clear to what extent and how these Eurocentric approaches to digital literacy and social connectedness translate to various local realities of the Global South, where increasing numbers of young people have either direct or indirect access to social media and the internet, but occupy very different social contexts as compared to their counterparts in the Global North (Rangaswamy and Arora, 2016; Banaji, 2017).

In India, low cost mobile phones, cheap data plans, and vernacularization of content have furthered access cutting across socioeconomic strata (Rangaswamy and Arora, 2016). The Associated Chambers of Commerce and Industry of India (ASSOCHAM, 2015) conducted a survey on social media habits of children with 4,750 parents in metropolitan cities (Social Development Foundation, 2015) claiming 95% teens surveyed used the internet, 81% used social media and 72% logged into social media more than once a day. It also uncovered underage use: 65% kids under 13 years used social media. At the same time, media alarms us with stories like 'Indian teenagers show risky behaviour online: McAfee' (Press Trust of India (PTI), 2014) or 'Addicted to You(Tube): To say that toddlers are nuts about YouTube would be an understatement' (Kumar, 2015) or 'One in three teens lose sleep over gadgets, social media' (Dutt, 2016).

Social media and technology are not always portrayed in a bad light. There were articles about using social media for assignments and exam preparation (Pednekar, 2016) or experts wanting to include it in school curriculum (Pednekar, 2017)—but positive, or even more reflective, stories are harder to come by. Perhaps, the older generation mirrors its struggles and anxieties of navigating through the complex web of social media on young people and their protective instinct comes to the fore? Children are considered vulnerable and in need of protection across almost all disciplines. However, young people's engagement with digital/social media is very different from that of adults. Children's practices online have evolved differently because they are (often described as) 'digital natives' (Burn et al., 2010). Of course, the impact of the COVID-19 related lockdown subsequent to March 2020 has shifted perspectives considerably in relation to some of these debates, with focus returning once more (in the popular discourse) to accessibility and digital literacy and sidelining concerns around screen time and other related debates.

In this paper, we share insights from in-depth personal interviews with community leaders from civil society, research and advocacy as well as professionals working with young people in India that address important questions relating to media literacy, social connectedness, and digital citizenship in a digital/social world. 'Digital society' is conceptualized as being governed by 'datafication' and 'platformisation' as Katzenbach and Bächle (2019) discussed the work (p. 4–5) of Mejias and Couldry who defined datafication as a, "cultural logic of quantification and monetisation of human life through digital information", and Poell, Nieborg and van Dijck who conceptualized platformization as a "key development and narrative of the digital society". Digital/social media platforms are now "indispensable infrastructures of private and public life...shifting cultural practices...becoming the dominant mode of economic and social organisation" (Katzenbach and Bächle, 2019, pp.5).

This paper addresses the following research questions:

(1) What specific research priorities might emerge in the context of India around media literacy, social connectedness, and digital citizenship? How can these issues be studied in relation to the lived realities of young people and their carers?
(2) How can we contextualize existing knowledge about digital media use and literacy to help support young people and their adult caregivers and maximize benefits of this digital/social world, while taking into account nuances of the local by mapping stakeholders and bringing in their voices?

In order to learn more about issues faced by parents and young people as they navigate a digital/social media world in India, we interviewed a range of stakeholders working directly or indirectly with parents and young people, schools and teachers, international institutions and organizations.

MEDIA LITERACY, SOCIAL CONNECTEDNESS, AND DIGITAL CITIZENSHIP

Notwithstanding the recent efforts to expand the scope of media literacy scholarship, much of the literature on children and media has focused on Western countries and on dominant groups

within the middle classes, which some scholars have referred to as WEIRD families: those in Western, Educated, Industrialized, Rich, and Democratic contexts (Henrich et al., 2010; Alper et al., 2016). In Western democracies, citizenship is often tied to behaviors such as voting, campaigning, volunteering, petitioning, and protecting individuals' rights. For instance, Choi (2016) found that digital citizenship is conceptualized by scholars in four main ways: in terms of ethics/safety, as political or personalized participation, the ability to evaluate information, and critical resistance/activism. Below, we have discussed some key themes in the existing literature on digital citizenship among youth, including safety and privacy, engagement and participation, and the role of various stakeholders in different learning environments.

Safety and Privacy

One way in which digital citizenship has been conceptualized has been through the lens of safety and privacy. Issues of ethics, mutual respect, creating a safe environment, and digital rights and responsibilities were central to such conceptualizations (Mossberger et al., 2007; Ohler, 2012; Robb and Shellenbarger, 2013; Frau-Meigs et al., 2017; Vlaanderen et al., 2020). The discussion around risks and literacy has related mainly to identifying different kinds of potential risks social media pose for children and youth and ways of mitigating them. Early work has also been about quelling fears regarding technopanics—moral panics over contemporary technology and its risks to young users—e.g., cyberporn and online predators and showing links between hyped media coverage and consequent content legislation (Cassell and Cramer, 2008; Marwick, 2008). The nuances of lived realities were often ignored but recent studies have attempted to address these, for example, in Livingstone (2014) and work by Staksrud and colleagues (2013) and more recent work has started focusing on strategies to help children minimize these risks (Livingstone et al., 2017; Desimpelaere et al., 2020). Some of these discussions have also revolved around digital rights and responsibilities, including free expression, respecting intellectual property, digital etiquette and wellbeing, and lawful use of online spaces (Robb and Shellenbarger, 2013; McDool et al., 2020; Subrahmanyam et al., 2020; Desimpelaere et al., 2020).

Concerns regarding safety (including bullying, shaming, violence, and sexting) of young people on social media were also important themes in the literature. Safety online has to do with the environment available to children and youth, just as one would expect safety at home, in school or at a mall. Livingstone et al. (2014) found that children encountered solicitation of sex, porn, violence, bullying, shaming, etc. online. They categorized these items into three types of risks: content related, conduct related and contact related. Ringrose et al. (2013) found a link between online and offline lives with gender issues reported in sexting and shaming (girls especially) on social networking sites (SNSs). Other contextual variables—apart from gender—were age, existing emotional issues, broader family context, and parents' familiarity with technology with reference to adolescents' excessive internet use and parental mediation in Europe (Kalmus et al., 2015). Additionally, Marwick and boyd (2014) described how 'drama' operates in teens' online lives and how widespread use of social media among teenagers has altered dynamics of aggression and conflict. Recent scholarship focused on cyberbullying and how children can intervene to help victims as well as parents' role in imparting digital skills (Vlaanderen et al., 2020; Livingstone et al., 2017).

A related concern is that of privacy, which centers around the control one exerts over the nature and amount of personal information that is shared on social media and how knowledge about protecting one's privacy online can help children (Lee 2013; Desimpelaere et al., 2020). Youth are sharing more personal information on their profiles than in the past. They choose private settings for Facebook, but share with large networks of friends. Most teen social media users said they aren't very concerned about third-party access to their data (Madden et al., 2013). Marwick and boyd (2014) also noted that social media has changed the ways in which one practices visibility and information sharing, and offered a model of networked privacy to explain how privacy is achieved in networked publics. Another more recent study reported that young people did not see their online and offline lives as different and there was a relation between face-to-face and digital interactions and self-esteem (Palfrey, 2016; Subrahmanyam et al., 2020).

Participation and Social Connectedness

Participation has been conceptualized as both political and civic participation as well as personal or cultural participation. Work on uses (including expression and presentation) of social media by children dealt with self-expression, identity formation, status negotiation and peer-to-peer sociality as observed by boyd (2008). Hogan (2010) described the splitting of self-presentation into performances—synchronously situated—and artifacts—asynchronously exhibited—derived from Goffman's work on dramaturgy. Lenhart et al. (2015) described teens' use of social media for romantic purposes like flirting, wooing, breaking-up, controlling/abusing and sharing a (usually offline) relationship online. Participation was also analyzed from a uses and gratifications perspective (Dunne et al., 2010; Quan-Haase and Young, 2010).

Within the United States, social connectedness and digital citizenship have been viewed largely through the lens of participation, creative expressions, and popular culture. For instance, Jenkins (2006) argued for policy and educational interventions to address the "participation gap" in how young people access and use media to develop competencies and experiences to more fully express themselves as engaged cultural citizens. However, other scholars have emphasized that it is essential to foreground ethical and social justice issues by reimagining media literacies and social connectedness through civic engagement and anti-oppression literacies (Scharrer and Ramasubramanian, 2015; Mihailidis 2018; Ramasubramanian and Darzabi, 2020).

Scholars also found association between social media use and children's wellbeing. While social media use was found to be strongly associated with social capital, it was not directly linked with wellbeing (Ellison et al., 2007; Best et al., 2014). Researchers have noted an absence of robust causal research regarding this

direct impact. However, McDool et al. (2020) used proxy data to point to potential adverse effects of increasing time spent online on children's wellbeing. Nonetheless, given that increase in social capital enhanced adolescents' self-esteem, and in turn, a sense of wellbeing, this perspective merits further research (Valkenburg et al., 2006). Holmes (2009) outlined opportunities provided by socialization online as it leads to increased social capital and support and fosters connectedness, thus making it possible for young people to have possible positive experiences in the future. Work has also been done on using social media to engage with youth on health related matters (Byron et al., 2013; Evers et al., 2013; Hswen et al., 2013; Hausmann et al., 2017; Coyne et al., 2020). Swist et al. (2015) and, more recently, Coyne et al. (2020) acknowledged the link between children's social media use and their wellbeing. In their exhaustive review, Swist et al. (2015) observed that social media impacts children's physical and mental health, identity and relationships, learning and play, and risk and safety, among other aspects and those positive and negative impacts must be seen in context. On the other hand, Coyne et al. (2020), in their eight-year longitudinal study based on the Flourishing Families Project at Brigham Young University, United States revealed that increased time spent on social media was not associated with increased mental health issues and implored research to move beyond its focus on screen time. This is especially relevant in the context of our pandemic world.

Factors Influencing Learning Environments

Several external factors influence how youth engage with social media. For instance, access to technology, parental involvement, school curricula, and sociopolitical factors influence both formal and informal learning environments. Using social media to enhance education and learning (especially online) (Friedman and Friedman, 2013), addressing the 'digital divide' (differential levels of access to digital devices and networks as well as the capacity to use them in productive and meaningful ways), suggesting media education as a bridge and the creation of a 'third space' as a way to address the divide (Burn et al., 2010), and advising caution in dealing with the moral panic related to it (Bennett et al., 2008) were the ideas dealt with in this theme. Other scholars have emphasized on the need for formal education of students on the professional use, design and implementation of social media systems (Jacobs et al., 2009).

In the realm of parenting, it was noticed that mothers were likely to give and receive support on social media and use it as a parenting tool (Duggan et al., 2015). Active parental involvement was detected when the child had experienced online harm (Kalmus et al., 2015). Parenting strategies reflected anxieties about online risks and inadvertently contributed to limiting children's opportunities (Tripp 2011). Clearly, a balance needs to be found between panicking about risks online and opportunities that a digital/social world offers young people. A Euro-American parenting perspective emphasizes independence and autonomy, and other evidence (Ho et al., 2008; Smetana 2017) points towards cultural differences in parenting styles and its impact on children's behavior.

Parental mediation was key to influencing children's beliefs and behaviors (Gelman et al., 2004), thus making the development of open communication and trust in parent-child relationships significant to young people's wellbeing (Lee and Chae, 2012; Padilla-Walker et al., 2012). This was true in case of media ranging from television to the Internet (Livingstone and Helsper, 2007; Clark, 2011) and included approaches like modeling and co-use (Connell et al., 2015; Harrison, 2015). Parental mediation was often categorized into two broad styles: active and restrictive (Lee and Chae, 2007) and Padilla-Walker and Coyne (2011) — while accepting this categorization — characterized it as prearming and cocooning respectively. The active/prearming style was a more conversational, open, and trust based relationship between the parent and child(ren) grounded in communication, modeling and co-use strategies, whereas a restrictive/cocooning style was more about rules and restrictions set by parents for their children to protect them from online harms and risks. Livingstone, in her study with Helsper and more recently in her work with Blum-Ross that extensively used interviews with parents, has described parental mediation as active, restrictive, and co-using (Livingstone and Helsper, 2008) and as embrace, balance, and resist (Livingstone and Blum-Ross, 2020). Livingstone and Blum-Ross also tended to associate the embrace and resist strategies as potentially risky in the sense of planning towards the long-term digital future of young people, favoring balance in a world fraught with uncertainty.

Beyond Media Literacy Perspectives From the Global North

While literature reviewed thus far is important for understanding key themes and factors influencing media literacy, digital citizenship, and social connectedness, it draws almost entirely on scholarship from the Global North. The paucity in literature from the Global South is only now being remedied. In the case of India, the problem might be partially alleviated by decolonizing research and the way it is reported, and by building more diverse networks of scholarship both amongst scholars from within the Global South and across regions. Other researchers have argued for the need for a global approach to media literacy scholarship in a digital context (Mihailidis, 2012; Byrne et al., 2016; De Abreu et al., 2016; De Abreu et al., 2017).

Despite acknowledgement of the need to diversify and internationalize media literacy scholarship, most often it is discussed within the context of non-United States Western countries in the Global North rather than including countries and contexts from other parts of the world. Consequently, there are productive and active collaborations across Europe (fuelled partly by European Research Council grants) and trans-Atlantic partnerships. In other words, such internationalization efforts to media literacy scholarship often end up unintentionally reinforcing Euro-centric notions of media literacy constructed and perceived through a Western lens. We need to widen this view, which situates media literacy as originating from the United States, Canada, and Britain, to acknowledge multiple sociocultural locations from which knowledge about literacies

and media technologies have evolved and continue to evolve. It is important to further complicate and challenge the dominant Eurocentric narrative given the diverse nature of communities even in the geographic region that falls into the "Global North", due to historical and contemporary migrations.

Examining central issues in non-Western contexts, Mihailidis (2009) discovered that finding support for media literacy work among decision-makers and policymakers is often a challenge. Several media literacy educators in the Global South continue to draw on curricula developed in United States and European contexts, and stemming from Western models of media education and a certain cultural understanding of childhood. These curricula tend to focus on democratic practice, freedom of expression, and advertising literacies, which might not necessarily be relevant in all contexts. Additionally, there are other challenges in terms of building collaborations across various sectors focusing on children and media such as government, nonprofits, industry, and education. A respondent from the Middle East interviewed by Mihailidis cited in his study (2009, p. 14) said, "Media literacy is about more than just analyzing media messages, and a barrier to entry in the public school system is that there are many different official bodies who believe they should have a say in the implementation (of media literacy curricula)".

Ramasubramanian and Yadlin-Segal (2017) conducted interviews with scholars and educators from various youth and media contexts from around the world to bring to light cultural differences in definitions, practices, resources, and policymaking, which need to be considered in media literacy scholarship. For instance, Livingstone and Bulger (2014) discussed cross-cultural differences between how children in the Global North access the internet mostly through a computer whereas those from the Global South typically access it through mobile phones, with a single device often being shared among several members of a family. They pointed to barriers such as lack of access to technology, teacher training, parental knowledge, and culturally-relevant or locally produced curricular materials in the Global South. Similarly, a team of researchers (Byrne et al., 2016) who examined cross-national data from Argentina, Philippines, Serbia, and South Africa found that children typically accessed the internet at home using mobile phones. They also found that children in South Africa and Philippines engaged in fewer online practices and had a lower level of digital literacy compared to those in Argentina and Serbia.

Within Asian contexts, existing research focused on topics such as ICT adoption, censorship, cybersafety, and more broadly on protectionism (Cheung, 2009; Lee, 2010; AlNajjar, 2019). For example, AlNajjar (2019) found that in the Middle Eastern context, much of the discourse surrounding youth media use has focused narrowly on media risks with little attention paid to the role of digital media in the betterment of self and society. From a conservative Singaporean context, Yue et al. (2019) called for more research on digital citizenship from the Global South. In their focus group discussions with Singaporean youth, they found that media literacy skills influence negotiations of public opinions in ways that challenged mainstream ideologies. Similarly, among young Indonesian Muslim women, they found that issues of piety, religious obedience, and ethical entrepreneurship were emphasized. Patankar et al. (2017) observed the critical need for digital literacy in a country like India that is diverse in its populace and inequalities and described government efforts to make rural India digitally literate. Focusing on unemployed women in India, Mukherjee et al., 2019, examined the impact of these programs and their perceived value and found they enabled rural women to get jobs in, for example, BPOs (Business Processing Outsourcing units). Akram and Kumar (2017) offered a broad view of the positive and negative effects of social media on society, while Kumar and Rangaswamy (2013) drew on actor-network theory to flip notions of piracy and viewing pirated content, arguing that it fuels media consumption, technology adoption, and digital literacy.

Examining Digital Citizenship and Social Connectedness Within Indian Contexts

Media literacy and media literacy education in India began receiving government attention only in early 2000s with perceptible growth of the internet, both as a driver of the economy (with a focus on skills and capacities) and as a space for leisure activity and communication, and, perhaps most importantly, in relation to children, as a vehicle for information and knowledge dissemination and the potential to "democratise" access to education, especially in the pandemic context. The discussion on media and children therefore proceeds on two occasionally intersecting pathways: one is education through media and the other is education about media (both production and consumption). Our interest in this project is the latter. In this regard, the National Curriculum Framework proposed in 2005 that education in India should be connected with knowledge to life outside school which led to the introduction of a course on media studies for secondary students. The Central Institute of Educational Technology helped in creating Media Clubs in schools to promote media literacy in India in 2009–2010 up to 2014–15 (NCERT, 2017), with further records being unavailable. However, their focus was on media production—as students brought out school newspapers as part of the Media Club—rather than a critical engagement with media. State level bodies implemented and executed such media literacy and education activities at lower levels. These tend to include literacies about media as well as media used to develop multiple literacies—thus confounding the two pathways mentioned above. For instance the Gujarat Institute of Educational Technology, Education Department, Government of Gujarat produced television programmers for teachers and children of 6–14 years of age (GIET, 2010) on media literacy. However, it was found that programs were often broadcast during school hours, when children could not watch, although some schools scheduled time for viewing in school and college (for undergraduate students) (Govindaraju and Banerjee, 1999).

Different state and central boards of education in India also periodically share guidelines regarding social media usage at school and to keep stakeholders notified of activities that are encouraged for children's learning. But, there appears to be a gap between research, praxis, and policy in a manner that

contextualizes existing knowledge, and helps support young people and carers maximize the benefits of this digital/social world even as we take into account nuances of the local. Current policies do not insist on evidence-based decision-making or draw on experiences and expectations of a wide range of stakeholders, and clearly, young people's voices are not driving them—nor have they been expected to, in what has largely been a top-down, non-participatory policy process. Similarly, media is quick to offer basic parenting advice regarding children's online practices, without attention to specific circumstances, sometimes forcing relationships between the latest fad and its adverse effects.

There is a slowly emerging body of interdisciplinary literature that looks at the need to build critical skills among young people in India. These skills will allow them to negotiate a digitally mediated world, in terms of relationships and political and cultural realities (Bhatia and Pathak-Shelat, 2017). It will also help children unpack media representations (Sreenivas, 2011) as their engagement with social media like YouTube and WhatsApp deepens (Sarwatay, 2017). Examining attitudes towards advertising literacy among Indian tweens, Trehan (2017) found low levels of comprehension of persuasive intent, exaggeration, and misinformation but high levels of celebrity recognition, visual literacy, and a gender divide in terms of perceived sexual objectification of women in advertising. As part of a ten-country comparative study of youth and digital media use, Raman and Verghese (2014) observed that political and civic socialization of urban Indian youth was largely dependent on social media—a fact that was similar to their counterparts in most parts of the world. Such scholarship, being guided by the vision of developing an inclusive and multicultural mindset, will thus fill out the idea of what it means to be an informed citizen.

The present study adds to the sparse literature on media literacy from the Global South, especially in terms of the role of policymakers such as educators, nonprofit leaders, and community leaders. It examines how they shape discourses about digital citizenship and social connectedness within the Indian youth and media context. The uncertainties of the online world have led parents in India to depend on media discourse, digital/social media, teachers, local parenting experts, digital media experts, and organizations working with children for advice on how to deal with young people's experiences online. Questions of access, uses, practices, risks and opportunities are common but many parents lack access to well-researched answers. Newspapers largely run stories motivated by technopanics; there is a generational digital divide, and parents often do not model what they preach—especially when their mediation follows a restrictive style. They tend to believe that regulation of some kind is a solution: at the family level by restricting use or accepting only certain kinds of access; at the societal level by depending on schools/teachers; or at the institutional level with governmental bans or board guidelines.

While some parents and teachers cited media literacy as a possible solution (Sarwatay, 2017), policy and implementation are lacking in this regard. As children (digital natives) might navigate through these digital/social worlds differently than their elders, there is confusion about the dos and don'ts and, while advice is available, access to parental mediation and communication strategies in a digital world is unequal. As more of our existence is digitally datafied, citizenship itself is being digitized but there are myriad issues of how this existence is structured and designed and how parents can guide young people and learn from them as they navigate through these worlds (ideally) together. This is why it is important to examine the underlying systems that enable young people and their parents in these online worlds. What helps them dispel notions fuelled by technopanics? Can regulation help? What is the role of media literacy? How can social connectedness lead to better communication and engagement between parents and children and reduce navigation confusion? How do we become digital citizens even as structures and designs are evolving and getting optimized?

METHODS

In this project, we take an ecosystem-based approach to understanding digital citizenship and social connectedness in the Indian context, using a series of in-depth interviews with a selected group of stakeholders. As literature reviewed in the previous section suggested, informal and formal learning environments have shaped how youth engaged with digital citizenship, how media literacies are practiced, and how social connectedness emerged in various contexts. Various types of contextual factors such as family environments, school curricula, sociopolitical climate, and technological access influenced how youth used media to connect, learn, and participate in creative, personal, political, and civic activities. Therefore, it is important to examine the role of stakeholders such as parents, teachers, social workers, children's advocates, and others who shape the media environment for young people.

Several educational and research organizations as well as the media in India have shown interest in youth and social media and have considered—in varying levels of detail—how parents and children navigate experiences online. Specific research priorities have emerged in the Indian context, and, given the relative recency of such research in the Global South, most often, quantitative methods like surveys (questionnaires and structured interviews) have been employed, the main target of these being teachers and parents. However, little attention has been paid to other influencers of youth and media spaces such as social workers, industry experts, and children's advocacy groups, all of which also influence meso-level and macro-level policies and practices related to digital media literacy.

From the management of technology and innovation standpoint (Tsujimoto et al., 2018), one of the significant ecosystems perspectives is the multi-actor network perspective. The actors are government, universities, consumers, firms, policymakers, user communities, etc. and they deal with key variables like power, regulation, and knowledge, among others. This multi-actor network is but one aspect of the wider ecosystem of connective media theorized by van Dijck (2013) that includes invisible technical dimensions of online platforms including business and commerce aspects as well as infrastructures that

TABLE 1 | Details about the participants.

Sr No	Pseudonym	Gender	Socio-economic background	Work	Details
1	ABC	Female	Upper middle class	*Civil Society:* Child psychologist and parent-educator	Founder-director of a preschool and consultant for usually well-to-do families on parenting issues including those related to digital and social media usage
2	DEF	Female	Middle class	*Civil Society:* Social media and parenting expert	Involved with several social media initiatives some of which focus on how parenting needs for middle and upper-middle class families must adapt to a digital/social media world
3	GHI	Female	Upper middle class	*Civil Society:* Mom-blogger	Assists relatively high-end private schools with their web presence, organizes events related to parenting for the school's clientele which is generally middle to upper middle class
4	JKL	Male	Upper middle class	*Professionals:* Head, Digital and social media marketing company	Works with corporate organizations and schools to cater to their digital/social media marketing needs, clientele usually comes from middle to upper middle class
5	MNO	Male	Upper middle class	*Professionals:* Cyber lawyer	Trains corporate and government employees on cybersafety and runs an initiative on online safety for schools and colleges across the socioeconomic spectrum
6	PQR	Female	Upper middle class	*Professionals:* Advocate and professor	Managing director of an organization that works for victims of cyber crimes, deals with people from different castes and classes
7	STU	Male	Upper middle class	*Research and Advocacy:* Head, Child rights centre	Research and capacity building activity at a centre working on child rights that is supported by UNICEF in a reputed private university
8	VYW	Female	Upper middle class	*Research and Advocacy:* Director, Centre for development communication	Associated with Global Kids Online and UNICEF Innocenti that aims to reach young people across the spectrum regarding their online habits
9	XYZ	Male	Middle class	*Research and Advocacy:* Expert in digital and social media	Interest in media for social change; his work tends to focus on organizations engaged with disadvantaged communities/ vulnerable people

enable and support online activities as well as social and democratic dimensions (van Dijck et al., 2019). Experts interviewed in this study are actors in this network of connective media who juggle key variables mentioned above to ensure balance in business, social, and democratic dimensions of the ecosystem. Interviews as a method to map stakeholders and ecosystems have been used across several fields (Ginige et al., 2018; Raum, 2018; Prieto et al., 2019; Woods et al., 2019) and was thus the chosen method for this study as well.

There has been some thoughtful dialogue on issues relating to digital media and children's digital lives; however these discussions tend to happen in rarefied and often disparate spaces, and have not yet begun to make a dent on policy. This paper attempts to understand how key stakeholders understand these issues, and what they see as key concerns based on their deep understanding of the culture, and socioeconomic contexts in which Indian children live their varied lives. In-depth personal interviews were conducted from October to December 2019 (pre-COVID-19 period) in Ahmedabad, Gujarat, India with professionals working directly and indirectly with young people and their parents in India in both informal and formal learning contexts. These individuals collectively represent a group that plays a significant role, some as policymakers and others as key influencers of media discourse and interlocutors of media practice within and outside educational institutions.

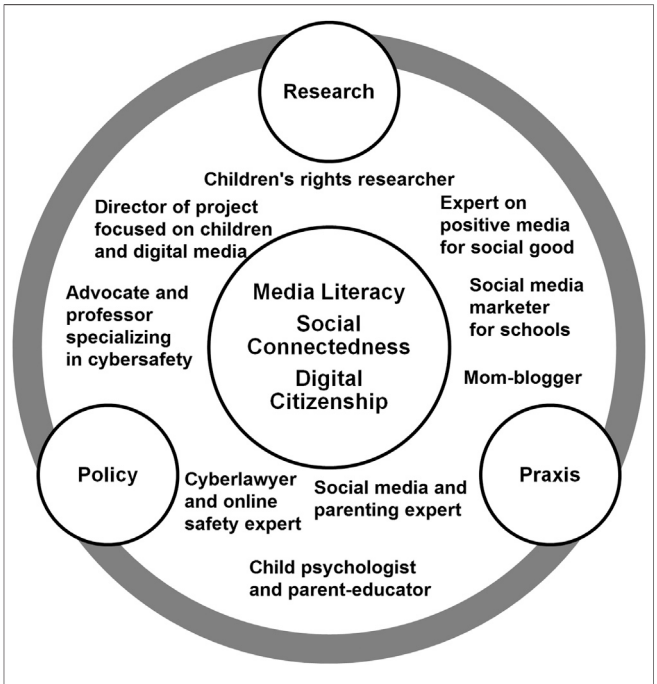

FIGURE 1 | Participants' positions across the policy-praxis-research axes.

The main questions that guided the interviews were:

(1) How do they frame and perceive issues related to young people's media literacy, social connectedness and digital citizenship?
(2) What insights have they gained through working with parents and children?

In this paper, we define media literacy as young people's ability to safely access and use digital/social media for identity and relationships, learning and play, and consumer and civic practices. Social connectedness is characterized as the sense of belonging between young people and their adult caregivers in a digital/social world. Digital citizenship is closely tied to the two concepts above in the broader context of engaging with the society around them in a digital/social world.

Local ecosystem mapping through interviews was conducted to better understand how these experts describe and examine the current scenario in India. The nine experts interviewed are briefly described (in **Table 1**) with their relative positioning (in **Figure 1**) along the policy-praxis-research axes. Pseudonyms have been used to protect their identities.

These stakeholders are either directly or indirectly working with parents and young people, schools and teachers, international institutions and organizations to become part of the ecosystem of connective media through their practice, research, and/or eventually policy and have their ear to the ground as to how young people and parents navigate a digital/social media world. They come from a relatively privileged section of the Indian society to be in a position to impact policy directly or indirectly within their local ecosystem while their work covers people across the socioeconomic spectrum. These experts engaged with the first author in semi-structured interviews around the following topics:

(1) New media (specifically the Internet, digital/social media).
(2) Children and media in the local context.
(3) Understanding of existing systems, media discourse around this topic.
(4) Gaps in research, advocacy, policy, and academia.

Informed consent was obtained from participants at the start, and a scanned copy of the form was sent to them after completion of the interview. Interviews were recorded, and transcribed. Interviews were conducted in English with conversation sometimes slipping into Hindi or Gujarati. An interesting methodological side-note is that an application was used to transcribe interviews instantly and while it performed fairly decently in English, it had trouble recognizing the Indian accent in some places and failed to transcribe non-English spoken words correctly. We had to correct those parts by listening to the recording and editing the mistakes out. With the exception of two, who were interviewed by phone and email respectively due to their strict preference, all interviews took place at their offices/homes. Interviews were scheduled after explaining the purpose, with each lasting between 30 min to 1 h. All participants remarked on the importance of the topic in current times.

The interviews began with broad questions aimed at drawing out their ideas about digital/social media and their understanding of the local children and media landscape. Across participants, there was a common theme of children and adolescents being inundated by media messages, the compounding effect of digital/social media, and increased importance of parenting in these times to safeguard children's rights. This led to a deeper dive into issues they outlined to elicit responses related to existing systems, perceived gaps, media discourse, and possible solutions. Responses to these questions varied, reflecting their different locations.

The child psychologist focused on the importance of goal setting and communication, those involved with social media spoke about co-use and balanced consumption, experts who dealt in cyber crime took a cautionary stance, and academic and research experts focused on the need for research and foregrounding children's voices. Many asked why this topic was chosen, perhaps to place it in loop of the discourse surrounding these issues. Data from interviews was supplemented with researchers' observations, background/peripheral conversation with experts, and field notes, suggesting:

(1) Nearly all interviewees had children and brought some context from existing experiences or voiced concerns about anticipated problems.
(2) Solutions cited came from personal experience, peer discussions, events about digital parenting, and other professional avenues.
(3) Identification of relevance of this topic and gaps in research, advocacy, policy, and academia stemmed from reflections above.

While guided by literature, we did not approach data with preexisting themes and used an inductive approach, allowing themes to emerge from the data. A semantic approach was applied to thematic analysis. The transcripts were coded and themes were generated as shown below.

FINDINGS

In-depth interviews help participants express themselves and guide the interview, thereby allowing the researcher to rectify and add to the process and remain open to developing ideas further, even seeking new directions and interpretations (Brenner, 2006; Glesne, 2011). A first order of themes from the interview data was extracted which was further consolidated into a second order which were the basis of this section. Analysis was done and quotes were pulled from interviews to give a layered, detailed context. Issues of child-centered-design, dearth of knowledge about opportunities and risks of social media among parents, and confusion around how to navigate this digital world were some of the themes that emerged as interpreted from the interview data. Questions were raised about children's wellbeing, including what parents could do about this, the possibility of (and the problems with) regulation, and the need to focus on how parents could foster

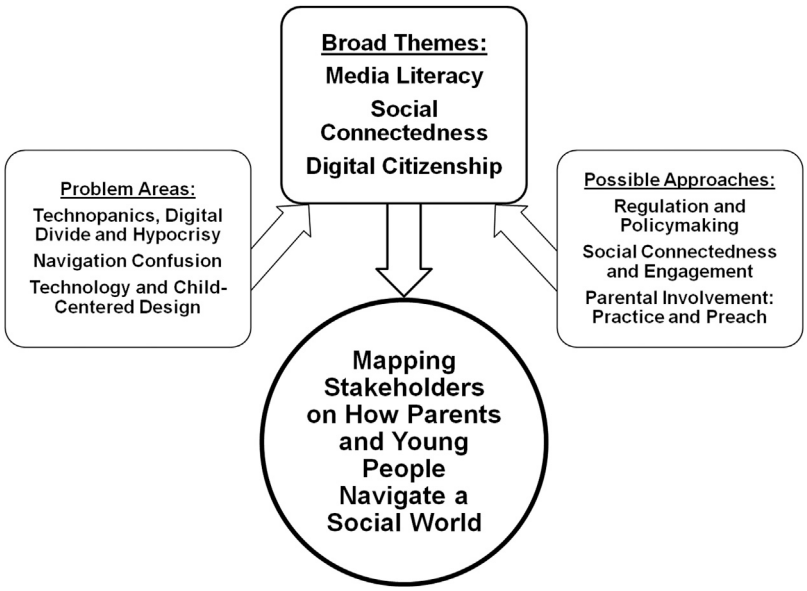

FIGURE 2 | Main themes from the interview data.

trust and a meaningful connection with young people that would frame their engagement with technology.

Main themes from the interview data are shown in **Figure 2**. Respondents pointed to what they saw as problem areas, such as technopanics, digital divide, navigation confusion, and technology design that was not child-centric, but also indicated possible approaches to addressing these issues, through regulation, improved parental engagement, and more open communication with all stakeholders. These were grouped into three broad themes, of media literacy, social connectedness and digital citizenship, roughly corresponding to the themes in the global scholarship as outlined in an earlier section of this paper.

Some experts spoke from a cautionary perspective while others focused on safeguarding young people's interests. ABC was vehemently against giving social media access to very young children observing that handing over phones to toddlers as a behavioral incentive was a bad idea. She also opined that teenagers are going through a rough phase in life as it is, and parents need to be extra careful when they observe behavioral changes in their adolescent children, possibly due to digital/social media. DEF was a big believer in co-using digital/social media with children as a strategy to digital parenting. While she or her child had not faced cyber crime personally, she was wary of coming across unpleasant or dangerous experiences and felt one needed to be prepared. Many sessions she organized for her mothers' club focused on this theme. Her mantras were 'practice what you preach' and 'precaution is better than cure' and this reflected throughout the interview. GHI and JKL believed parents exert a lot of control over children's media diets (especially younger children) and they needed to be aware of the digital/social world to make the right decisions for their wards. They had identified an acute lack of awareness about several issues like privacy, safety, tools to safeguard young people online and hence organized/participated in events aimed at parents to spread awareness and aid parental mediation regarding children's technology use.

MNO and PQR had seen many cases of cyber crime and victimization. They were aware of the level of ignorance related to risks in a digital/social world. They hold frequent workshops and training/counseling sessions for young people, victims or high-risk individuals or organizations like corporate and government entities. While STU's work is not directly focused on the impact of social media on young people, he works on children's rights and capacity building which ties in with awareness and training. VYW strongly believes young people's attention span and sleep are adversely affected and this needs research attention. When confronted with the argument that young people love to binge watch, she countered with the nuance of viewership vs. engagement and how the latter is getting more superficial. XYZ posited a generational shift in media consumption and engagement patterns. Young people are moving towards a visual medium of expression, however many of them struggle with communicating verbally, he said. He also mentioned a lack of acknowledgment of personal responsibility for your actions on social media and opined how that might contribute to increasing cases of cyberbullying.

Based on these interviews and the researcher's field notes, the average middle-class school-going urban-based young person with access to digital/social media would have a full day's routine with school, extracurricular, and other activities in a media rich and dense environment as follows: Waking up in the morning as the radio is playing, tinkering with the smartphone (usually mom's) and television, getting to school while passing by hoardings and billboards, studying in a class with a smartboard/projector/computer, talking about latest on YouTube/TikTok/

Snapchat/Instagram/PUBG with peers, sharing memes, assignments, tuition timings, banter on WhatsApp, FaceTiming/VideoCalling family and friends, and using laptop/computer/internet-enabled television/voice assistant for education and entertainment.

Parents, on the other hand, oscillated between how much access should be given to young people in this digital/social world and were occasionally swayed by media discourse on technopanics to limit usage leading to tensions in relationships with their wards. This gets further complicated when parents can't/don't/won't practice what they preach and young people call them out on these contradictions. Parents tend to perceive computer/laptop use as productive behaviour while television/smartphone use as unproductive behaviour leading to disagreements and disharmony, sometimes leading to breakdown of trust and communication between the parent and child.

While the opening questions helped build context regarding the local realities, specific questions as the interviews progressed, helped identify the following themes.

Technopanics, Digital Divide, and Hypocrisy

Issues of risks and literacy, health and wellbeing, safety (including bullying, shaming, violence, and sexting), and privacy were raised by experts who work directly and indirectly with young people and parents, schools, organizations, etc. Lack of (digital/social) media literacy was cited as one of the reasons why most parents and some young people were concerned regarding their online uses, practices, and experiences. Media discourse also added fuel to fire as coverage about social media addiction, challenges like blue whale and momo (Pednekar, 2017), and safety and privacy issues were sensationalized. However, this is a challenge that can be met by inculcating media literacy and digital-smart parenting which is an uphill climb because we are still battling technopanics, digital divide and hypocrisy. DEF was frank in her admission when she said, "We held a panel discussion recently on 'digital media parenting'. . .on what should be the role of parents in today's digital media scenario, how do we cut down on screen time? But, sometimes we act like hypocrites. We ask them [children] not to use it and as parents we use it so it [a part of the panel] focused on how to balance it [screen time]."

MNO had the strong opinion that privacy does not exist in a datafied world. This problem is compounded by a lack of awareness regarding online safety among majority citizens. PQR concurred when she opined that usually people become aware of risks when something untoward happens.

"The new media forms are much more easily accessible than the other forms of media and they are up to date. However, we must also note that such media is also plagued by fake news, non consensual images, revenge porn contents etc. This makes the young minds sometimes glued to such media because they may have never seen such things and due to adolescent curiosity they may be more than willing to share such things in groups secretly which may increase the humiliation of the victims."

To this end, recognizing the need for steering discourse, the Central Board of Secondary Education (CBSE)–a national level board of education in India managed by the Union Government and implemented in several public and private schools throughout the country—issued the 'Guidelines for Safe and Effective Use of Internet and Digital Technologies in Schools and School Buses' (2017) including 'Tips to stay safe on social networking sites for students' (p. 4). This serves as a primer for ideal online behaviour and can guide parents regarding technology mediation at home as well.

Experts also insisted that parents need to set aside their reservations about the digital divide and not being tech-savvy enough. They have to be more digitally/socially clued in so they could pass on literacy lessons to children. PQR found patterns in levels of awareness and corresponding styles of parenting in different regions of the country. She reported, "...my organization receives cases from all across India. However, I can highlight [patterns] from three regions:..Tamil Nadu, West Bengal and Gujarat, specifically. Parenting style may differ as per the culture of the region. I have seen that compared to Gujarat and West Bengal, Tamil Nadu parents are more aware and stricter when it comes to using of internet and social media by children. . .Parents may be busy and they may not be able to monitor children always. Cyber safety issues still remain lagging behind when it comes to comparing Southern, Western and Eastern regions."

Clearly, given the diversity and breadth of India, one may find different trends in different regions. She opined that awareness regarding cyber victimization was higher in South India compared to West and East India as they seemed to only spring to action after a crime has been committed. However, it is important to note that preexisting notions regarding adults' or children's digital/social abilities influenced by technopanics or digital divide will only exacerbate the problem at hand. This gets compounded when parents give out and act on contradictory sets of norms for uses and practices online as children tend to follow in the parents' footsteps.

Navigation Confusion

ABC was of the firm opinion that digital and social media technologies do more harm than good for especially young and impressionable minds that can be swayed by the glamour and glitz of online platforms if a certain opportunity-based perspective was not built into young people's psyche. She insisted, "It is our responsibility as parents and teachers to show the younger generation, through our actions, that these are but tools you use in life after receiving due instruction in how to effectively utilize them for your benefit becoming ideal digital citizens."

Reflecting on her practice as a child psychologist, she gave the analogy of children being soft as clay and how we can mold them through our words and actions. She gave the example of a goal setting exercise and how it is important to ensure children forge and follow a certain path for themselves. She added, "And, that we can't just teach them this by talking about it, we have to show it to them to avoid navigation confusion. Digital and social media can work for or against our children's positive experiences depending on how we have shaped their perspective about it."

She elaborated how this works by citing a phenomenon she has come across many times, especially among teenagers,

"...because they are in the phase where they want to show off. They want to show that they are something! 'I have friends. I have boyfriends. I have done this. . .' as a status symbol. So, for teenagers, I firmly believe that, in their formative years, if we get them into the habit of goal setting, then [social] media can be of good use because then it will serve as a positive influence. Like, when they follow celebrities on social media they will focus on how Virat Kohli (cricketer) became such a great sportsperson, what does Bill Gates (businessman) say [about becoming successful]. But, if this connection [between goal setting and how social media is perceived and can be used for our benefit], has not been established, then they [teenagers] get into the show off mode where they try to put up a show of that which doesn't exist!"

What she is saying can be tied to our existing understanding that technology is neither good nor bad and it depends on how we use it. Opportunities and risks exist in a digital/social world just like they did before and we need tools like goal setting to utilize the affordances to our advantage. DEF agreed as she ruminated about 'sharenting'–parents sharing about kids' lives and their photos and videos online—as she goes back to issues of hypocrisy and lack of policies to protect children from online risks. She insisted that we are confusing children when we create social media accounts for infants and then insist they shouldn't use these platforms because they are bad for them. She also attributed a lack of awareness among parents and young people about safely navigating online to making contradictory and/or restrictive decisions. She believed cybercrime is hard to face, "Consequences of cybercrime also affect you mentally, so we must know about online safety precautions. Every school and college should have sessions on cybercrime."

She mentioned that while guidelines (like the CBSE ones above) are helpful, we need more to spread awareness and help parental mediation of children's technology use. This is because parents in India can sometimes go from one extreme of sharenting and making accounts for underage children to another extreme of announcing blanket bans for adolescents usually based on academic performance and feedback. This can confuse young people and raise questions like: How do we navigate in this social media world? What can be the consequences of navigation confusion? How can we stop negative consequences? These were also some of the questions raised by the stakeholders. The next issue gives us more insight into the genesis of this navigation confusion.

Technology and Child-Centered Design

Digital and social media are considered ideal platforms for connection, communication, and community building. However, sometimes platforms can alienate people even as we have a false sense of security from being on the application or website as we take its benefits for granted. GHI shared how websites she creates for schools to keep parents clued in on attendance, homework, and performance of students, sometimes fosters a deeper disconnect while maintaining the illusion of information richness. This is where an emphasis on social connectedness becomes important. Issues of technology and child-centered design enable you to have access to (sometimes large scale aggregated) data, but you miss out on nuances that are unique to an individual. She shared, "...there is no communication between the teacher and the parents. Everything is updated on the website or application; in a way, technology does lessen the burden, but there is no personal touch. But it depends on the school as well. I have enrolled my daughter in a school that uses technology [like smart board, WhatsApp groups] but also believes in personal connection and communication."

Navigating a digital/social media world also depends on the intrinsic composition of the platform. JKL who heads an online marketing firm insisted that a lack of child-centered-design is to blame for risks faced by young people and added that low levels of awareness among adults is also problematic. He cited examples of cyber crimes and cyberbullying and made his case by explaining, "Online safety is currently not taken too seriously until they become victims or someone closer [to them] becomes a victim and at that time they surrender [to the situation] and say 'Oh I should do that [take precautions].'...we are not [a] kids-driven [society]...like [for e.g.] finding a restaurant that has kid-friendly food! You only realize these things when you experience them."

GHI insisted that technology is only an enabler and it is our responsibility to lean toward or away from it to balance the communicative aspect of our relationship with and surrounding children. She posited that there is a three-way relationship between parents, children and teachers/schools and this triad is mediated by technology and personal communication. The child needs to be at the focal point of this triad and technology should help, not harm while centering young people in a mediated communication design. Social media technologies respond to user behaviors; their affordances can be shaped by deliberate (and informed) patterns of use. We can either create silos and echo chambers or actively seek multiple perspectives to foster understanding.

Regulation and Policymaking

Media literacy is often cited as one of the solutions to risks that new media bring along with its benefits. However, is it too much to ask of individuals to be aware of everything and its repercussions? Should the industry self-regulate? Should the government bring legislative regulation? VYW agreed that this problem needs industry and government involvement and added, "If we give free rein to corporate and media companies they do what they do and then every time [something new comes out], the individual or parent has to constantly worry about what new [impact] it will have on me or my kid. . .But at the same time censorship and regulation will always be problematic, right?"

XYZ, who is also part of a think tank on digital media platforms, asserted the importance of keeping discourse around digital and social media and its impact on society alive and current. He urged, "It's important to bring experts together to put forth their ideas and perspectives on how digital and social media is impacting people's health and mental wellbeing. Young people are digital natives and we are witnessing a generational shift in the way these new media technologies are being used."

However, experts pointed that young voices are distinctly absent in the policymaking process. A possibility in regulation

could be evidence-based policy and decision-making where digital natives participate along with older generations. However, currently there is a massive gap between what happens on ground vs. legislation or even advocacy around these issues. Illustrative in this regard are recent bans on TikTok and PUBG, etc. popular platforms, which young people used for identity creation, self-expression, community building, among others. While current bans are for political reasons, earlier bans (due to sensationalist media stories) were later lifted, only to be reinstated again. Many young people, especially from marginalized backgrounds, used these platforms and these decisions overlooked impact on said audiences/users.

Social Connectedness and Engagement

Social connectedness in a digital/social world depends on our communication and engagement with and demonstration of it to our children. ABC emphasized, "[Social] media is absolutely fine because that's the world we live in where everything is digital and that's how it's going to be and there is nothing to worry about. But as a parent or educator or school, which direction do you show your children towards? Do they think [social] media is a resource for learning or to show off?" DEF echoed the sentiment, "Parenting in a digital and social media world is just like a coin with two sides...the internet has everything from porn to [tips on] parenting. It is up to us where we draw the line and choose and tell our kids what is good and bad. Kids are after all kids and we as parents need to control ourselves and check our behavior. . .practice what we preach."

Some experts, though, thought social media for very young children was a complete no-no. If social media was having a bad impact on teenagers, parents were encouraged to limit/rescind access for older children too. Nonetheless, the quantity and quality of social connectedness depends on goal setting as you help create a systematic template for children to follow. They have a sense of direction and will most likely find ways to optimize opportunities and disarm risks in this online experience, navigating these social worlds without confusion and with confidence. ABC added, "Assigning specific responsibilities to and setting goals with/for your children ensures they use their screen time wisely. And this needs to start at the young age of two to two-and-a-half years, because this approach becomes the way of life as your child becomes a teenager."

This becomes easier to do when you share a communicative and engaging relationship with your children. DEF shared, "I heard a panel expert say, 'we should always add 'co-' in front of everything we do with our kids like co-play, co-sleep, co-read in the initial years'...because we cannot completely shun these new technologies and their exposure in today's world. How long will you not tell your kid not to use any of the gadgets when you yourself are using it for hours."

This brings an interesting dynamic to notions of trust and communication between parents and children. Parents can bond with children over the latest online or do things together like watch a movie. This helps foster and strengthen social connectedness and engagement and is in line with parental mediation techniques like 'balance' (Livingstone and Blum-Ross, 2020) where the parent-child relationship is about doing things together and in moderation.

Parental Involvement: Practice What Preach

The involvement of parents in children's digital/social lives is crucial towards ensuring young people's long term wellbeing. A healthy relationship must be based on communication and trust. It is important that parents practice what they preach and remember that young people have rights in this digital age just as in other spheres of life. STU, who heads an initiative for children's rights, reiterated, "Children need guidance regarding their online practices just as they need guidance in education, sports, career, and life; this is their right and digital citizenship is becoming an essential in our ever-changing world."

VYW recounted that ordinary people use media positively i.e., using media to enhance life, "...getting new friends, getting new knowledge, making you aware of something that enriches your life, making you feel valued as a citizen: all of these things [enhance life]...[it's not unimportant] just because it's on new media."

She added that parent-child communication can foster discipline and moderation in use, chalk up multiple options for activities, and ensure certain minimum hours of sleep for everyone as essential—something that people are missing out on these days. Parents and young people could navigate a social world better by understanding how media literacy, social connectedness, and digital citizenship can help them with:

(1) A better sense of links between policy, governance, and regulation.
(2) Social connectedness and engagement with young people.
(3) Practicing what they preach.

There could be many social factors along with emergence of digital and social media contributing to trends in children's uses, practices, and experiences online. Additionally, as PQR noted, parenting styles may differ as per the regional culture, and given the world we live in, MNO reiterated digital parenting as the need of the hour. We need to understand why and how young people use social media to express and present themselves and focus on opportunities like education and learning to make the best use of these platforms.

DISCUSSION

A range of issues such as a lack of child-centered-design, dearth of knowledge about opportunities and risks of social media, and confusion about navigating this digital/social world emerged from a thematic analysis. Based on these insights, we offer ways to think about children's wellbeing, how adult caregivers can maximize children's wellbeing, the possibility of and problems with regulation, and recommendations for parents to foster trust and meaningful connection with young people to

frame their engagement with technology, while pointing to research gaps and directions for future scholarship in India.

In most conceptions of society, children are considered a group that is vulnerable and in need of protection. This responsibility to protect and care is placed by society largely on the shoulders of parents and other adults like teachers, caregivers, etc. and more broadly, on the institutions that play a role in children's growth and development. Children have from their very inception been treated as a special group by law, academia and the market, and in this regard, media studies are no exception. As our review indicated, scholarship has been equivocal and often polarized regarding children's media (especially digital/social media) access, usage and its moderating role in identity formation and social interactions, and, more recently, on how children develop civic, cultural, and political ideas and notions of citizenship (Nolas et al., 2016). Concerns articulated in research and policy circles about children's literacies, rights and parental cautions about appropriate and productive media use/participation have also been reflected in mainstream media discourse.

In regard to the first concern articulated in this paper, of identifying research priorities specific to the Indian context, these conversations offer some direction that research could take to inform developing digital media literacy programmers that address the fears, anxieties, hopes, and everyday realities of Indian families. As some of the informants in this study have suggested, this has led to a multi-pronged yet somewhat uncoordinated response to managing anxieties and promises of digital media in relation to children in the Indian context. Across all the themes that emerged, a well conceived media literacy effort was seen as pivotal to mitigating risks and facilitating a positive relationship with media for young people. It is interesting that parents too are seen as important participants in such literacy efforts—both as targets of critical media literacy programs and as facilitators. This may be particularly important in the Indian context, as parents' experiences with media (both digital and pre-digital) vary widely depending on socioeconomic and cultural milieu.

This brings us to the second research question we set out to address: how can such media literacy programmers address the nuanced needs of local cultures while working with existing [often civic] literacy gaps? There is also an important—but in these conversations a less perceptible—shift from the language of responsibility to that of rights and participation. In such a framework in the context of India, communication rights are realized through media literacy—where children discover or are sensitized to issues of representation and participation in digital and other media through deliberately thought out literacy programmers designed bearing in mind the very diverse contexts that Indian children occupy. Shakuntala Banaji's work, for instance, brings into conversation historical ideas about children and childhood in India with everyday lived experiences of children from the margins—drawing from this the understanding that intervention for and about children must involve children's voices and recognition of their agency (Banaji 2017). This perhaps is one way to respond to concerns expressed by some of the stakeholders around the top-down approach to technology design as well as the relatively little effort put into actually involving children in conversations around their mediated/media lives. Such conversations of course cannot ignore the fundamental truth about India—that (as is the case in other diverse cultures) there is no one group of children that represents the whole, and that even as we think about policy broadly, there must be room for multiple local variations in application.

In recent years, some multilateral agencies such as UNICEF and UNESCO have attempted to define and advocate for children's rights drawing on research-based inputs from activists and academics, taking forward—to some extent—a media literacy movement that emerged in the wake of the spread of television. In most of these projects there has been recognition that children occupy complex worlds and a shared understanding of these diverse realities based on rigorous research must inform policy and programmatic interventions. These have engendered partnerships between development agencies and academics, with a slowly increasing representation from the Global South. The Global Kids Online project initiated by UNICEF, the London School of Economics and Political Science, for instance, while starting off with a Eurocentric focus, has now broadened to include a network of researchers from 15 countries, India among them. The interdisciplinary and international nature of such networks holds promise for a widening of the lens that informs policy in areas such as education and technology development, both key to realizing any media literacy agenda. However, what seems to be missing is the link with the state institutions that allow for interventional ideas to be supported at scale in sustainable ways.

But no matter where one looks, it is difficult to escape the ambivalence that pervades thinking in the area of children and media, and the usefulness of media literacy efforts in the face of a rapidly changing, increasingly interconnected world where children—and the adults in their lives—seem to have to continually recalibrate their ways of being, learning and relating. While some hail social media developments as opportunities for children to learn and grow, others fear risks of exposure to a world we do not fully know and understand (Livingstone and Helsper, 2008). There is also the fear of the older generation (parents, teachers, etc.) of being left behind due to their lack of understanding and ability of maneuvering these media, as compared to the younger generation which is identified as 'digital natives' (Burn et al., 2010). Some also question the skills of these natives in navigating the complicated world of social media. Hence, the emergence of literature around literacy—ranging from information literacy to media literacy and digital literacy to social media literacy—to enable children and parents to skillfully and safely engage with this virtual environment (Buckingham, 2006; Bennett et al., 2008; Livingstone 2014). All these questions acquire different nuances and meanings in different cultures, and in India, as perhaps in other transitional societies, they must be considered against a range of social, political, and economic issues. In the deeply paternalistic and patriarchal family structures, for instance, how might children's autonomy and parental engagement operate? How might social media use, or device

ownership and control vary across demographic categories? What in fact might social connectedness or digital citizenship for children mean in a context where even adults find themselves multiply disadvantaged and disenfranchised? How does media literacy then work alongside other urgently required literacies to empower children and facilitate their growth?

There is no doubt that there is a rich and rapidly growing body of scholarship on children's engagement with digital technologies, and many convincing arguments for robust media literacy programs. While opinions will always range and often fall into sharply divided buckets, together they open up questions for future research, some of which are alluded to above. As noted earlier, much of the work that is currently drawn upon by researchers, educators and policy makers and cited here originates from the United States and United Kingdom, to a lesser extent Europe and Australia. In this review, there was one study from Saudi Arabia, one on Latino immigrants, with a few featuring sections on Asian countries like China and India. In the Indian context, the authors could only find limited industry research on this topic (from organizations like ASSOCHAM, TCS, etc.), some academic research done by students which came to the foreground because of local/regional newspaper coverage and a spot of mainstream media work circling around sensational stories, like underage use, social media crises (such as the Blue Whale game and the more recent #BoisLockerRoom incident) and tips to parents. While issues related to digital media use and practice comes into public attention during such incidents, there has been little sustained scholarly engagement that spans the spectrum from educators to media scholars to policy makers to program implementers—the full complement of perspectives and disciplinary knowledge that may be required to make media literacy in the country an evidence based project.

In terms of methodology, the larger research projects currently underway in India are modeled on or directed largely by Western frameworks—including the Global Kids Online project, which of course offers room for cultural contextualization. Deeper ethnographic engagements that allow for a contextualized understanding of children's media practices, and qualitative interviews with teachers and parents, would help build a more robust evidence base that can inform policy. It may be worthwhile to think back on efforts such as Newspapers in Education programs that were led by the media industry (recognizing their need to build a consumer base among younger readers) and understand how they also served as media literacy efforts, so as to gain some sense of what might work today, and with what kinds of partners—industry, the state, educational institutions, and parents. After all, digital media are here to stay, and whether we like it or not, we need to make productive use of them, as tools, as environments, or as interfaces.

Despite the considerable technopanic generated around the negative aspects of social/digital media like violence, bullying, hate, addiction, and privacy there are also positives, including the possibility of agentic self representation, productive interactions and rich relational experiences, increased access to education and learning opportunities, and even employment. We need more research that looks at the differential ways in which media penetration and access might affect children's opportunities in this regard, and how media literacy could be a way to mitigate some of these issues. There is also a need to consider such issues as young people's understanding of ethics in the digital world, their adoption of and thoughts about technologies like virtual reality, augmented reality and artificial intelligence and how they use their networked self to cross over into adulthood—again, all within the cultural contexts of India. For instance, how might we understand ethical decision-making within the framework of a religious community? What forms does bullying take online where students of diverse backgrounds might be interacting—and can the lessons from race-based discrimination stand in for caste-based discrimination in India? How can children activate their agency through and with digital media? The example of UNICEF's Children as Media Producers (CAMP, 2014) suggests that children even in resource poor contexts can engage with media technology when given a chance, and when equipped with the right tools of critical literacy. But to build such media literacy programs one requires the understanding gained from robust research, using methods that are appropriate to a particular context and the participants who occupy it.

All these issues have gained a new salience in the global experience of the COVID-19 pandemic, and its wide-ranging impact on social life, particularly on children's education. As briefly alluded to earlier, this has brought in a new urgency to the issue of digital/social media literacy for both children and caregivers. It also forces us to recognize and address in literacy programs, the complexities introduced when children need to learn online, where parental involvement takes on a completely new texture, and the granularities of lived context (access, connectivity, space, familial structures, and responsibilities) determine the ways in which young people relate not only to the digital but also to life in general.

The informants in this study offered media literacy as a broad umbrella approach that could address most of the issues that they themselves identified as problematic in relation to children's engagement with digital media. But they could point to almost no locally generated knowledge that could undergird a culture-centered approach to media literacy. This then becomes an area that is ripe for exploration by young scholars in not only media and communication but also education, child development, sociology and social policy studies. In other contexts, scholars have called out the need to decolonize digital culture studies (Risam, 2018; Arora, 2019); it is important that we begin this process in relation to media literacy studies as well. Given that media literacy is a "second order" research area, dependent on diverse bodies of knowledge including those mentioned previously, this would mean that we need to develop creative collaborations across disciplines and engage not only in extensive primary research but also actively dialogue across subject borders.

LIMITATIONS AND CONCLUSION

This paper is a starting point for more dialogue and support first, for developing a culture-centered approach to understanding core issues, developing argumentation taking into account multiple socioeconomic realities, and ultimately, for using media literacy

for active engagement and participation by youth in a pluralistic, non-Western, democratic context. We acknowledge that a major limitation of this study is its dependence on a narrow range of stakeholders, which gives us only a slight flavor of the range of opinions and experiences that could inform further research. The larger project (this data is from) will also bring in additional insights from in-depth interviews with children themselves, parents, and educators. Nevertheless, while stakeholder participants interviewed were privileged in many ways, their work spread across the socioeconomic spectrum which means that their views are certainly informed by sensitivity to larger Indian contexts.

Policy formulation in this area, and more importantly implementation, needs to take a flexible approach that is sensitive to multiple lived realities of children across India. Certainly contextual factors like age, gender, family background, education, income, and rural/urban location feed into these differences. But this is both the challenge and value of qualitative research—that while drawing out broad themes likely to resonate across situations, there is acknowledgment of variations therein.

Another limitation is digital learning and social connectedness have been greatly affected in the pandemic-related lockdown. While this study was conducted pre-COVID-19, future research must consider how these relationships affect young people and media literacy in India in the context of virtual learning, working from home, and greater social isolation during the pandemic. Further research using culture-centered approaches to media literacy and digital citizenship are needed within the Global South, including in India. Additionally, as this study reveals, beyond youth and parents, conducting research on other stakeholders who shape media and educational policies are important to consider within media literacy scholarship in order to fully understand the various systems, values, and priorities that shape digital media use by young people.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because this data is part of a long-term project related to the doctoral thesis of Devina Sarwatay under the guidance of Prof. Usha Raman at the Department of Communication, University of Hyderabad, India. Requests to access the datasets should be directed to Devina Sarwatay, devina.sarwatay@gmail.com.

ETHICS STATEMENT

Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

The paper was jointly conceptualized by the three authors. DS conducted the interviews, analyzed the data and wrote a substantial portion of the literature review and the analysis. UR supervised the study design and wrote portions of the Discussion. SR contributed to the literature review and helped frame parts of the analysis. Both UR and SR offered critical comments on drafts of the paper and helped rewrite sections.

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Context, Development, and Digital Media: Implications for Very Young Adolescents in LMICs

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The rapidly expanding universe of information, media, and learning experiences available through digital technology is creating unique opportunities and vulnerabilities for children and adolescents. These issues are particularly salient during the developmental window at the transition from childhood into adolescence. This period of early adolescence is a time of formative social and emotional learning experiences that can shape identity development in both healthy and unhealthy ways. Increasingly, many of these foundational learning experiences are occurring in on-line digital environments. These expanding vulnerabilities and opportunities are being further amplified for young adolescents growing up in low resourced settings around the world. Cultural and contextual factors influence access, use, and appropriation of digital technology. Further, neurobehavioral changes associated with the onset of puberty often coincide with entry into social media and more autonomous use of technology. In low-and-middle-income countries (LMICs), disparities in access, use, and appropriation of digital media can amplify prevailing economic gaps, and compound gender inequalities during early adolescence. In LMICs, adolescents are often the early adopters of mobile technology and social media platforms. While the impact of social media on the well-being, particularly mental health, of young adolescents has been a focus of research in high-income countries (HICs), much less is known about the impacts of social media use on young adolescents in LMICs. In this paper, we review what is known about the interaction between digital media and early adolescent development. We highlight crucial gaps in the evidence in LMICs; and describe some hypotheses and areas for future research to address these compelling issues.

Keywords: very young adolescents, digital media, social media, LMICs, Global South

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THE PROMISE OF THE DIGITAL WORLD

Youth are often the early adopters, rapid adapters, and innovators of new technologies—in ways that amplify risks and opportunities, impacting health, well-being, and trajectories of social and economic success. World-wide, social media has become one of the primary modes of digital media use—particularly for youth. The largest generation of adolescents in history is coming of age in the next decade. Most children below the age of 14 (89%) are growing up in low-and-middle-income

countries (LMICs[1];The World Bank, 2019)—and increasingly amidst rapid technological changes. However, most of the current literature exploring the relationship between digital media and well-being has been conducted with older adolescents growing up in high-income countries (HICs; Livingstone et al., 2017a; Schønning et al., 2020). Shifts in cultural and social context, coupled with the dynamic biological changes of early adolescence, inform how adolescents use digital media. A global developmental science lens can expand our understanding of the relationship between context, development, and digital media use in early adolescence.

The transition into adolescence constitutes a window of opportunity which can set and reset developmental trajectories with a lasting impact (Dahl et al., 2018). Early adolescence is characterized by a set of transitions—from childhood into adolescence, the onset of puberty, and social transformations. Across cultures and countries, these transitions make early adolescence a developmental period of opportunity, but also of increased risk for behavioral, emotional, and mental health problems (Dahl et al., 2018). These vulnerabilities can be amplified if new technologies—and the ways that youth use these technologies—are not optimized to recognize and minimize these risks. Early adolescence is also a key opportunity period for exploration and learning, particularly related to identity development and the navigation of an increasingly complex social world (Dahl et al., 2018), processes that are transformed by social media (Spies Shapiro and Margolin, 2014).

The impact of social media use in very young (or early) adolescents (VYAs), those between 8 and 12 years of age, has been largely neglected by research, despite the fact that VYAs in LMICs undergo profound changes in access to digital media, are a growing demographic for social media platforms, and represent the most inexperienced adolescent users (Pangrazio and Cardozo-Gaibisso, 2020). VYAs in LMICs are often early adopters of technology and parents and caregivers may lack the learning and expertise necessary to provide effective guidance around social media use (Barbosa, 2014; Livingstone and Byrne, 2015).

A developmental science perspective (Giovanelli et al., 2020) can provide insights into how neurobehavioral changes in early adolescence can interact with social and emotional learning challenges—and with the contexts in which youth are developing. These interactions can create specific risks for digital media use as well as specific opportunities for this developmental stage (see **Table 2A**). When considering the ways these risks and opportunities may be further amplified in LMICs, it is critical to recognize how specifics of economic and sociocultural contexts shape so many aspects of these learning experiences (see **Table 2B**). Taken together, this perspective highlights the potential to leverage insights into (1) the social and emotional learning experiences that contribute to developmental inflection points that occur during early adolescence; (2) how changes in digital media use during an inflection point can alter specific trajectories related to health, education, social, and economic success, and (3) the specific ways in which family, social, economic and cultural contexts shape different dimensions of early adolescent development (Bornstein, 2017).

[1]See **Table 1** (Glossary) for definitions and some considerations about key terms.

TABLE 1 | Glossary.

High income countries (HICs)	Countries with a gross national income per capita of $12, 536 or more in 2019 (World Bank Atlas method)
Low- and middle-income countries (LMICs)	Countries with a gross national income lower than $12, 536 per capita (Threshold between low and middle income: $1,036)
Global south	LMICs located in Africa, Asia, Oceania, Latin America, and the Caribbean Mahler, 2017, but not necessarily on the Southern hemisphere
Low-resource settings	Settings characterized by relative lower funds than other settings, but not necessarily pertaining to the Global south
Digital media	Digitized content that can be shared through online networks
Social media	Subset of digital media, related to the online platforms that allow people to create and share information with others and establish social networks Kross et al., 2020
Adolescence	Period of life between 10 and 24 Sawyer et al., 2018 or 25 National Academies of Sciences, 2019 years of age between childhood and adulthood –
Early adolescence	Generally understood as the subset of adolescent years between 10 and 14 years of age (WHO), 10–12 years of age (NASEM), characterized by the onset of puberty (Note: Early adolescence might also be used to refer to those adolescents who reach puberty earlier than their peers)
Very young adolescents	Sometimes used as synonymous with early adolescence, can also include pre-adolescents (8–12 years of age), some overlap with "tweens"

DIGITAL MEDIA, DEVELOPMENT, AND LEARNING

Biological and neurobehavioral changes in the transition years of early adolescence, initiate a set of dynamic changes—not only in growth and physical development but also in learning processes that shape cognitive, emotional, social, and identity development. These formative learning experiences are occurring in specific social, family, peer, and cultural contexts—in ways that shape individual experience and development (Dahl et al., 2018). VYAs have natural proclivities toward greater independence, expanding their sense of self, and exploring ways to navigate the complex social world of adolescence. Social media platforms appeal to these proclivities and play an important role in promoting self-expression and providing a source of social support and privacy from adults (Uhls et al., 2017; Gerwin et al., 2018). In the virtual space, online risks are positively associated with online harms (Livingstone and Helsper, 2009), so curtailing access for protection can limit positive exploration that is necessary for learning and development. Supporting VYAs' use of digital media requires striking a balance between encouraging autonomy and assuring protection. Here we outline key early adolescent developmental processes that could inform policies and practices

TABLE 2A | Examples of how specific aspects of social emotional learning & identity development in early adolescence create risks and/or opportunities.

SEL relevant neurobehavioral changes in early adolescence	Developmental SEL challenges in early adolescence[a]	Digital media risks	Digital media opportunities
Increased sensitivity to social evaluative feedback Increased motivational salience of status, prestige, respect, and belonging Increased novelty-seeking, and exploration Pubertal activation of romantic and sexual motivations	• Learning to navigate increasingly complex social environments • Learning to manage more complex peer relationships; more emotionally charged peer relationships, including emerging romantic and sexual interest	• Cybervictimization and digital drama[b] • Social media features (including publicness, quantifiability and permanence)[c] intensify social evaluation and exclusion, as well as the drive for social rewards which can include showcasing risky behavior • Social media add a digital dimension to peer influence, including exposure to peers' risky behavior and mechanisms for peer influence	• Social connection[d] • Online platforms allow for social skills and relationship practice at a time of expanding peer relationships. These can also create opportunities for scaffolding and monitoring (e.g., by teachers and parents). • Written and asynchronous communication might easier social entry points for shy, isolated, or marginalized adolescents • Exposure to social networks and norms beyond the local physical community
Increased proclivity for social exploration and social risk taking	Self/other learning Identity formation	• Exposure to negative role models • Risk of cybervictimization, especially for marginalized youth • Exposure to hate speech and exploitation • Construction and permanence of digital footprint restricts flexibility and temporality in identity development. • Vulnerability to advertisement targeted at adolescents[e]	• Exposure to positive role models • Digital platform for exploration and experimentation and creative expression[f,g] • Exposure to positive and social cultural norms not reflected in the immediate geographic community[h] • Connecting with similarly minded peers might be associated with increased sense of acceptance • Gamified experiences might be conducive to experiences of mastery
Increased desire for independence and autonomy	• Emerging capacities of cognitive control (particularly under conditions of strong emotion) • Navigating risky environments without adult supervision	• Unsupervised and unmediated time online due to limited parental skills and resources might lead to increased exposure to harmful content[i] • Overly restrictive parenting can curtail online learning opportunities	• Openness to parental mediation (relative to older adolescents)[j] • Motivation to develop digital skills and literacy can provide openness to school scaffolding and digital citizenship curricula[k]

to transform social media into safe and enriching digital spaces for youth.

Developmental Challenges of Early Adolescence: Learning to Navigate Complex Social Worlds, Forming Identities, and Increasing Autonomy

A key aspect of adolescent development is the social reorientation from family to peers and other influential adults, as adolescents strive for independence (Fitton et al., 2013; Nelson et al., 2016). Due to changes in socio-emotional learning processes (Blakemore and Mills, 2014; Casey, 2015; Shulman et al., 2016), VYAs experience increased sensitivity to their social world, including social evaluation (Somerville, 2013), and peer influence (Albert et al., 2013). In addition, reward and regulatory mechanisms undergo extensive development throughout adolescence (Casey, 2015). As a result adolescents exhibit emerging capacities of cognitive control, that might be particularly challenged under conditions of strong emotion or reward (Casey, 2015; Dahl et al., 2018). Social and digital media have become "salient developmental contexts" (Vannucci and Ohannessian, 2019), that uniquely appeal to, and are challenged by, the heightened importance of social contexts, and increased sensitivity to rewards, and emerging regulatory capacities. These powerful platforms of exploration and autonomy allow adolescents to build their identity and social worlds against an extended backdrop of complex peer relations, comparison, acceptance and audience (Subrahmanyam et al., 2006; Valkenburg and Peter, 2008; Fitton et al., 2013; Gerwin et al., 2018; Vannucci and Ohannessian, 2019; Pangrazio and Cardozo-Gaibisso, 2020).

Developing technical competence in these digital developmental contexts is important for early adolescent self-esteem, pride, and confidence (Fitton et al., 2013). Online platforms serve as a space to escape parental monitoring, to develop problem solving skills, and to master challenging tasks (Uhls et al., 2017), particularly during the global pandemic (Survey Monkey and Common Sense Media, 2020; Magis-Weinberg et al., 2021). Developing mastery, as

TABLE 2B | LMICs considerations that apply broadly to digital media use in VYA.

- Digital divides in use, access and appropriation exacerbate existing disparities (e.g., gender, socioeconomics, educational attainment)[l,m,n]
- Digital gender divide[o]
- General and digital literacy might be barriers to access[p], compounded by undersupply of culturally, linguistically, and regionally tailored content
- Transition into secondary school might be a point of vulnerability[q]
- Mobile phone use and subsidized data use by Big tech is especially suited for social media consumption (vs. using the computer which facilitates other activities)[r]
- Cultural norms and values (i.e., individualism vs. collectivism, self enhancement vs. self-transcendence) influence and in turn are influenced by digital media use
- Exploration can expand beyond the community[s]
- Digital media enable remote acculturation, which might open avenues for exploration, challenge to local norms and intergenerational discrepancies that might also lead to parent-adolescent conflict[t]
- Gender norms might limit girls' exploration and limit mixed-gender socialization[u].
- Lack of intergenerational knowledge, scaffolding and wisdom related to digital media. Compared to HICs, parents are relatively more inexperienced and tend to be overly restrictive[v].
- Adolescents help parents with technology[w] and act as online information brokers[x]
- Limited online regulation and safety [y]

[a]*Dynamic physical and brain maturation contribute to changes in learning and cognitive, emotional, and social, and identity development. Coupled with behavioral and contextual changes, early adolescence is a critical time of heightened sensitivity to information related to the self- and other, increasing the drive for social rewards and sensitivity to social evaluation (Dahl et al., 2018).* [b]*(Patchin, 2020).* [c]*(Nesi et al., 2018a,b).* [d]*(Rideout and Fox, 2018).* [e]*(Rummo et al., 2020).* [f]*(Spies Shapiro and Margolin, 2014).* [g]*(Uhls et al., 2017).* [h]*(Ybarra et al., 2015).* [i]*(Cabello-Hutt et al., 2018).* [j]*(Branje, 2018).* [k]*(Pangrazio and Cardozo-Gaibisso, 2020).* [l]*(Benítez Larghi et al., 2015).* [m]*(Plan International, 2018).* [n]*(Pew Research Center, 2019).* [o]*(Plan International, 2018).* [p]*(Pew Research Center, 2019).* [q]*(Eccles and Roeser, 2011).* [r]*(Romanosky and Chetty, 2018).* [s]*(Manago and Pacheco, 2019).* [t]*(Ferguson and Bornstein, 2012; Asemah et al., 2013).* [u]*(Kågesten et al., 2016).* [v]*(Barbosa, 2014; Livingstone and Byrne, 2015; Cabello-Hutt et al., 2018).* [w]*(McKenzie et al., 2019).* [x]*(Yip et al., 2016).* [y]*(Livingstone et al., 2015).*

well as gaining increased skills and competencies are important VYAs tasks, related to identity formation (Field et al., 1997; Conger et al., 2009), that can be specially scaffolded with digital media. With the rapid expansion of digital learning worldwide in the face of the COVID-19 pandemic, this reality has become even more true. Digital platforms leverage learning associated with two key processes that undergo development during early adolescence - reward processing and competition. By *gamifying* rewards and social evaluation, digital platforms motivate learning through the pursuit of competence and mastery. This builds upon the development of real skills and knowledge along with the feeling of success and growing confidence, contributing to affective learning and shaping identity for VYAs (Sailer et al., 2017; Dahl et al., 2018).

Social Media: Opportunities for Early Adolescent Social Emotional Learning and Identity Development

Early adolescence is an important inflection point around digital media use, with (1) increasing access and autonomy over mobile devices, particularly in HICs (Rideout and Robb, 2019; Young and Tully, 2019; Smahel et al., 2020) and social media (Odgers and Robb, 2020), (2) lack of effective regulations, and (3) lack of supervision and scaffolding, particularly in LMICs. Digital independence allows for unsupervised technology use, risk-taking, and digital autonomy (Ofcom, 2017; Anderson and Jiang, 2018). Before COVID-19 lockdowns, young people in LMICs reported that mobile devices granted more autonomy and allowed for greater mobility since phones also make them feel safer and able to communicate with parents and peers (Girl Effect and Vodafone Foundation, 2018). In LMICs, connecting online can help reduce loneliness and increase well-being (Girl Effect and Vodafone Foundation, 2018). During lockdown, online tools have become increasingly vital as sources of connection for adolescents (Survey Monkey and Common Sense Media, 2020; Magis-Weinberg, 2021).

Digital media affords online opportunities for youth, including access to information and education, connection with friends, expression of identity, entertainment, creative expression, participation, and engagement (Hasebrink et al., 2008; Livingstone et al., 2017b; Uhls et al., 2017). Social media in particular can help adolescents fine-tune social skills, meet social needs and enhance relatedness (Spies Shapiro and Margolin, 2014; Uhls et al., 2017), as predicted by the *stimulation hypothesis* (Bryant et al., 2006; Valkenburg and Peter, 2007). Social media features transform peer and group dynamics by changing the frequency, quality, intensity, and novelty of social interactions (Nesi et al., 2018a,b). Unlike in-person interactions, online communication allows for remote constant social connection which is also customizable (e.g., deciding to block a friend) (Manago, 2014; Nesi et al., 2018a,b). As VYAs develop social skills, they may benefit from the ability to customize online interactions but can also be challenged by increasing demands for availability or the lack of social cues in online settings. Thus, in contrast to older adolescents, VYAs may require additional support and parental mediation as they enter social media spaces.

Relationships are by-and-large strengthened online, with social media being key in maintaining existing friendships and online social networks mirroring and reinforcing offline social networks (Rideout and Fox, 2018). VYAs constantly connect with friends online, handle life events and strengthen interpersonal ties (Fitton et al., 2013; Vannucci and Ohannessian, 2019). Social media also allows for online-only friendships which can offer VYAs critical support, particularly for adolescents who are marginalized offline (Ybarra et al., 2015; Massing-Schaffer et al., 2020). Digital technologies can also offer new opportunities for mental health interventions with young people, particularly the most marginalized, in LMICs (Giovanelli et al., 2020; Rost

et al., 2020). Social media has played a preeminent role as a bridge for physical distancing in the pandemic lockdowns around the world, constituting a protective but also a risk factor for adolescent mental health and well-being (Ellis et al., 2020; Magis-Weinberg et al., 2021; Magson et al., 2021).

Several factors influence the impact of social media on VYAs (Spies Shapiro and Margolin, 2014), including (1) patterns of use, (2) gender, and (3) underlying vulnerabilities and strengths, resulting in a complex landscape of associations with well-being. Patterns of use based on time, number and type of social media platform determine whether psychosocial outcomes are positive or negative. For example, for VYAs in HICs, high social media use across a variety of platforms can be a risk factor for distress but can also enhance friendship competence and support (Vannucci and Ohannessian, 2019). Research in HICs suggests gender differences in motivations driving use. Girls are more likely to turn to social media for interaction than boys, engaging in self-disclosure of feelings and problems (Lenhart, 2015a; Rideout and Fox, 2018), while boys use more video games to interact and enhance their social status (Lenhart, 2015b; Patchin, 2020).

Social media enhances relational interactions for adolescents who are already socially engaged, "rich get richer" (social enhancement hypothesis; Peter et al., 2005; Desjarlais and Willoughby, 2010). However, social media can also amplify isolation and other barriers for lonely adolescents (Jackson, 2007) and negatively impact self-esteem (Valkenburg et al., 2006). Further, the *social compensation* hypothesis posits the use of social media to make up for offline introversion or social anxiety, "poor get richer" (Valkenburg et al., 2006). At the same time, the *displacement* hypothesis (Kraut et al., 1998) proposes that social media can displace time spent on health-promoting activities, including exercise, face-to-face interactions, and educational activities. Research should explore how the different hypotheses predicting the impact of social media on adolescent well-being in HICs (social stimulation, enhancement, compensation, displacement) apply to youth in LMICs. For example, in settings with limited extracurricular activities or safe spaces for youth to meet after school, online platforms do not displace other alternatives, and might be *the only* option for adolescents to meet their friends. Furthermore, the benefits of social compensation through social media might not be as strong in settings where there is heightened value for in person communication.

Digital Media: Risks for Early Adolescent Social Emotional Learning and Identity Development

Digital and social media are also associated with online risks for dangerous or illicit behavior enabled by the anonymity of the online world (World Health Organization, 2011; Uhls et al., 2017; UNICEF, 2017; Patchin and Hinduja, 2020). Most behaviors and risks online appear to mirror offline activities (for a review in HICs see George and Odgers, 2015). However, in HICs it has been shown that digital media also introduces new risks for adolescents, particularly in relation to body image (Choukas-Bradley et al., 2020), sleep (LeBourgeois et al., 2017), cyberbullying (Patchin and Hinduja, 2020), and digital reputation (George and Odgers, 2015). In adolescence, peer interactions contribute to psychopathology onset and maintenance, and influence risk taking (Gardner and Steinberg, 2005). Thus, some negative aspects of peer relationships can be amplified and transformed by social media, including cybervictimization (Fisher et al., 2016), social exclusion and *digital drama* (Anderson and Jiang, 2018), social comparison and feedback seeking (Nesi and Prinstein, 2015), and risky behaviors (Vannucci et al., 2020).

Especially in lower socio-economic backgrounds, negative online experiences can "spill-over" into negative offline interactions and events (George et al., 2020). Further, although social media platforms are officially restricted for under 13 year-olds, many VYAs still access them, without protections appropriate for their age (Young and Tully, 2019; Odgers and Robb, 2020). The VYAs most vulnerable to online risks include girls, youth marginalized by identity, culture, race, ethnicity or economics, and children with disabilities or those with mental health concerns, compounding with their vulnerability to offline risks as well (UNICEF, 2017). Youth growing up in LMICs may experience greater risks associated with social media use (Livingstone et al., 2017a; Banaji et al., 2018)—because of the digital dimension to existing vulnerabilities, and the fact that they typically have less adult support, scaffolding, and monitoring online (Cabello-Hutt et al., 2018). These vulnerabilities are compounded by the insufficiency of services and policies to address child and adolescent mental health needs (Zhou et al., 2020) despite the fact that they are a leading cause of health-related burden for youth worldwide (GBD Causes of Death Collaborators, 2017). In LMICs, cross-sectional studies conducted with older adolescents in Asia and Latin America have found some evidence of a negative association between screen time and unhealthy behaviors (Yan et al., 2017), and problematic media use and poor mental health (Hanprathet et al., 2015; Oberst et al., 2017; Wang et al., 2018), mediated by the fear of missing out and intensity of social media use (Oberst et al., 2017). Adolescents who use more social media experience the most risks but even more opportunities (Marques et al., 2018).

Opportunities and risks associated with digital media vary depending on the developmental stage and sociocultural context of the user (Cabello-Hutt et al., 2018; Smahel et al., 2020). Older adolescents engage in more online risks, regardless of having more digital skills (Livingstone and Helsper, 2009; Sasson, 2014; Cabello-Hutt et al., 2018). But, in addition to risks, older adolescents also enjoy more online opportunities than early adolescents (Livingstone and Helsper, 2009). Thus, early adolescence is a window of opportunity for promoting digital skills that better prepare adolescents for the online world.

CONTEXTUAL AND CULTURAL FACTORS BROADLY INFLUENCING VYA ACCESS, USE AND APPROPRIATION OF DIGITAL TECHNOLOGY

Adolescent digital ecologies are impacted by individual beliefs, abilities and family dynamics, as well as structural factors related

to income, technology access and cultural values (Livingstone et al., 2017a; Banaji et al., 2018; Cabello-Hutt et al., 2018; Marques et al., 2018; Smahel et al., 2020; Manago and McKenzie, under review). Socioeconomic status, educational resources and parental availability, expertise and attitudes toward technology, and mediation inform opportunities and risks for youth's lives online (Lemphane and Prinsloo, 2014; UNICEF, 2017; Banaji et al., 2018; Cabello-Hutt et al., 2018).

Both access and effective use are required to make the most of media. Around the world, economic and sociocultural factors influence multiple digital divides in (1) *access*, (2) *use*, and (3) *appropriation* of digital media that affect early adolescents (Benítez Larghi et al., 2015). Digital divides compound other social and structural inequities such as education, poverty, gender, age and geography (UNICEF, 2017; Banaji et al., 2018). Digital divides have been exacerbated by the pandemic lockdowns and school closures. As of November 2020, two thirds of school-aged youth did not have internet connection at home. This lack of access disproportionately affects 87% of youth in LMICs compared to 6% of youth in HICs, limiting education and connection with peers and family during the global COVID-19 pandemic (UNICEF International Telecommunication Union., 2020). Still, increased access without increased skills and literacy can amplify existing inequalities (Toyama, 2011).

Home computer and tablet access is relatively rare in LMICs (Pew Research Center, 2019). Compared to these platforms, the more common mobile access to the internet provides lower levels of functionality and content availability and the ability to seek and find information (Fong, 2009). Mobile devices facilitate access to social media platforms that are optimized for this medium of delivery. In addition, in many LMICs, cell phone plans provide free access to social media platforms, whereas internet services providers regulate cost and accessibility of third-party platforms and other services (Romanosky and Chetty, 2018). Predominant access through mobile devices contributes to a *smartphone* "bedroom culture," where use is more private and less supervised (Bovill and Livingstone, 2001). In low education, low-income settings, the use of social media is much more prevalent than other technology-based activities (like looking for information, educational opportunities or interacting with governmental agencies) (UNICEF, 2017; Girl Effect and Vodafone Foundation, 2018; Pew Research Center, 2019).

Emergent in childhood, gender norms and attitudes start to crystalize in early adolescence, as a result of pubertal changes, resulting in an expansion of boys' worlds but a contraction of girls' worlds, particularly in LMICs (Chandra-Mouli et al., 2017). While in Europe there are few gender differences in terms of adolescent technology access (Smahel et al., 2020), in LMICs there is a *digital gender divide* where girls disproportionately face barriers to access, use and appropriation (Plan International, 2018). Adolescent boys are 1.5 times more likely to own a mobile phone than girls, who must borrow devices (Girl Effect and Vodafone Foundation, 2018). Sharing friends and relative's phones gives girls conditional and restricted access, recreating conditions of gender specific community surveillance (Manago and Pacheco, 2019). Girls experience increased online risks and lower opportunities that mimic their offline realities, including community scrutiny and harassment or grooming. Female adolescents are worried about strong backlash responses that aim to reinforce traditional social norms (Girl Effect and Vodafone Foundation, 2018).

In early adolescence, the early adoption of new media, social reorientation, and increased sensitivity to context, may enhance opportunities for culture acquisition (Ferguson and Bornstein, 2012; Worthman and Trang, 2018). Social media practices of early adolescents reflect and are influenced by *local* cultural norms, dimensions, and values (Manago and McKenzie, under review). For example, an emerging literature *with adults* has demonstrated how cultural differences in collectivism *vs.* individualism (Hofstede, 1980) impact features of online networks as well as online behavior. Korean young adults, as part of a collectivistic culture, emphasize the relational aspects of social media, including belongingness, more than US young adults. In contrast, individualistic settings are associated with more direct communication and more open self-disclosure (Huang and Park, 2013; Na et al., 2015; Hong and Na, 2018). Thus, social media can reinforce traditional *local* cultural values (Holmes et al., 2015). Digital media also enables *remote* acculturation by permitting indirect intercultural contact across geographic distance (Ferguson and Bornstein, 2012). For instance, early adolescents in Jamaica can develop an orientation toward U.S. culture through mass media, without necessarily traveling abroad (Ferguson and Bornstein, 2012, 2015). As early adolescents are actively learning about themselves and their social worlds, it is important to examine the effects of how the indirect exposure to multiple cultures through digital media informs identity development, relationships with peers and families.

Given the increased motivation to gain social value in adolescence, it is important to recognize the strong socio-cultural influences on the ways to enhance self-evaluation (Becker et al., 2014) in the continuum between openness to change *vs.* conservation and self-enhancement *vs.* self-transcendence (Schwartz, 2012). For example, in a particular cultural context is an adolescent's positive self-evaluation based more on doing her duty or on controlling her life? This could play out in the way young adolescents seek social value enhancement in the digital domain. It could also play out in the opposite way—creating conflicts between the social-value currencies online and those in the local cultures. There are similar issues with gender norms, values, and behaviors (Abiala and Hernwall, 2013). Context and religious influences can amplify some traditional cultural values (Schwartz, 2012), and more specifically the opportunities for gaining social value as an adolescent girl vs. a boy (Kågesten et al., 2016). For example, some cultures value bold behavior in boys, but shy behavior in girls. These can shape the social learning opportunities and vulnerabilities in LMICs and can create or amplify conflicts with the local culture. There is also emerging evidence of the influence of media on gender norms in early adolescence (Kågesten et al., 2016; Livingstone et al., 2017a). Reshaping of relationships with families might introduce intergenerational discrepancies and result in parent-child conflict (Ferguson and Bornstein, 2012; Manago and McKenzie, under review).

NEW DIRECTIONS: INVESTIGATING SPECIFIC IMPACTS OF DIGITAL AND SOCIAL MEDIA ON EARLY ADOLESCENTS IN LMICS

Early adolescence is a time of mental health symptom onset (Paus et al., 2008), with increased frequencies of internalizing and externalizing problems (McLaughlin and King, 2015; Petersen et al., 2015). While the impact of social media on well-being, particularly mental health, has been an important focus of research in HICs, this question is underexplored in LMICs (Odgers and Jensen, 2020; Orben, 2020). In HICs, in work mostly with older adolescents, there is a negative (but small and non-causal) association between social media use and well-being [see recent reviews by Ivie et al. (2020), Odgers and Jensen (2020), Orben (2020), and Schønning et al. (2020)]. However, manifestations of psychopathology might be different for younger vs. older adolescents (American Psychiatric Association, 2013), and hence it is necessary to have a more granular study of the relationship between digital media and well-being for VYAs and consider developmental trajectories of psychopathology. Emerging evidence in the USA suggests that social media use might be associated with externalizing behaviors, including poor behavioral conduct and delinquent behavior in early adolescence (Ohannessian and Vannucci, 2020). There is currently a paucity of work on VYAs in general, and the Global South in particular (see Schønning et al., 2020, where only around 5% of the studies were conducted in early adolescence in the Global South—all of them in Asia).

There is an urgent need for work on early adolescence in a broader set of contexts in the Global South. Given that social media is the predominant digital media use for youth in these settings, understanding its relationship with adolescent well-being is paramount. Future studies should leverage the important recent advancements in research practices (Kross et al., 2020) which include moving away from coarse and subjective measures of screen-time. Studies should incorporate objective measures of media use, focus on longitudinal and experimental designs that are suited to assess causality, and align with principles of transparent and reproducible data analysis (Odgers and Jensen, 2020; Orben, 2020). It is important to incorporate an individual differences approach to identify sources of vulnerability and resilience, beyond average effects. Crucially, studies should focus on diverse and under-represented youth around the world and incorporate a socio-cultural and developmental approach (Manago and McKenzie, under review).

The heterogeneous effects of social media on well-being relate to the different psychological processes at play as users navigate this emerging social ecosystem (Kross et al., 2020). For example, positive online experiences reduce loneliness for early adolescents in Peru, with opposite effects for negative interactions (Magis-Weinberg et al., 2021). Early adolescent use of social media for comparison with others is associated with depression above and beyond a simple measure of screen time (Magis-Weinberg et al., in prep). Research should incorporate more careful consideration of different dimensions of digital media (patterns of use, motivations, positive and negative dimensions, passive vs. active use, etc.) to fully characterize its positive and negative consequences (Kross et al., 2020; Odgers and Jensen, 2020; Orben, 2020). In **Tables 2A,B**, we highlight several dimensions of VYA development that might inform risks and opportunities and warrant further investigation in LMICs. Future research should consider not only the heterogeneity that exists *between* HIC and LMICs, but also *within* LMICs. More research is needed to further delineate the *general principles* operating through early adolescent developmental processes of socio-emotional and identity learning and well-being in relation to digital media use. More research is also needed that focuses on how these principles apply in *specific* ways within particular contexts, countries, and cultures. Achieving a deeper understanding of these interactions in LMIC settings, can inform innovative approaches to promote early learning and development of adaptive digital skills and discernment.

BUILDING SKILLS AND RESILIENCE FOR CONSTRUCTIVE ENGAGEMENT ONLINE IN LMICS

Given the persistent global expansion of digital media use, there is an opportunity to leverage developmental science to inform policies and practices that create safe and enriching digital spaces. Enhancing opportunities for scaffolded learning to promote the early development of technology relevant knowledge and skills in VYAs has multiple benefits. This improves individuals' abilities to find and effectively learn, contribute, and connect, while also improving their capacities for avoiding harms. A developmental science approach[2] is crucial to ensure that the evolving adolescent needs and capacities do not lag behind design and policy considerations for younger children which might be focused on safety and reliant on parental controls. Developing policies and practices that help to provide these opportunities for VYAs can be particularly challenging in many LMIC settings—yet the importance is even greater because of the combination of increased vulnerabilities and opportunities.

Despite reorientation toward peers, in the transition from childhood into adolescence caregivers still play an important role in supporting learning, setting limits, and influencing behavior (Branje, 2018). Early adolescence offers an opportunity for more parental and teacher mediation and guidance during exploration of digital media, making it a prime time for intervention and setting of future trajectories (Odgers and Robb, 2020). It is therefore crucial to build a strong evidence base that can support culturally appropriate recommendations for parental and teacher guidance to promote positive media

[2]For a concrete example of policy that incorporates a developmental approach in HICs, see the *Age appropriate design: a code of practice for online services* published in the United Kingdom (Information Commissioners Office, 2020). This regulatory document delineates standards to safeguard minors within the digital world in developmentally appropriate ways by recognizing different needs and abilities in five groups: (1) the pre-literate and early literacy stage (2) core primary school years, (3) the transition years (what we refer to as VYAs), (4) teens, and (5) approaching adulthood (Information Commissioners Office, 2020).

use, digital citizenship and literacy in LMICs. Special attention should be paid to addressing the gender digital divide in LMICs.

Across the globe, VYAs experience transitions in school to larger, more complex social environments, or to a complete departure from formal education (Eccles and Roeser, 2011; UNESCO Institute for Statistics, 2018). Given the multiple transitions, it becomes important to find ways to support adaptive learning—and there are ways where digital media can contribute. Schools can serve as spaces where early adolescents can learn digital habits and get formed as digital citizens and can offer VYAs important guiding and support from teachers (Cabello-Hutt et al., 2018; Pangrazio and Cardozo-Gaibisso, 2020). In HICs there has been a proliferation of school-curricula to promote digital citizenship, media literacy and online safety, with limited evidence of their efficacy (Bulger and Davison, 2018). This presents an opportunity to tailor and redesign materials to cater to the specific needs of LMICs while building the body of evidence about their impact. Researcher-practitioner collaborations with schools in LMICs can advance design, implementation, and evaluation of school-curricula and programs to foster abilities around balance, online privacy and safety, online relationships and well-being and digital literacy (Magis-Weinberg, 2021). These programs can be more effective if grounded on developmental science principles and tailored to different stages (Pangrazio and Cardozo-Gaibisso, 2020). Crucially, digital technologies present a unique opportunity for learning experiences that go beyond classroom education on digital literacy to provide *experiential* learning (Kolb, 2014) in a simulated but realistic environment. For example, *Social Media TestDrive* (DiFranzo et al., 2019) is an interactive simulation that combines social media and educational components. In this safe environment, young adolescents get hands-on experience and guided reflections on the risks and benefits of social media. Like a driver simulation, this allows for learning to navigate the opportunities and vulnerabilities on the "digital highways," building effective skills early on (Ribble et al., 2004). This can set early adolescents on positive learning trajectories as they get more experience in social media and online relationships later in adolescence.

CONCLUSION

There is a compelling need to better equip young adolescents to successfully navigate the risks and the opportunities of the digital world. This challenge is compounded by the rapid pace of change, variability across global contexts in the ways digital devices are becoming available and used by youth, and limited high-quality global data capturing these dynamic changes in the wave of technological uptake. Focusing on early adolescence as a time of opportunities—a period of rapid growth, learning, and exploration online when youth are developing goals, values, priorities, and are open to adult guidance—creates an exciting approach to early intervention and prevention for digital well-being.

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

LM-W, ABS, and RD contributed to conception, design of the manuscript, and wrote sections of the manuscript. LM-W wrote the first draft of the manuscript. All authors contributed to manuscript revision, read, and approved the submitted version.

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BRIEF RESEARCH REPORT
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Brief Report–Modeling Media Use: How Parents' and Other Adults' Posting Behaviors Relate to Young Adolescents' Posting Behaviors

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Middle school is a period when young adolescents become more engaged with social media and adults become increasingly concerned about such use. Although research finds that parents often post about their children on social media, little is known about how adults' social media behaviors relate to youths' online behaviors. We surveyed 466 middle-school students about their social media habits, privacy-respecting behaviors, and their parents', other adults', and their own posting behaviors on social media. While 68% used social media, only 41% posted pictures. Of those, 33.5% also had parents and/or adults that posted about them. Using this subset, we found that adults' privacy-respecting behaviors (e.g., asking permission to post, showing post first) were significantly related to youth using these same privacy-respecting behaviors when posting on social media. Like many areas of development, young adolescents may learn about social media use by modeling their parents' and other adults' behaviors.

Keywords: social media, modeling, early adolescence, privacy, privacy-respecting behaviors, posting

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INTRODUCTION

Research finds that youth are overwhelmingly using social media and that use increases drastically during the middle school years (Pew Research Center, 2018). This increased usage has caused concern about how youth protect their privacy when connecting with others online, who may or may not be known to them (Wisniewski et al., 2015; Shin and Kang, 2016). While recommendations about teaching privacy are plentiful, little of it considers how youths' digital behaviors may mirror the online activities of important adults in their lives, such as parents. Decades of research have robustly demonstrated that youths' media habits are often congruent with their parents. For instance, studies of television have found that parents' television (TV) viewing habits predict their children's viewing habits more than access to TV or having a TV in the bedroom (Saelens et al., 2002; Yalçinet al., 2002; Gorely et al., 2004; Davison et al., 2005; Jago et al., 2013). One possible explanation is the influence of parental modeling on children's development (Tizard and Hiughes, 1984). Though robustly shown to influence traditional media habits (e.g., Gorely et al., 2004), the association between adults' and young adolescents' new media habits have not been well studied. Thus, we explore how middle-schoolers' online posting behaviors might relate to their parents' and other important adults' privacy-respecting posting behaviors on social media.

Learning Through Modeling

From the earliest ages, children look to important adults around them to learn how to interact, behave, speak, and so on (Tizard and Hiughes, 1984; Gopnik, 2012). This finding exists in a variety of developmental perspectives, from social-cognitive theories of modeling (Bandura, 1971) to sociocultural perspectives of guided participation (Rogoff, 1991). Given this consistent pattern of learning and development, it would make sense that young adolescents, who are new users of social media (Martin et al., 2018; Pew Research Center, 2018), would look to important adults around them for guidance on how to engage with these sites. This might be especially relevant when considering behaviors that are privacy-respecting, such as thinking about what is posted and getting permission before posting about others. Therefore, we surveyed young adolescents about their posting behaviors and the behaviors of their parents and other important adults.

METHODS

Sixth, seventh, and eighth graders (n = 466) in two middle schools in the Southeastern region of the United States completed anonymous online surveys in their homeroom or advisement class.

Measurement

Students reported on their demographic characteristics (gender, age, and ethnicity) and what types of social media they used most frequently. They were also asked whether their parent(s) and/or other adults ever posted photos of them on social media. If they selected yes, they were asked how often their parents and other important adults 1) show you what was posted, 2) ask your permission before they post, and 3) share private information about you. Response options included "never," "sometimes," and "always." These answers were summed with "share private information" reverse coded. Thus, higher total scores indicated more privacy-respecting behaviors. Youth were also asked if they ever posted pictures of friends on social media. If yes, they were asked how often they 1) showed the picture first and 2) asked permission. Response options were also "never," "sometimes," and "always." These posting behaviors were totaled into a privacy-respecting score as well.

Analytic Plan

First, the frequency of use of different types of social media was calculated. Then an analytic sample of students who posted on social media and had parents or other adults that posted on social media was created (n = 166 students). To determine if adult privacy-respecting behaviors were associated with tweens' privacy-respecting behaviors, ordinary least square (OLS) regressions were run with youths' privacy-respecting behaviors as the dependent variable and adults' privacy-respecting behaviors as the predictors. Covariates included gender, age, and ethnicity (white, not white).

RESULTS

The 466 students that participated ranged from 11 to 14 years (M_{age} = 12.6 (sd = 1.33)), with 45% being female (4% preferring not to share gender) and about half (56%) being White, 14% Black, 12% Latinx, and 11% Asian. Of these students, 68% used social media. Instagram was the most popular site (55%), followed by Snapchat (48%), and TikTok (22%). Of the full sample, 191 posted on social media. These posting youth tended to be slightly older, have a parent that posted about them, and be female and non-White, compared to their non-posting peers. Of those youth who post, 166 reported that their parents posted images of them on social media accounts and 148 reported that other adults posted images as well. In total, 137 adolescents reported posting on social media and having parents and other adults post about them. From this, two analytic samples (166 youth that post images and have parents that post; 137 youth, parents, and other adults all post; see **Table 1** for details) were created to assess how adults' privacy-respecting posting behaviors related to youths' online posting behaviors.

Adult Posting Habits

Across the full sample of youth whose parents and other adults post images of them, 40% and 32% respectively never asked permission prior to posting. Most did show the youth the photo at least some of the time (91% parents and 86% other adults) and parents and other adults rarely shared private information about the youth in their posts (19% parents, 16% other adults). See **Table 2** for details.

Parent and Adult Behaviors Predicting Posting Behaviors

The posting behaviors of parents and other important adults were significantly associated with tweens' posting behaviors. When parents showed their child the post before posting, their child was also more likely to show their friends pictured in the photo before posting (B = 0.17, SE = 0.07, p = 0.02). Similarly, when parents asked their child for permission before posting, their child also tended to ask others' permission prior to posting (B = 0.36, SE = 0.09, $p < 0.0001$). When parents' total privacy-respecting behaviors were higher, so were their children's (B = 0.46, SE = 0.1, $p < 0.0001$). Other adults' behaviors were also significantly related to youths' posting behaviors. When they showed photos prior to posting, so did youth (B = 0.22, SE = 0.09, p = 0.016). When they asked permission before posting, so did youth (B = 0.196, SE = 0.09, p = 0.038). Gender and age were also related to posting behaviors, with females and older participants engaging in more privacy-respecting behaviors. See **Table 3** for details.

DISCUSSION

This survey of middle-school students' social media use found that more youth report using social media than posting on social media (315 vs. 191). This pattern of viewing more than posting aligns with findings from Pew's recent survey of US youth (13–17 years) (Pew Research Center, 2018). Others also find more lurking (i.e., viewing without posting or commenting) than posting in early adolescence (Len-Ríos et al., 2016).

TABLE 1 | Demographic characteristics of participants.

	Full sample (n = 466)	Youth and parents post (n = 166)	Youth, parents, and other adults post (n = 137)
Age	M = 12.6 (SD = 0.85)	M = 12.7 (SD = 0.8)	M = 12.7 (sd =0 .81)
Gender			
Female	45%	52%	53%
Male	51%	46%	45%
Prefer not to say	4%	2%	2%
Race/Ethnicity			
White	56%	56%	58%
Black	14%	21%	22%
Latino	12%	13%	12%
Asian	11%	9%	8%
Other	7%	1%	0%

TABLE 2 | Frequency of parent and other adult privacy-respecting behaviors.

	Never		Sometimes		Always		Sample Size	
	Full %(n)	Subsample %(n)	Full %(n)	Subsample %(n)	Full %(n)	Subsample %(n)	Full	Sub sample
Adult shows before posting								
Parents	8.7% (29)	7% (13)	54.5% (182)	54% (88)	36.8% (123)	39% (65)	334	166
Other adults	14% (37)	12% (17)	52% (139)	49% (71)	34% (90)	29% (42)	266	144
Adult asks permission before posting								
Parents	40% (133)	43% (69)	38.5% (128)	37.5% (60)	21.5% (72)	19.5% (31)	333	160
Other adults	32% (85)	32% (46)	43% (113)	43.5% (62)	25% (67)	24.5% (35)	265	143
Adult shares private information								
Parents	81% (268)	79% (126)	17% (56)	20% (31)	2% (7)	1% (2)	331	159
Other adult	84% (224)	80% (115)	14% (36)	18% (26)	2% (6)	2% (3)	266	144

Note: Full sample includes youth who report that parents or other adults post about them; Subsample includes youth who post and report that adults post about them. Values between full and subsample do not significantly differ.

TABLE 3 | OLS Regression testing if parent and other adults' behaviors predict youths' posting behaviors.

	Youth shows before posting		Youth asks permission before posting		Youths' average privacy behavior	
	(1)	(2)	(1)	(2)	(1)	(2)
	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)
	(n = 166)	(n = 137)	(n = 166)	(n = 137)	(n = 166)	(n = 137)
Parent						
Show	0.17* (0.074)	0.09 (0.09)				
Permission			0.42*** (0.07)	0.36*** (0.9)		
Total					0.46*** (0.1)	0.37* (0.15)
Other Adult						
Show	---	0.22* (0.9)				
Permission			---	0.196* (0.09)		
Total					---	0.28+ (0.15)
Gender	0.22* (0.09)	0.18* (0.93)	0.08 (0.1)	0.14 (0.1)	0.20* (0.08)	0.21* (0.08)
Race	−0.05 (0.09)	−0.079 (0.1)	0.06 (0.11)	−0.16 (0.11)	−0.22 (0.08)	−0.06 (0.09)
Age	−0.03 (0.05)	−0.04 (0.06)	−0.13* (0.06)	−0.08 (0.07)	−0.04 (0.05)	−0.26 (0.05)
Constant	1.5* (0.72)	1.57* (0.78)	2.64** (0.85)	1.9* (0.89)	1.31+ (0.66)	0.98 (0.72)
Adj R2	0.065**	0.127***	0.21***	0.31***	0.15***	0.237***

+p < *0.06*, *p < *0.05*, **p < *0.01*, ***p < *0.001*.

In our sample, ¾ of parents posted images of youth on social media and almost 60% of youth reported other adults posted images of them as well. Thus, youth have an online presence, even if they do not have an account or post themselves. While parents and other adults tend not to share private information, they do not always ask permission to post about these tweens or even show the youth the post first. Thus, many young adolescents have an online presence that they did not create and do not control. In considering youths' digital privacy, the behaviors of parents and other adults should be included. Other studies of parental sharing about children on social

media have found that parents often post images and content about their children (Ammari et al., 2015; Ouvrein and Verswijvel, 2019) and many parents think they *should* ask permission more often than they actually do (Moser et al., 2017). Our findings provide one more reason why asking permission might be valuable. Results also highlight the importance of considering other adults, such as relatives and family friends.

Though few demographic characteristics were available in this anonymous dataset, it is worth noting that females were more likely to show images to friends before posting and engage in more privacy-protecting posting behaviors. Other studies have found that adolescent females, compared to males, spend more time editing photos and carefully considering what is posted (Dhir et al., 2016; Yau and Reich, 2019). Thus, it is likely that this consideration around sharing extends to sharing about their peers as well. Age was only related to asking permission before posting, with older middle schoolers being more likely to ask. Though not well studied, there is some evidence that friendship maintaining posting behaviors can relate to feelings of closeness which then predicts friendship maintaining posting behaviors (Rousseau et al., 2019). Perhaps 8th graders were further along in their cycle of peer closeness and relationship maintenance posting behaviors than those in younger grades.

Slightly over 1/3 of the sample had posted on social media and had their own image posted by others. Not surprisingly, parents and other adults' posting behaviors were related to youths' posting behaviors. Developmental theories robustly demonstrate the myriad ways in which youth learn from others (Bandura, 1971; Tizard and Hiughes, 1984; Rogoff, 1991; Gopnik, 2012). Posting behaviors on social media may be one more area in which youth look to important people in their life to learn how to engage with these sites. To date, most research exploring how parents model and support children's media habits have focused on young children (Coyne et al., 2017), with research on older children targeting mediation and monitoring practices (Wisniewski et al., 2015). These findings suggest that adult behavior may indirectly shape adolescents' privacy practices, highlighting an important aspect of how youth might learn about privacy online.

Limitations

Given the age of the participants, most of the sample did not post on social media, even though many were using social media platforms. This limited our analytic sample and subsequently our ability to test for smaller effects. As a cross-sectional study, the association between adults' social media behaviors and youths' is not causal. Additionally, the use of self-report introduces the risk of errors in memory, knowledge, and interpretation. Also, the selection of youth in the Southeastern U.S. limits the generalizability of findings to youth in other regions.

CONCLUSION

Even with these limitations, this exploratory survey study of middle-schoolers' social media use and posting behaviors provide insights into areas to consider when parenting around social media. Rather than rules or direct instruction, adults could model what we hope our children will do—consider others' privacy when engaging online.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because these data were collected as part of a research practice partnership by the school partners. Requests to access the datasets should be directed to Stephanie Reich (smreich@uci.edu).

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the University of California, Irvine Institutional Review Board. 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

All authors contributed to the design of the study, creation of the survey, and analysis and interpretation of the data. The second author facilitated data collection. The first author drafted the initial manuscript and the three other authors helped with revisions.

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Mixed Results on the Efficacy of the CharacterMe Smartphone App to Improve Self-Control, Patience, and Emotional Regulation Competencies in Adolescents

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Unprecedented levels of access to adolescents' time and attention provide opportunities to convert traditional character and socioemotional competencies interventions into behavioral intervention technologies. However, these new tools must be evaluated rather than assuming previously validated activities will be efficacious when converted to a mobile platform. Thus, we sought to design and provide initial data on the effectiveness of the CharacterMe smartphone app to build self-control and patience, which are built on underlying social-emotional regulation competencies, in a sample of 618 adolescents (M_{age} = 16.07, Female = 56.6%). We also sought to examine whether framing the app activities as having a transcendent (spiritual connection or moral/prosocial) rather than instrumental purpose would increase engagement and change in self-control, patience, and emotion regulation. Finally, we tested the impact of framing activities as building strengths vs. fixing weaknesses. Results highlight the difficulty of translating psychological interventions to behavioral intervention technologies. Overall, the CharacterMe smartphone app was unsuccessful in increasing self-control, patience, or emotion regulation in adolescents, with analyses showing no significant mean changes over time. Framing conditions and user engagement were largely not significant predictors of change in self-control, patience, and emotion regulation.

Keywords: technology, intervention, development, character, patience, self-control, adolescence, emotion regulation

INTRODUCTION

Adolescents around the world have access to smartphones and spend significant amounts of time on their mobile devices. Rates of adolescents' smartphone access are at or above 95% for most developed nations and unrelated to parental income (Madden et al., 2013; Yong-Wan et al., 2017). Even among 21 developing countries, a median of 54% of adolescents per country own a smartphone or use the internet occasionally (Poushter, 2016). Moreover, adolescents who have a device use them frequently. In the USA, 45% of adolescents report "almost constantly" using

their devices (Anderson and Jiang, 2018), and South Korean youth aged 10–19 report using their smartphones an average of 11 h per week (Yong-Wan et al., 2017).

Although numerous studies document the risks of high rates of various types of smartphone use among children and adolescents (e.g., problems related to addiction, anxiety, and depression; Jeong et al., 2016; Elhai et al., 2017), other research suggests adolescents may benefit when they engage with technology in healthy ways (e.g., Uhls et al., 2017; Moreno and Uhls, 2019). Given that smartphone use shows no signs of decreasing, it is imperative that researchers and designers work together to increase the ways adolescents can engage technology in a beneficial manner.

Given unprecedented levels of access to adolescents' time and attention through mobile devices, there is a unique opportunity for psychologists to convert traditional socioemotional learning and character strength interventions that promote positive youth development (e.g., Guerra and Bradshaw, 2008; Durlak et al., 2011; Proctor et al., 2011; Lavy, 2020) into behavioral intervention technologies. However, few such apps exist for youth. Numerous digital mental health interventions focus on ameliorating symptoms of mental illness and other physical health problems in children and adolescents (Liverpool et al., 2020; Temkin et al., 2020), but most of these do not focus on promoting more general socioemotional skills or character strengths in non-distressed populations. At the time of our app development, several scientifically vetted apps on the open marketplace delivered positive psychology interventions to adults. For example, the Happify app was a popular delivery tool for positive psychology, cognitive-behavioral therapy, and mindfulness-based activities and was soon validated in adults (Parks et al., 2018). However, few studies examined the effectiveness of similar apps among adolescent users. Since our data collection, a few standalone apps have reached the marketplace targeting self-regulatory capacities in adolescents (e.g., eScape by Hides et al., 2019; SmartCAT2.0 by Silk et al., 2020), but those were not available during our design process. Thus, we endeavored to assess whether digital media might be developed to cultivate character strengths in adolescents.

Although behavioral intervention technologies provide increased opportunity for user access and integration with daily life, they also exacerbate challenges related to user adherence and engagement that are less prominent for in-person interventions (Schueller et al., 2013). These challenges are especially pronounced when targeting adolescent users, who tend to have lower self-regulatory capacities (Blakemore and Choudhury, 2006; Opitz et al., 2012) and may require greater scaffolding to gain socioemotional and moral competencies that promote character strengths than adults (Schnitker et al., 2017). Thus, psychologists must not assume previously validated activities will be efficacious on a mobile platform for adolescents.

Given these opportunities and challenges, the aim of the present study was to design and conduct an initial assessment of the CharacterMe smartphone application's ability to build social-emotional capacities for emotion regulation (i.e., processes that monitor, assess, and modulate emotional reactions in goal pursuit; Zeman et al., 2002) that facilitate development of the character strengths of self-control (i.e., the ability to override predominant responses; Inzlicht et al., 2014) and patience (i.e., the ability to stay calm in the face of frustration, adversity, or suffering; Schnitker, 2012) among adolescents. We chose these strengths to offset broader concerns that smartphone use is associated with lower delay of gratification and impulse control (Wilmer and Chein, 2016) alongside findings that adolescents with lower self-regulatory abilities are more prone to the negative effects of smartphone use (e.g., addiction; Gökçearslan et al., 2016). Moreover, ethicists theorize self-control and patience assist in the acquisition and expression of a range of character strengths (Pianalto, 2016), and empirical data show these strengths promote positive social skills and well-being (Tangney et al., 2004; Schnitker, 2012; Ronen et al., 2016; Schnitker et al., 2017; Morrish et al., 2018; Lavelock et al., 2021). Researchers have successfully built apps to increase such regulatory strengths in adults; for example, Fishbach and Hofmann (2015) found a 1-week smartphone intervention increased self-control in the pursuit of personal goals. Thus, we were confident in the necessity and potential success of building a behavioral intervention technology for youth cultivating self-control and patience as well as the underlying social-emotional capacities for emotion-regulation.

Following an extensive design process, we developed an app around nine regulatory tasks. The first three tasks targeted the improvement of self-control based on the strength-energy model of self-control (Baumeister et al., 2007), which conceptualizes self-control as a domain-general strength that is depleted by short-term exertion but can increase through repeated use over time. At the time we developed our app, there were over a dozen studies that suggested enhancing domain specific self-control through small acts of practice translated to enhanced self-control in other domains for adults. Although a subsequent meta-analysis found that these self-control training effects were likely smaller and less stable than originally reported (Inzlicht and Berkman, 2015), there were still persistent effects for self-control practice in one domain increasing self-control across multiple domains. Researchers have begun testing such self-control interventions based on this model with adolescent samples; initial work suggests interventions can increase self-control and patience when not perceived as too difficult (Schnitker et al., 2017). Altogether, the effectiveness of self-control enhancing activities needs further exploration, but there is some empirical support for their potential with adolescents. Moreover, little is known about the impact of delivering these interventions through digital tools designed specifically for adolescents. Thus, *we hypothesized our three "Get Better" tasks grounded in the strength-energy model would increase the character strengths of self-control and patience as well as emotion regulation competencies in adolescents through a smartphone app (H1a)* because increases in domain general self-control would facilitate improvements for across all strengths and competencies requiring regulation. Task descriptions and the studies from which we adapted them are provided in **Table 1**.

The remaining six tasks (also in **Table 1**) sought to cultivate patience in the context of interpersonal conflict by targeting underlying social-emotional competencies related to emotion

TABLE 1 | Description of CharacterMe tasks.

Task	Participants instructed to…	Adapted from
Self-Control tasks		
Hand swap	Use a non-dominant hand for 5–20 min	Schnitker et al., 2017
Math challenge	Solve math problems and then are interrupted with a chance to instead watch a video	Galla et al., 2014
Watch your mouth	Choose one word they say too much and avoid using it for 5–20 min	Gailliot et al., 2007
Conflict resolution tasks		
Listen up	Listen to a piece of music of their choice for 30 s that helps to improve mood	Moore, 2013
Mindfulness	Engage in a mindful breathing exercise for X min	Meiklejohn et al., 2012; Metz et al., 2013; Zoogman et al., 2015
Selfie	Take a picture depicting themselves during a conflict, then relax and breathe deeply for 60 s before taking another picture of themselves	Merry et al., 2004; Meiklejohn et al., 2012; Metz et al., 2013; Zoogman et al., 2015
Solutions	Brainstorm three ways to solve the conflict in a more positive manner then indicate the best solution and reflect on their choice	LeCroy and Rose, 1986; Johnson et al., 1997
Take perspective	Imagine how the other person felt during the conflict and rate the other person's emotions	LeCroy and Rose, 1986; Johnson et al., 1997; Beelmann and Heinemann, 2014
Think again	Reappraise their initial negative thoughts about the conflict	LeCroy and Rose, 1986; Merry et al., 2004; Schnitker, 2012

regulation. Previous research suggests there are three types of patience that share a common core but distinctively express themselves for interpersonal frustrations, long-term life hardships, and short-term daily hassles (Schnitker, 2012). Adolescents encounter interpersonal stressors at a high rate (reporting an average of 7–8 conflicts per day; Laursen, 1995), so we focused on activities around engaging interpersonal conflicts in a more regulated and patient manner. Extant research demonstrates a connection between adolescents' abilities to resolve conflicts well and the self-regulatory skills we were interested in cultivating (e.g., Vera et al., 2004). Likewise, two previous studies with interventions specifically targeting increases in the virtue of patience among adults showed that activities involving meditation, cognitive reappraisal, emotional awareness, savoring the present, and adopting a positive viewpoint contributed to an increase in patience and well-being across time (Schnitker, 2012; Lavelock et al., 2021). Moreover, numerous studies testing specific strategies to build social-emotional competencies that underlie patience in adolescents support the efficacy of activities that build emotional recognition (Merry et al., 2004; Meiklejohn et al., 2012; Metz et al., 2013), use music to regulate mood (Moore, 2013), teach mindfulness meditation (Meiklejohn et al., 2012; Metz et al., 2013; Zoogman et al., 2015), generate potential interpersonal solutions for conflict (LeCroy and Rose, 1986; Johnson et al., 1997), facilitate perspective-taking (LeCroy and Rose, 1986; Johnson et al., 1997; Beelmann and Heinemann, 2014), and teach cognitive reappraisal/reframing (LeCroy and Rose, 1986; Merry et al., 2004; Schnitker, 2012). Although these tasks do not specifically target the development of self-control, they require self-control to engage, so we would expect that they might build self-control alongside the social-emotional competencies that underlie patience according to the strength-energy model. *Thus, we hypothesized that our six "Solve a Conflict" tasks would increase the character strengths of patience and self-control as well as emotion regulation competencies across time (H1b).*

In order to examine the impact of technologically mediated interventions, it is important to consider the level of use and engagement by the target audience alongside the actual content of activities. Studies assessing positive psychology interventions and behavioral intervention technologies suggest intervention effectiveness is dependent on participant engagement and effort (Lyubomirsky et al., 2011; Schueller et al., 2013; Schnitker et al., 2017; Schnitker and Richardson, 2019). Designers can increase engagement by using small rewards (Thompson et al., 2008), enhancing user agency (Coyle et al., 2012), and highlighting an app's usefulness (Venkatesh and Davis, 2000). Accordingly, we designed the CharacterMe app to include an individual point-based participation reward system (without using *social* rewards that are more likely to activate addictive interaction), allow for activity choice, and include introductory videos explaining the potential positive effects of the activities. However, including these design elements does not guarantee high engagement, so attention to usage data is an essential component of the design process (Klasnja et al., 2011). We tested the hypothesis that *higher levels of engagement of particular tasks would predict changes in the character strengths of patience and self-control as well as emotion regulation competencies across time (H2).*

Another important area to consider for building behavioral intervention technologies is the higher-level motivations that adolescents have for engaging in character building interventions

(Schnitker et al., 2020). Therefore, we also examined whether framing the app as providing distinct types of benefits would change effectiveness and engagement. In their integrated framework for building behavioral intervention technologies for mental health, Mohr et al. (2014) argue designers need to theoretically address both the "why" and "how" of interventions to explicate the overarching goals alongside specific behavior change strategies. However, the aim to build self-regulatory skills could activate a wide variety of higher-order goals that might differentially affect the perceived usefulness of the app, and perceived usefulness predicts subsequent usage behavior (Venkatesh and Davis, 2000). Previous research with adolescents demonstrates that experimentally activating transcendent, or beyond-the-self, motives (e.g., helping others, making the world a better place) in contrast to self-oriented motives (e.g., getting rich, performing well to get a job) for educational activities increases academic self-control and grade point average (Yeager et al., 2014). We manipulated the framing of app activities through the introductory videos, a self-reflection task, and instructional language to emphasize the utility of the activities to either (a) foster spiritual purpose and connections, (b) promote moral development and prosociality, or (c) improve performance and success. *We hypothesized the first two framings with beyond-the-self components would lead to higher levels of app engagement and greater increases in the character strengths of patience and self-control as well as emotion regulation competencies across time (H3).*

In addition to considering differential impact of providing self-oriented and beyond-the-self sources of motivation, it also important to consider the impact of strength-based vs. deficit-oriented approaches. We examined whether framings would differ based on how they were worded in terms of building strengths vs. fixing/preventing deficits (e.g., build connections vs. prevent disconnection). Positive psychologists claim that strengths-building interventions have beneficial effects beyond traditional deficit-repair approaches (e.g., Seligman et al., 2005), and research from the motivation literature shows that people are more successful in the pursuit of approach/promotion vs. avoidance/prevention goals (Elliot and Friedman, 2007). *We hypothesized that framing activities as strength building would lead to greater increases the character strengths of patience and self-control as well as emotion regulation competencies than framing activities as fixing deficits (H4).*

In summary, the CharacterMe smartphone application was designed to engage adolescents in the use of research-informed strategies for building the character strengths of self-control and patience as well as underlying emotion regulation capacities. Specifically, we created three "Get Better" tasks based on the strength-energy model, which we hypothesized would increase self-control (*H1).* We also targeted the development six emotion regulation strategies situated in interpersonal conflicts in our "Solve a Conflict" tasks, which we hypothesized would build patience and self-control, alongside the underlying social-emotional capacities for emotion regulation (*H2).* We also sought to examine whether framing the app activities as having a transcendent (spiritual connection or moral/prosocial) rather than instrument purpose would increase engagement and change in self-control, patience, and emotion regulation (*H3*). Finally, we tested the impact of framing activities as building strengths vs. fixing weakness (*H4*). Following previous studies of character interventions in adolescents (e.g., Strengths Gym; Proctor et al., 2011), we sought to examine the effectiveness of the intervention across a 6-month period. Two meta-analyses of school-based programs developing many of the social-emotional competencies underlying our patience building activities found that positive changes in students persistent for at least 6 months after intervention (Durlak et al., 2011; Taylor et al., 2017). Thus, behavior intervention technologies converting in-person interventions to an online platform should seek similarly persistent effects.

MATERIALS AND METHODS

App Design Process

Our team engaged in an iterative participatory design process (Spinuzzi, 2005) for building the smartphone app. We assembled an interdisciplinary team, which included a designer, personality/social psychologist, developmental psychologist, and developer. We sought to approach our collaboration with a focus practicing the virtues Steen (2013) deems essential for participatory design: cooperation, curiosity, creativity, empowerment, and reflexivity.

Our first step to design was conducting a literature review of the existing interventions that had been previously validated to cultivate character strengths. Next, we brainstormed ideas for app design. We also conducted a systematic assessment of the app marketplace to map the landscape of related products. We surveyed teens for their top five most-used apps as a way to determine which user interfaces and interactions would be conventional and expected by our target audience. We followed the convention of the simple, bottom navigation from Instagram and the bright, playful colors of Snapchat along with its whole-screen swiping gesture as a secondary navigation (see **Supplementary Material** for design process visuals).

One aspect common in apps popular among teens that we did not borrow was the deliberate use of *social* reward (e.g., posting to a social network and getting likes from friends) to create addictive patterns (e.g., Van Deursen et al., 2015) that lead to problematic smartphone use, which is consistently correlated with depressive and anxiety symptom severity (Elhai et al., 2017). We resolved early on to reject these patterns in our design because research suggests people low in self-regulation are more prone to smartphone addiction (Gökçearslan et al., 2016). Using social rewards that might promote addiction would undermine our efforts to increase self-regulation among our most vulnerable users. Thus, we designed a simple point-based system, assigning experience points to each activity completed for progression through 10 levels across the 2-week study period visible in an animated bar at the top of the home screen.

We (designer and researchers) continued forward to fully implementing our iterative participatory design process (Spinuzzi, 2005), which included a user survey and focus groups with adolescents at local high schools to gauge interest in

various app activities and designs as well as conversations with stakeholders As we began to focus on patience, self-control, and emotion regulation as target strengths and capacities, we asked adolescents to describe real-life scenarios where they struggled in these areas and solicited feedback on how various technologically mediated tools might provide solutions for these needs. Adolescent focus group participants expressed that they would get caught in cycles of recurring interpersonal conflicts (though they used the terminology of "fights") and would be very interested in tools that would help them try out new strategies for staying calm during or soon after the conflict. Thus, our adolescent focus groups indicated a "solve a conflict toolkit" was a highly attractive and intrinsically rewarding activity. They also expressed interest in "get better" activities that would feel more game-like and build regulatory skills.

Next, our designer mapped out data architecture and user experience in flow charts and sketches, which began describing the elements comprised in the behavioral intervention technology model (Mohr et al., 2014), answering why, what, how (conceptual and technical), and when questions. The designer and academics reconvened to tweak designs and then began the arduous process of working out the specific instructions for the tasks in the app. Whereas, the researchers on the team were biased toward material with high fidelity to the scientifically-tested intervention protocols, the designer and developer were biased toward pithiness, minimalism, and positive user experience. This friction mirrored Steen's (2011) identification of the tension of balancing the users' knowledge and ideas with the practitioners'/researchers' expertise inherent in human-centered design.

During this time, programming began in earnest that also attended to the back-end data structures and web interface that enabled researchers to edit framing conditions and access participant data. Finally, we began testing the design with users and continued to tweak the app. At this point, the app was approved in both the Apple and Google Play stores for download, but the study experience could only be accessed with a specific code provided by the research team. See also https://mattlumpkin.com/portfolio/characterme-2/ for more description of the design process.

Sample and Procedure

Adolescents ranging in age from 15 to 19 ($N = 618$, $M_{age} = 16.07$, $SD_{age} = 0.99$; Female = 56.6%) were recruited from nine high schools in metropolitan Los Angeles, CA after obtaining approval from the Institutional Review Board. Participants were ethnically diverse: 41.1% Asian, 29.5% Latinx, 12.9% White, 11.5% other, and 5.0% African American. Participants differed in self-reported socioeconomic status: 10.4% very poor or poor, 32.2% lower middle-class, 43.8% middle-class, 13.5% upper middle-class or rich.

Participants completed an online pretest (T1); engaged in the CharacterMe app for 2 weeks and completed an online post-test (T2); and completed online follow-up surveys at 1-month (T3) and 6-months (T4). We chose to require 2 weeks of app engagement based on previous character and emotion regulation interventions study durations in adolescents (e.g., Liehr and Diaz, 2010; Schnitker et al., 2017) and adults (e.g., Seligman et al., 2005; Mitchell et al., 2009; Fishbach and Hofmann, 2015) coupled with feasibility for participant retention and payment. Participants were compensated for their time through Amazon gift cards as follows: $14 for the T1 survey, $32 for app participation, $14 for the T2 survey, $20 for the T3 survey, and $20 for the T4 survey. Attrition rates were 30% at T2, 42% at T3, and 54% at T4. Although power analyses are not available for latent growth models, a sample size of at least 100 participants is preferable (Curran et al., 2010), suggesting the current sample is sufficiently powered. We report how we determined sample size and all data exclusions (if any) in the **Supplementary Material**.

Upon completing the first survey, participants were assigned to one of six framing conditions crossing the three purpose domains with the approach vs. avoidance orientation (spiritual approach, spiritual avoidance, moral approach, moral avoidance, instrumental approach, instrumental avoidance). They were instructed to watch two framing-specific videos related to the app, each highlighting the usefulness of the two types of tasks, and then complete a self-reflection exercise intended to help them internalize the app's manipulated usefulness to their own lives. See the **Supplementary Material** for links to the framing videos and reflection task instructions. The framing conditions were also reinforced through a second viewing of the two videos after ∼1 week of app engagement.

Although the framing videos and reflection task were the primary mechanisms for manipulating the purpose of the app activities, we also intended to reinforce the framing through minor tweaks to the instructions for the Daily Thermometer, Hand Swap, and Watch Your Mouth activities in the app. There were no instructions specific to framings for any of the six conflict solving tasks. Due to researcher error, while engaging the back-end administrator interface, participants in four of the six conditions received the incorrect wording for the Thermometer, Hand Swap, and Watch Your Mouth tasks. Specifically, the instrumental/avoidance condition viewed moral/approach wording, the moral/avoidance condition viewed moral/approach wording, the moral/approach condition viewed spiritual/approach wording, and the spiritual/approach condition viewed the moral/approach wording. See a full accounting of the framing activities and instructions per condition in the App Framing Error Details page of the **Supplementary Material**. Although these instruction errors undermined the purity of the framing conditions, the manipulation was very subtle (i.e., replacement of a few words in introductory instruction screens; see **Supplementary Table 1**) in comparison to the much more explicit manipulation provided by the videos and engagement in the self-reflection exercise. Inspection of the reflection exercise responses showed that participants were applying the framings from the videos to their own lives. Thus, although the instruction errors within the app for three out of 10 activities undermined the purity of the conditions, there is still value in examining the framing results. However, all interpretations should be made with caution and not applied without replication.

The CharacterMe App was available for download in the Apple and Google Play stores or accessed through an online

browser. A description of the design process and screenshots of the app are available in the **Supplementary Material**. Following participant assent and parental consent, participants were sent a code to allow access to the app. Participants had the option to enable push notifications, which provided daily reminders to engage in tasks (see **Supplementary Material** for schedule). Participants who were engaging with online browser version received reminder texts three times per week for 2 weeks.

Participants were asked to fill out a feeling thermometer task each day. They were given suggestions for basic self-control tasks and conflict resolution tasks to complete each day, but they were also allowed to choose their own tasks. For the conflict resolution tasks, adolescents detailed a recent conflict, indicated who was involved, and provided a reason for the conflict. Participants rated four emotions (anger, sadness, upset, and happiness) during the worst point of the conflict (e.g., "How angry were you?") and following the task (e.g., "How do you feel now?").

Measures

The following measures were used in the present analyses. Items for these measures and descriptions of all other measures included in the study are listed in the **Supplementary Material**.

App engagement was assessed through the number of days participants engaged the app across the 14-day period, and by summing the number of times participants engaged in each specific task.

Patience was assessed with the 3-Factor Patience Questionnaire (Schnitker, 2012) for three factors: life hardships patience (e.g., "I am able to wait out tough times"), interpersonal patience (e.g., "I am patient with other people"), and daily hassles patience (e.g., "In general, waiting in lines does not bother me"). Responses ranged from 1 = *not like me at all* to 5 = *very much like me*. Previous research has demonstrated the utility of this scale to measure change in patience in response to short-term interventions among adolescents (Schnitker et al., 2017). Internal reliability omega coefficients were 0.53 for daily hassles, 0.64 for interpersonal, and 0.74 for life hardships patience.

Self-control was measured with the Brief Self-Control Scale (Tangney et al., 2004). In accordance with de Ridder et al. (2011), we assessed inhibitory self-control using items directed toward overcoming impulses (e.g., "I am good at resisting temptation"). Responses ranged from 1 = *not at all* to 5 = *very much*. Negatively worded items were reverse-scored to reflect higher inhibitory self-control. Numerous studies have used this scale to measure adolescent self-control across time and cultures (e.g., de Ridder et al., 2012; Li et al., 2019; Liang et al., 2020). Internal reliability was 0.53.

Emotion regulation was assessed with the Children's Emotion Management Scales (Zeman et al., 2002). Of interest were anger regulation (e.g., "When I'm feeling mad, I control my temper") and sadness regulation (e.g., "When I am feeling sad, I control my crying and carry on"). Responses ranged from 0 = *not true* to 2 = *very true*. Numerous studies have used this scale to assess adolescent emotion regulation across time (e.g., McLaughlin et al., 2011), and scale findings correlate with respiratory sinus arrhythmia among adolescents (e.g., Cui et al., 2015). Internal reliability was 0.70 for anger regulation and 0.55 for sadness regulation.

Analytic Plan

To examine the effectiveness of the app tasks in promoting anger and sadness regulation, self-control, and three factors of patience, latent growth curve models (LGCM) were estimated to examine within-person change across time. Unconditional LGCMs were estimated to examine overall change across time. Next, conditional LGCMs were estimated to include CharacterMe tasks, framings, and number of days of engagement with the app as predictors of change, controlling for age and gender[1].

RESULTS

App engagement across the course of the study is diplayed in **Figure 1**. Model fit indices for conditional and unconditional LGC models are shown in **Table 2** and parameter estimates for LGC models are shown in **Table 3**.

Unconditional Models

For all six constructs, there were no significant changes over time, on average, which fails to provide evidence for *H1*. The variance of the slopes for sadness regulation (but not anger regulation), self-control, and all three types of patience were significant, suggesting interindividual differences in intraindividual change. Though significantly different from zero, the size of effects for variance in slope for self-control and the three patience factors were quite small (i.e., all coefficients <0.01); thus, any inferences based on effects related to variability in these variables should be made with extreme caution. In contrast, the variance of the slope for sadness regulation was similar in size to the variance of the intercept, which allows for solid grounding to make inferences about predictors of change in sadness regulation.

Conditional Models

Participants who spent more days engaging with CharacterMe showed negative changes in sadness regulation but positive changes in life hardships patience. In other words, more time in the app was associated with decreases in sadness regulation and increases in life hardships patience across time.

Engagement with particular tasks was not a significant predictor of daily hassles patience, self-control, or anger regulation. Greater engagement with Hand Swap and Watch Your Mouth was positively associated with changes in sadness regulation, whereas greater engagement with Mindfulness and Take Perspective was negatively associated with within-person changes in sadness regulation. Changes in life hardships patience was positively associated with greater engagement with Take Perspective and Watch Your Mouth but negatively associated with Hand Swap. Engagement with Take Perspective and Think Again positively predicted within-person change in interpersonal

[1]Additionally, we ran exploratory supplemental analyses, which included religiosity predictors as covariates in the conditional LGCMs. These findings are reported in the **Supplemental Material**.

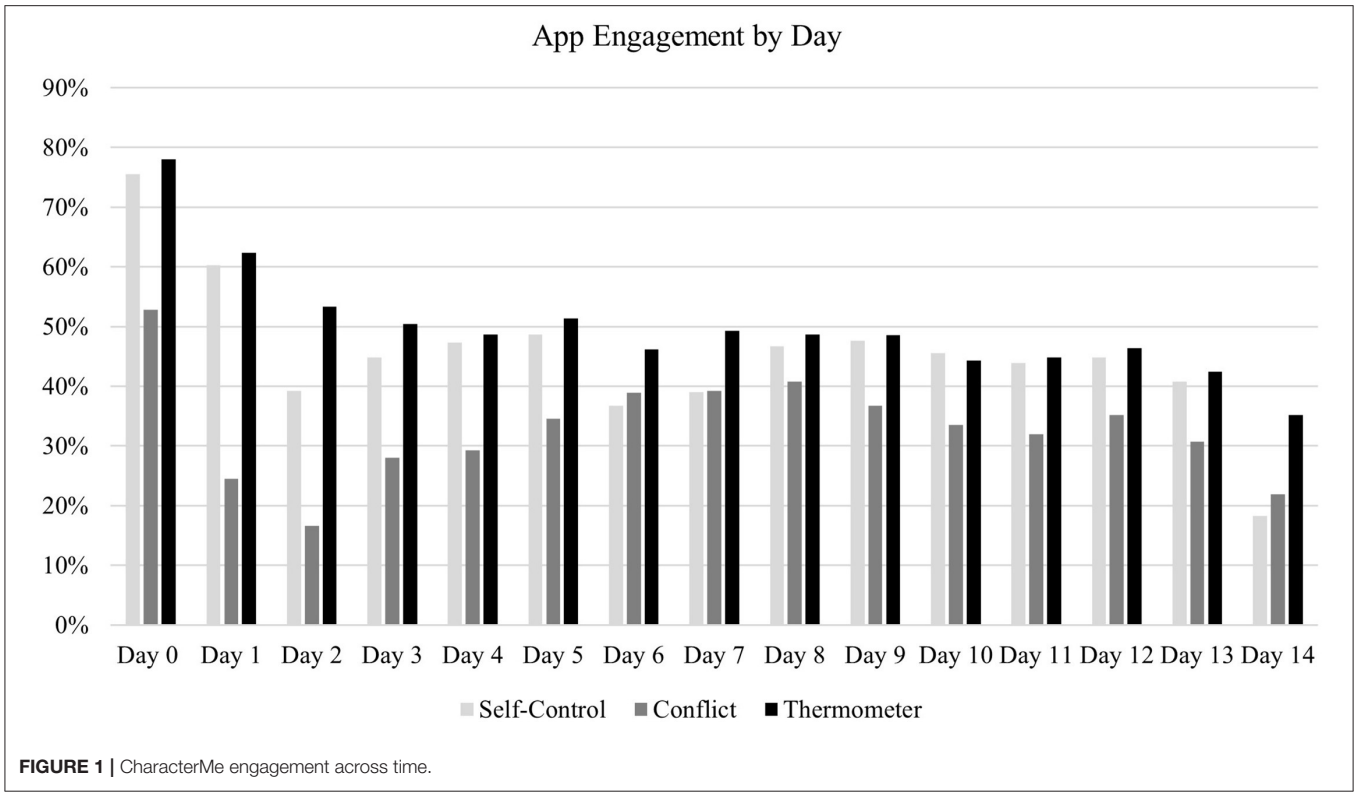

FIGURE 1 | CharacterMe engagement across time.

TABLE 2 | Model fit indices for latent growth curve models.

	AIC	BIC	$\chi^2(df)$	CFI	TLI	RMSEA
Unconditional model						
Life hardships patience	3928.84	3964.44	8.19 (6)	0.99	0.99	0.02
Interpersonal patience	3092.00	3132.05	21.44 (5)***	0.97	0.96	0.07
Daily hassles patience	3735.68	3771.28	20.67 (6)**	0.97	0.97	0.06
Self-Control	1923.68	1959.26	9.87 (6)	0.99	0.99	0.03
Anger regulation	2035.20	2075.24	10.31 (5)	0.98	0.98	0.04
Sadness regulation	1589.50	1625.10	21.43 (6)**	0.93	0.93	0.06
Conditional model						
Life hardships patience	3184.23	3297.42	67.51 (55)***	0.98	0.97	0.02
Interpersonal patience	2462.31	2575.50	82.71 (55)**	0.97	0.96	0.03
Daily hassles patience	3066.99	3180.18	96.48 (55)***	0.94	0.91	0.04
Self-Control	1513.85	1626.93	69.97 (55)	0.97	0.96	0.02
Anger regulation	1659.43	1776.82	61.57 (54)	0.98	0.97	0.02
Sadness regulation	1304.00	1417.19	83.37 (55)**	0.92	0.90	0.03

AIC, Akaike Information Criteria; BIC, Bayesian Information Criterion; RMSEA, Root Mean Square Error of Approximation; CFI, Comparative Fit Index. For unconditional models of life hardships, daily hassles, and sadness regulation and for all conditional models except anger regulation, residuals for T4 values were small but negative, and thus fixed to 0.
$^*p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

patience whereas engagement with Mindfulness was negatively related. Thus, findings were mixed for *H2*.

There was limited support for *H3/H4*. Compared to instrumental/avoidance framings, moral/avoidance framings predicted more positive within-person change in life hardships and interpersonal patience whereas the spiritual/approach framing predicted positive change in interpersonal patience only.

DISCUSSION

Results highlight the difficulty of translating psychological interventions to behavioral intervention technologies. Overall, the CharacterMe smartphone app was unsuccessful in increasing self-control, patience, or emotion regulation in adolescents, with analyses showing no significant mean changes over time.

TABLE 3 | Parameter estimates for LGC models.

	Life hardships patience	Inter-personal patience	Daily hassles patience	Self-Control	Anger regulation	Sadness regulation
Unconditional model						
Mean						
Intercept	3.27***	3.37***	3.38***	3.07***	2.13***	2.14***
Slope	0.01	0.00	0.00	−0.03	−0.00	−0.00
Variance						
Intercept	0.38***	0.34***	0.40***	0.12***	0.13***	0.07***
Slope	0.00***	0.00***	0.00***	0.00***	0.00	0.08***
Conditional model						
Gender	−0.009	−0.006	0.000	−0.001	−0.004	0.001
Age	−0.002	−0.001	−0.003	−0.002	−0.001	0.000
Hand swap	−0.001***	0.000	−0.001	0.000	0.000	0.000*
Math	−0.001	−0.001	0.000	−0.001	0.000	0.000
Watch your mouth	0.001*	0.000	0.000	0.000	0.000	0.000*
Listen up	−0.001	−0.001	−0.001	0.000	0.000	0.001
Mindfulness	−0.003	−0.004*	−0.002	0.000	−0.002	−0.002*
Selfie	0.002	0.000	−0.003	0.000	0.001	0.002
Solutions	−0.001	0.000	−0.001	0.000	0.000	0.001
Take perspective	0.002***	0.001*	0.001	0.000	0.000	−0.001*
Think again	−0.001	0.004*	0.002	−0.001	0.001	0.000
Total engagement	0.002*	0.000	0.000	0.000	−0.001	−0.002**
Framing						
Instrumental/Approach[a]	0.012	0.008	−0.010	0.000	0.010	0.005
Moral/Avoid[a]	0.030**	0.023**	0.001	−0.002	0.013	0.008
Moral/Approach[a]	0.019	0.006	0.004	−0.003	0.006	−0.001
Spiritual/Avoid[a]	−0.005	−0.002	−0.018	−0.013	−0.002	0.003
Spiritual/Approach[a]	0.004	0.016*	−0.012	0.002	0.009	0.004

[a]*Instrumental/Avoid framing is the reference.*
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Why Was the App Largely Ineffective?

User Engagement Provides Limited Information

Initial analysis suggests low levels of sustained user engagement may explain the app's ineffectiveness; by the 5th day, less than half of participants remained engaged (despite being paid for participation). However, low engagement does not seem to be the only reason for the null findings because the total days of engagement in the app was not a significant predictor of change for interpersonal patience, daily hassles patience, self-control, or anger regulation. Total engagement did predict very small increases in life hardship patience, but it also predicted very small decreases in sadness regulation. Though a decrease in sadness regulation was opposite the hypothesized effect, further analyses suggest it may reflect a willingness to accept sadness rather than suppress it.

Engagement with particular tasks only partially elucidates these findings further. Greater engagement in four of nine tasks (Hand Swap, Watch Your Mouth, Mindfulness, Take Perspective) led to small simultaneous increases and decreases in three out of six outcomes (life hardships patience, interpersonal patience, and sadness regulation). Though statistically significant, these effect sizes are extremely small, and there does not appear to be a meaningful pattern of findings that can be interpreted for life hardships or interpersonal patience. Thus, few conclusions should be made from these analyses.

The only pattern of effects for which we are willing to make tentative inferences are for the sadness regulation outcome, because it evinced greater variance for the slope than other measures. Higher levels of engagement in Hand Swap and Watch Your Mouth, which are built upon the strength-energy model of self-control, predicted increases in sadness regulation. In contrast, greater engagement with Mindfulness and Take Perspective tasks predicted decreases in sadness regulation. Although initially appearing contradictory, this pattern of effects makes sense upon further analysis. Hand Swap and Watch Your Mouth build inhibitory capacity, which would facilitate adolescents' abilities to suppress sadness. In contrast, the Mindfulness and Take Perspective tasks require adolescents to become more aware of their own and other's emotional states, which could solicit emotional reactivity that is difficult to regulate in adolescence (Cui et al., 2015), especially in relational contexts like interpersonal conflict. Additionally, the Mindfulness and Take Perspective tasks teach participants to experience emotions in a non-judgmental manner, which might increase their *acceptance* of sadness as an appropriate emotion under circumstances of loss such that they decrease efforts

to suppress sadness (Liverant et al., 2008). This pattern of results could also suggest adolescents who experience heightened emotional reactivity from interpersonal conflicts chose to engage this task more often, but when coupled with the finding that total app engagement was associated with a similar decrease in sadness regulation, the interpretation that the mindfulness and perspective-taking tasks increase a willingness to accept sadness is more probable. Regardless, both enhanced reactivity and sadness acceptance may be appropriate responses after conflict that lead to relational repair or inhibition of relational aggression (Sullivan et al., 2010). However, they could also undermine the adolescent's ability to resolve conflict due to emotional hyperarousal and escalation (Moed et al., 2015). Future research is needed to explore this further as we did not assess subsequent relational repair attempts, relational aggression, or escalation.

Framings Only Partially Explain Low Efficacy

Researchers suggest establishing the usefulness of behavioral intervention technologies for users is essential for an app's success (Venkatesh and Davis, 2000), so another explanation for the null results might be that the app's utility was not evident to participants. We experimentally manipulated the purpose of the app by framing the activities as useful for (a) fostering spiritual purpose/connection, (b) promoting moral development, or (c) improving performance/success. Likewise, we influenced whether participants adopted an approach vs. avoidance motivation by experimentally manipulating the app's purpose as building strengths vs. fixing deficits. Overall, these framing conditions had minimal effects on outcomes. There were no significant differences based on framing condition for daily hassles patience, self-control, anger regulation, or sadness regulation.

There were significant but very small effects for interpersonal patience and life hardships patience. The spiritual/approach framing condition (i.e., receiving messages to "find purpose in belonging," "find connection") was associated with increases in interpersonal patience compared to the instrumental/avoidant framing group. This could suggest that the beyond-the-self motivation better promotes patience that is other- vs. self-directed. However, the effect did not extend to other outcomes and was so small as to make it insufficient evidence to support hypotheses 3 or 4, especially considering the error in framing instructions within the app for three activities. Future well-powered studies could explore whether such effects for beyond-the-self motivation replicate specifically for patience.

Similarly, participants in the moral/avoidance framing condition (i.e., receiving messages to "guard honor," "defend character") showed increases in both interpersonal and life hardships patience compared to the instrumental/avoidant framing group, but effects were very small and did not extend to other outcomes. Again, the errors in coding condition-specific instructions also limit inferences. We expected the moral framing to increase patience, but we did not hypothesize that the avoidant orientation would increase patience. Most research supports the benefits of approach motivations (Elliot and Friedman, 2007), but some studies suggest avoidant prosocial messages are more effective for people dispositionally-prone to avoidant motivation (Jeong et al., 2011). Although adolescents have some higher approach motivations than adults, they also report higher avoidance motivations (i.e., anxiety, fear; Gray et al., 2016), which might make them more sensitive to avoidant framing. However, we must reiterate that these effects were very small, and we found no differences for four of six outcomes. Thus, the overall conclusion must be that our results provided insufficient support for hypotheses related to the framings.

Other Potential Explanations and Future Directions

Given that differences in user engagement and manipulated purpose do not fully explain the null results for the study, we must consider other explanations for why the CharacterMe app was largely unsuccessful at increasing regulatory strengths. It is likely that intentionally growing self-control, patience, and emotion-regulation is a challenging activity for adolescents—so challenging that engagement in our app lacked the appropriate scaffolding to place activities within Vygotsky's zone of proximal development (Chaiklin, 2003). Previous studies have found that self-administered trainings to improve self-control, patience, and emotion regulation are only effective when perceived as not too difficult by adolescents, and some tasks, such as cognitive reappraisal exercises, may not be effective at all when self-administered (Schnitker et al., 2017). Our intent with the app was to scaffold the development of skills and strategies in daily life, but success may be dependent upon interpersonal engagement with a more highly skilled adult (Rhodes and Lowe, 2009) or peer (Tudge, 1992).

Future studies could utilize technology that includes direct scaffolding from a more highly skilled adult/peer. For instance, Silk et al. (2020) recently demonstrated promising results for the SmartCAT2.0 app to treat anxiety disorders among adolescents. Like CharacterMe, SmartCAT2.0 included similar exercises in sections of the app devoted to more general skill building and contextualizing skills in real-life situations. A key difference is that SmartCAT2.0 participants' therapists were able to use a clinician portal to monitor participant engagement within the app and discuss progress at in-person counseling sessions. Future studies using apps to build self-regulatory skills might test whether this in-person engagement is necessary for efficacy or whether interactions with skilled adults could be technologically mediated as well. Without such relational scaffolding, a more focused app involving limited activities might be more successful. For example, Hides et al. (2019) recently found that their Music eScape mobile app, which focuses exclusively on using music to manage emotions (akin to our Listen Up activity), improved emotion regulation in adolescents and emerging adults.

Although less likely, it is also possible that our study design is masking the positive effects of the app. We did not conduct a randomized controlled trial (RCT) whereby participants were assigned to a no-treatment control condition. It is possible that control participants would have decreased in patience, self-control, and emotion-regulation across the course of the study had they not used the app; so, it could be our app was successful in buffering normative declines. However, most research shows these capacities are stable or increasing (especially for girls) across adolescence (e.g., Branje et al., 2007). Our own data show the constructs were highly stable across time (i.e., no significant mean slopes for outcomes, very small effects for slope variance),

so this explanation is highly unlikely. Future studies could employ RCT designs to eliminate this alternative explanation.

Limitations and Lessons Learned

We measured self-control, patience, and emotion-regulation via adolescent self-reports, and several measures had low internal reliability despite previous use among adolescents. Alternate measurement modalities and instruments sensitive to developmental change might reveal additional significant results.

Second, we paid participants for their participation in the study, which may have inadvertently decreased engagement and effectiveness by undermining intrinsic rewards of the activities. However, the explicit endorsement of the app's utility through the framing conditions makes us believe that the participants were not unaware of the potential benefits, which previous work shows increases engagement (Venkatesh and Davis, 2000).

Finally, we were disappointed that our own errors produced during engagement with the app's back-end administrator interface, which limited the certainty with which we can make inferences from the findings related to the framing conditions. Although we were in conversations with our designer about the ideal administrator interface throughout the process, we obviously overestimated the capabilities of the research team to learn a new interface quickly and sufficiently enough to set up the study without error. We hope our mistake will push other teams of designers, developers, and researchers engaged in similar projects to design the back-end administrator interface with more checks and balances and simplicity to safeguard against researcher error or incompetence.

Conclusion

Finding some small positive effects of the CharacterMe app as well as other apps new to the marketplace offer promise that researchers and designers can leverage digital media to promote character strengths like self-control and patience alongside emotion regulation capacities in adolescents. However, null and negative effects underscore the importance of scientifically assessing apps before releasing them on the marketplace—even when they deploy scientifically-vetted activities.

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found in the Open Science Framework online repositories at https://osf.io/jezf6/.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Fuller Theological Seminary School of Psychology Human Subjects Research Committee. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

SS conceptualized app and study design, managed data collection, wrote the introduction and discussion, and made revisions after review. JS conducted data analyses and wrote the results. JR wrote the method, assisted in study design, collected data, and ran supplementary analyses. ML designed the app. BH conceptualized app and study design, managed data collection, and revised the paper. All authors contributed to the article and approved the submitted version.

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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.2021.586713/full#supplementary-material

Supplementary materials include a description of the design process, additional sample size and data exclusion information, framing condition materials, screen captures of the CharacterMe app, push notification schedule for participants, measure items for scales analyzed, description of all study measures, app framing error details, and supplemental analyses.

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Behind the Reasons: The Relationship Between Adolescent and Young Adult Mental Health Risk Factors and Exposure to Season One of Netflix's 13 Reasons Why

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With increasing media choice, particularly through the rise of streaming services, it has become more important for empirical research to examine how youth decide which programs to view, particularly when the content focuses on difficult health topics such as suicide. The present study investigated why adolescents and young adults chose to view or not view season 1 of *13 Reasons Why* and how individual-level variables related to adolescents' and young adults' viewing. Using survey data gathered from a sample of 1,100 adolescents and young adult viewers and non-viewers of the series in the United States, we examined how participants' resilience, loneliness, and social anxiety related to whether participants viewed the first season or not. Our descriptive results indicate that adolescents who watched the show reported that it accurately depicted the social realities of their age group, they watched it because friends recommended it, and they found the subject matter to be interesting. Non-viewers reported that they chose not to view the show because the nature of the content was upsetting to them. In addition, results demonstrated that participants' social anxiety and resilience related to participants' viewing decisions, such that those with higher social anxiety and higher resilience were more likely to report watching season 1. Together, these data suggest that youth make intentional decisions about mental health-related media use in an attempt to choose content that is a good fit for based on individual characteristics.

Keywords: selective exposure, 13 reasons why, adolescents, young adults, mental health

INTRODUCTION

Behind the Reasons: The Relationship Between Adolescent and Young Adult Mental Health Risk Factors and Exposure to Season one of Netflix's *13 Reasons Why*

Entertainment media producers have increasingly integrated mental health-related topics into their narratives, including depictions of depression, suicide, bullying, and sexual assault (Pirkis and Blood, 2001; Rubin, 2014). One recent series in this domain is *13 Reasons Why* (13RW), which debuted in the United States on Netflix on March 31, 2017. The streaming-only adolescent-directed original

series has been controversial for its plotline, which involves a detailed and graphic account of the series of events that lead to a fictional adolescent character (Hannah Baker) dying by suicide. Though the series has been popular among adolescent audiences globally, the show provoked a debate over its portrayal of sensitive subjects such as suicide, self-harm, rape, and bullying, with some arguing that it may have violated guidelines on media portrayals of suicide (Arendt et al., 2017; Chesin et al., 2019). Many educators and health professionals were critical of the depiction of suicide (Brooks, 2017), warning that it could contribute to a contagion effect, and linked the show to self-harm and suicide threats among young people.

Research on the first season of 13RW has depicted varied relations between viewing and adolescent and young adult behavior. Some studies have reported concerning findings related to viewing 13RW (e.g., Ayers, et al., 2016; Niederkrotenthaler, et al., 2019; Santana da Rosa et al., 2019; Bridge et al., 2020) while others have found no concerns related to viewing (e.g., Ferguson, 2019; Romer, 2020). Further, multiple other studies using large, non at-risk samples have found potentially prosocial correlates of viewing (e.g., Arendt et al., 2019; Carter et al., 2020). Together, these findings suggest there is disagreement between studies about whether effects exist and, if they do, whether they are more positive or negative (see also Mueller, 2019). One possible reason for these differing findings regards the nature of the audience; indeed, it is likely that some adolescents chose not to view the series because of the widely reported graphic nature of the content, while others viewed the series in an attempt to learn more about the subject matter or because they found the subject matter to be interesting or entertaining. Therefore, the purpose of this paper is to examine individual-level characteristics that relate to participants' viewing (or not) of the first season of the series. To our knowledge, research has not yet considered the characteristics of the audience of 13RW, and a study of this kind will provide more information regarding *who* watched season 1 of the series, and could help to explain some of the differences detected as to the correlates of viewing. Further, given the rise of mental health-related, adolescent-directed programming (Carter et al., 2020), this study can provide information about the characteristics of individuals who choose to consume, or not consume, such programming. Our study uses the selective exposure framework to examine the factors that may have associated with viewers opting to watch the show or opting out of viewing. Specifically, we use data from a survey of adolescent (13–17) and young adult (18–22) viewers and non-viewers living in the United States (N = 1,100). We examine participants' responses to why they chose to watch or not to watch season 1, and test how key risk factors including loneliness, social anxiety, and resilience associate with participants' viewing.

Selective Exposure and Entertainment Media Effects

Researchers have continually examined selection patterns of consumers in various contexts (Stroud, 2007). The selective exposure framework posits that audience members prefer content that is reflective of their perspectives, experiences, beliefs, attitudes, and decisions (Zillmann and Bryant, 1985; Sherry, 2001; Sherry, 2004; Sherry et al., 2006). According to this framework, these preferences may also leave viewers more susceptible to model portrayed behaviors. Self-concept, or an individual's representations and evaluations of themselves, is important in this context as it influences how people understand their own abilities, cognitive capacities, and the choices that they make to pursue certain activities. In other words, "self-concept does not merely reflect ongoing behavior, it actually guides behavior" (Brummelman and Thomaes, 2017, p. 1764). Thus, in the present context, we might expect that adolescents and young adults were drawn to view the first season of 13RW because the series portrayed adolescent and young adult life and therefore was consistent with individuals' experiences. Further, given the popularity and press attention received, individuals may have chosen to view 13RW because their friends discussed it or watched it themselves. In doing so, however, individuals are still making viewing decisions that align with their experiences in their social context. Additionally, however, certain adolescents and young adults may have opted against viewing because they felt that the nature of the content, and the portrayal of mental health and suicide, was not appropriate for themselves personally, even if it was consistent with their experience. Based on the nature of their social group, individuals also may have heard negative feedback about the series and its appropriateness, which would also influence decisions to not view 13RW.

Indeed, according to common notions of selective exposure (e.g., Zillmann and Bryant, 1985), when deciding what content to watch among a number of options, people will expose themselves to materials aligned to their personal predispositions, avoiding those they deem unrelated to them or inappropriate for them. Thus, individuals at risk for mental health concerns may choose not to view programming that portrays characters experiencing mental health crises even though the content "fits" with that individuals' lived experience. This may be particularly the case for 13RW, as the controversial portrayal of a character's death by suicide was covered extensively in the popular press around the world (e.g., Saint Louis, 2017), and adolescents themselves were conflicted about viewing the series (Common Sense Media, n.d.). Therefore, prior to viewing, it is likely that many individuals were well aware of the nature of the content, and could chose to view or not view based on their personal predispositions, as well as feedback they had heard about the series from their friends, parents, or the popular press.

Previous Research on 13 Reasons Why

As noted, previous research on the correlates of viewing 13RW has been mixed. These mixed findings are likely due to the nature of the samples, indicating that individual differences among viewers is key to understanding the correlates of viewing, not just of 13RW, but other related series that focus on mental health issues among adolescents. For example, multiple studies have found maladaptive correlates of viewing 13RW among small, at-risk samples, particularly those with an expressed mental

health need (e.g., Hong et al., 2018; Plager Zarin-Pass and Pitt, 2019). Chesin and colleagues (2019), however, found that suicide knowledge, or the knowledge of risk factors for suicide such as isolation, loneliness, and disconnection, was positively related to watching 13RW among those with no personal exposure to suicide, but there was no relationship between exposure and participants' suicide ideation severity or suicidal behaviors. Among a largely non-at-risk sample, Lauricella and colleagues (2018) reported that adolescents and young adults found the portrayal of mental health in 13RW to be realistic and felt that it gave them better awareness of suicide risk and how to have serious conversations with supportive adults about mental health.

Using ecological data, Bridge and colleagues (2020) conducted a time series analysis of suicide rates in the United States following the initial release of 13RW. Their analysis found that suicide rates increased beyond expectations among males aged 10–17 in the month after the season 1 of 13RW was released. Niederkrotenthaler and colleagues (2019) also found an increase in deaths by suicide in the three months following the release of season 1, but this increase was among female viewers. After reanalyzing the data using an auto-regression model that tested for changes in rates after removing auto-correlation and national trends in suicide, however, Romer (2020) found that the increase for boys observed by Bridge et al. (2020) was no greater than the increase observed during the prior month before the show was released, or the later months of that year. Though Romer (2020) found a slight change in suicide for girls the month after the show was released, he concluded that it was still difficult to attribute harmful effects of the show using aggregate rates of monthly suicide rates. Adding to the uncertainty of this debate, most recently, Ferguson (2021) found that watching 13RW was associated with reduced depressive symptomatology and was not associated with suicidal ideation among viewers. Finally, in meta-analytic work, Ferguson (2019) concluded that the current state of the literature did not support the idea that fictional media can create a suicide contagion effect.

Together, these studies demonstrate that individual-level, mental health risk factors influence the nature of the correlates of viewing. For example, those at risk for mental health crises report negative outcomes, including negative affect (Hong et al., 2018) and worsening mental health symptoms (Plager Zarin-Pass and Pitt, 2019), while those less at risk report adaptive changes in prosocial mental health behaviors, such as reaching out to support friends in need (Carter et al., 2020). Thus, understanding the individual differences that predict whether an individual watched the first season is key to understanding the correlates of viewing. This may be the case because at-risk individuals chose to not view the series because they knew about the nature of the content, and that the portrayal of a characters' death by suicide may be distressing to them personally. Conversely, non-at-risk individuals may have opted to view the series because it was popular, because they wanted to learn more about the subject matter, and because they felt that they could safely handle the portrayals of mental health in the series.

Given this context, we explore whether the correlates of 13RW on adolescent and young adults viewers is most likely attributable to individual risk factors for mental health concerns and suicide ideation. Given that risk factors appear to moderate viewer responses to 13RW, we hypothesize it is likely that these risk factors relate to choosing to view the series in the first place (see Valkenburg and Peter, 2013). Thus, we consider how specific risk factors relate to participants choices to view the series. We focus on these in particular, as all are linked to suicidal ideation and other mental health concerns. This is important in the present context, as Hannah's death by suicide was seen as one of the most controversial portrayals in season 1 of 13RW (e.g., Saint Louis, 2017).

Mental Health Risk Factors

We chose to focus on participant resilience, loneliness, and social anxiety because they have been identified in several studies as important risk factors related to suicidal ideation (Harris and Molock, 2000; Hefner and Eisenberg, 2009; Davaasambuu et al., 2017), although we note that many other variables relate to individuals' suicidal risk. Resilience refers to an individual's abilities to overcome adversity and is considered to be a protective factor against risk outcomes (e.g., Luther et al., 2000). Conversely, loneliness, or an individuals' perceived discrepancy between desired and actual social relationships (Peplau and Perlman, 1982), and social anxiety, or an individual's anxiety stemming from a fear of interpersonal evaluation in real and imagined settings (Leary and Kowalski, 1997), are seen as risk factors for various mental health concerns. Both loneliness and social anxiety are quite prevalent in society, although age and country of residence influence the extent of prevalence (Russell and Shaw, 2009; Yang and Victor, 2011). Indeed, social anxiety is the third most common mental health concern after depression and alcohol abuse (Russell and Shaw, 2009).

Resilience has been found to attenuate the impact of many risks including suicide (Johnson et al., 2011), while loneliness and social anxiety are risk factors for suicidal ideation (Stravynski and Boyer, 2001). Previous research has suggested that loneliness and social anxiety occur when interpersonal relationships are deficient and fail to meet personal expectations (Peplau and Perlman, 1982). As different life stages come with different developmental goals, the importance of social engagement differs over the life course (Heckhausen et al., 2010). In the case of adolescents and young adults, loneliness and social anxiety may derive, respectively, from various factors, including not feeling well connected to one's peers and fear of judgement from others, a failure to build social networks, the daunting task of launching a career, and trying to find a romantic partner (Luhmann and Hawkley, 2016). Lacking belongingness and feeling disconnected from peers and family are also among the major factors leading to suicide (Joiner, 2005).

Further, we chose to examine loneliness and social anxiety because previous research has found associations between these factors and suicidal ideation in early adolescence (Roberts et al., 1998), adolescence (Garnefski et al., 1992; Heinrich and Gullone, 2006) and young adulthood (Rich and Bonner, 1987). Strong

associations among suicide ideation, parasuicide, and different ways of being lonely and alone, defined either subjectively (i.e., the feeling), or objectively (i.e., living alone or being without friends), have been observed by empirical research (see Stravynski and Boyer, 2001). Moreover, the prevalence of suicide ideation has been found to increase with an individual's degree of loneliness and social anxiety, while having social support is seen by many as correlated to endorsements of high life satisfaction and having positive expectations for the future (Yeh and Inose, 2003).

We chose to examine resilience because it affects the ability of the individual to deal with difficult situations and actively move past them for a better future (Hamill, 2003). Resilience has been defined as a "positive adaptation within the context of significant adversity" (Luther et al., 2000; Masten 2001), indicating a "process of negotiating, managing, and adapting to significant sources of stress or trauma" (Windle et al., 2011, p. 2). Critical to the idea of resilience is that certain ecological factors and processes coupled with individual strengths may mitigate the potentially negative outcomes associated with adversities and risks (Jain et al., 2012). As a psychological construct, resilience works as a perceived ability that allows the individual to overcome adversity (Rutter et al., 2008; Johnson et al., 2010). Moreover, resilience has been conceptualized as "an ability, perception or set of beliefs which buffer individuals from the development of suicidality in the face of risk factors or stressors" (Johnson et al., 2011, pg. 564). As such, young people whose resilience is strong appear to be somewhat protected against depression and suicidal behaviors (McNamara, 2013).

The Current Study

Together, the selective exposure framework and existing literature suggest that adolescents and young adults make conscious decisions about the nature of the media content that they consume as a function of individual-level factors, including both individual mental health-related factors and social factors. Even when media content is similar to the lived experiences or attitudes of an individual, however, that individual may choose not to watch content that they find to be personally inappropriate or because others have warned that it is inappropriate. In the context of selective exposure, mental health, and viewing 13RW, we expect that those higher in resilience, and lower in loneliness and social anxiety, will be more likely to report viewing season 1 of 13RW and will report viewing the entire first season, rather than a portion of the episodes. We expect this because these individuals are theoretically most likely to be able to process the content in a healthy, adaptive way. Therefore, we predict:

H1: Participants' level of 1) loneliness and 2) social anxiety will relate negatively to viewing season 1 of 13RW, while participants' level of 3) resilience will relate positively to viewing season 1 of 13RW.

H2: Participants' level of 1) loneliness and 2) social anxiety will relate negatively to viewing the entire first season, while participants' level of 3) resilience will relate positively to viewing the entire first season.

Finally, we offered both viewers and non-viewers a number of close-ended options to explain their reasoning behind choosing to view season 1 or not. Thus, we ask:

RQ1: What were the reported reasons that adolescents and young adult viewers decided to watch or not watch season one of 13RW?

METHOD

Participants

The data in this study are part of a larger multinational survey that includes parents, young adults, and adolescents from five countries. The full sample was purposive in nature with the goal of achieving approximately 50% viewers and non-viewers of the series with approximately equal number of respondents at each age. This paper focuses on a subsample of that data (N = 1,100), including only adolescent (n = 600; ages 13–17) and young adult (n = 500, ages 18–22) participants from the United States. The majority (70%) of the participants for this study were female (n = 767). This subsample consists of 43% viewers (n = 219 adolescent viewers, n = 252 young adult viewers) and 57% non-viewers (n = 381 adolescent non-viewers, n = 248 young adult non-viewers).

Procedure

We developed an online survey and data collection was completed between November 2017 and January 2018. While this research study was funded by Netflix, the authors worked with the participant recruitment company, analyzed, and wrote descriptive reports independently. Data collection was completed by IPSOS Research, after receiving approval by the university's institutional review board. IPSOS Research worked with partners in each country to recruit participants. To target the adolescent sample, parents who reported that they had at least one child in the home between the ages of 13–17 received an email with introductory information about the nature of the research study and a link to the online survey. Parents first consented to their own participation, and completed an online parent survey (reported elsewhere). Once we obtained parent consent, adolescents had the opportunity to provide their assent, and then answer the survey questions. Young adult participants were recruited through local agencies by IPSOS and consented to their participation. The adolescent and young adult survey took approximately 20–30 min to complete. At the end, we thanked participants for their time, and they received compensation where appropriate. The survey for adolescents and young adults was identical; the only difference was in the recruitment and consent process.

Measures

Viewers and Non-Viewers. All respondents were asked if they had watched season 1 of 13RW. This question divided the sample into "viewers" (n = 471) or "non-viewers" (n = 629).

Complete Season Viewed. Each participant who indicated that they watched the show was asked how many episodes they

watched. The data was skewed toward those who reported watching all of the episodes (n = 296, 63%). Another 30 participants (6%) watched 9–12 episodes, 46 participants (10%) watched five to eight episodes, 63 participants (13%) watched two to four episodes, 30 participants (6%) watched only 1 episode, and six participants (1%) watched part of one episode. Given that 63% of viewers reporting that they had watched all of the episodes, we created a dichotomous variable for viewers who viewed all (1) or less than all (0) of the episodes of season 1.

Viewing Decisions and Reasons. We examined viewing decisions with a series of separate questions for non-viewers and viewers. Non-viewers were asked why they decided not to watch the show and could select all the reasons that applied from a 17-item list. Examples of items were "I wasn't interested in the story or subject matter," "I didn't feel the topics covered were relevant to my life," and "I heard that the content was graphic." Similarly, viewers were asked why they chose to watch the show and could select all the reasons that applied from an 18-item list. Examples of items for viewers were "The show was relevant to my life," and "it covered important subject matter that people my age should know more about." For a complete listing of response options, please see Lauricella et al. (2018).

Social Anxiety. We measured social anxiety using a 10-item measure from La Greca et al. (1988; Social Anxiety Scale for Children). Participants answered each item using a 5-point Likert scale anchored by (1) strongly disagree and (5) strongly agree. Example questions include "I worry about doing something new in front of other kids," "I am afraid that other kids will not like me," "I am quiet when I'm with a group of kids." A principal components analysis indicated that all items factored together. Thus, we summed and averaged the items to create an average social anxiety score, with higher scores indicating higher levels of social anxiety (M = 3.05, SD = 1.03). This measure was reliable (α = 0.94).

Resilience. Resilience was measured using an 18-item measure from the Institute of Education Science's measure of resilience (Internal Resilience Assets; Hanson and Kim, 2007). As above, response options for each item were presented on a 5-point Likert-type scale anchored by (1) strongly disagree and (5) strongly agree. Example items that were presented to respondents were "When I need help, I can find someone to talk to" and "I understand my moods and feelings." A principal components analysis indicated that all items factored together. Thus, we summed and averaged the items to create an average resilience score, with higher scores indicating higher levels of resilience (M = 3.90, SD = 0.68). This measure was reliable (α = 0.94).

Loneliness. Loneliness was measured using an 8-item measure from Roberts et al. (1993; Brief Measure of Loneliness for Adolescents) measure of loneliness. Response options for each item were presented on a 5-point Likert-type scale anchored by (1) strongly disagree and (5) strongly agree. Examples of items that were presented to respondents related to loneliness were "I lack companionship" and "I often feel isolated." A principal components analysis indicated that all items factored together. Thus, we summed and averaged the items to create an average loneliness score, with higher scores indicating higher levels of loneliness, (M = 2.57, SD = 0.82). This measure was reliable (α = 0.84).

Age. Respondents ranged in age from 13 to 22 (M = 17.32, SD = 2.91).

Gender. Respondents indicated their gender as either male (30.27%; n = 333) or female (69.72%; n = 767).

RESULTS

Rationale of Viewing

Among viewers, 79% of those who heard of the show reported hearing about it from friends. Viewers generally heard the show was popular (60%), intense (59%), and sad (53%). In order to answer RQ1, which asked about participants' reasons to view the first season of 13RW or not, we examined our dataset to understand why viewers and non-viewers of 13RW chose to watch the show (or not). The most common reasons viewers reported that they choose to watch was because they found the story interesting (69%), saw it on Netflix and decided to give it a try (57%), had either a friend (46%) or Netflix (40%) recommending it, and were curious about it because they read about the controversies surrounding the series (35%). However, only 20% of viewers reported they wanted to learn more about the topic and just 18% said they watched it because the show was relevant to their own life.

With respect to non-viewers, one-third reported that they did not watch because they felt that the content was upsetting to watch (33%) or they were not interested in the subject matter (27%). Other reasons they reported were that their friends talked about the show but that they decided it did not sound like something that they would like (25%), that it was inappropriate (18%), and some felt the content was too graphic (17%) or they did not find it relevant to their lives (9.6%). For some non-viewers, parents (8%) told them not to watch the program. Lack of access (13%) to Netflix (the subscription streaming service needed to watch the show) and not having time/opportunity to watch (22%) also resulted in non-viewership.

Thus, in answer to RQ1, the majority of viewers chose to view because they found the story interesting and because they saw it on Netflix; interestingly, however, only a small minority of viewers reported that they viewed season 1 because the show was relevant to their lives or because they wanted to learn more about the topics. Among non-viewers, a sizable minority chose not to watch because they thought the content would be upsetting, inappropriate, and/or too graphic, or because they were not interested in the subject matter. Thus, while there may be a number of reasons why an individual might find the content to be upsetting or graphic, this does indicate that approximately one-third to one-fourth of non-viewers did not watch because they were aware of the nature of the content and felt that it was not appropriate for them personally, or because their friends warned them not to consume the content.

TABLE 1 | Variance Inflation Factors and Correlations.

	VIF	Loneliness	Social anxiety	Resilience
Loneliness	1.63	--	–	–
Social anxiety	1.33	0.47[a]	--	–
Resilience	1.19	–0.42[a]	–0.09	--

[a]p ≤ *0.01*.

TABLE 2 | Relations Between Individual-Level Risk Factors, Demographic Variables, and Viewership of 13 Reasons Why.

	OR	z	*p*	[95% Conf. Interval]	
Loneliness	1.06	0.62	0.54	0.88	1.29
Social anxiety	1.15[c]	1.93	0.05	1.00	1.32
Resilience	1.25[a]	2.13	0.03	1.02	1.53
Gender	1.79[b]	4.08	0.000	1.35	1.37
Age	1.05[a]	2.10	0.04	1.00	1.10
Black	1.02	0.15	0.88	0.74	1.48
Asian	0.75	–1.09	0.28	0.45	1.26
American Indian	0.67	–0.99	0.32	0.30	1.48
Pacific Island	1.44	0.47	0.64	0.32	6.54
Other race	1.08	0.25	0.80	0.58	2.03
_cons	0.029[b]	–5.25	0.000	0.01	0.11

[a]p ≤ *0.05*.
[b]p ≤ *0.01*.
[c]p = *0.051*.

Exposure Decisions and Personal Risk Factors

Prior to analysis, we tested the correlations between the three main variables, social anxiety, resilience, and loneliness. While there was some relation between the variables, none of the variables reached a correlational value of 0.70, which would be indicative of multicollinearity. Moreover, Variance Inflation Factors (VIF) ranged from 1.19 to 1.63 indicating low multicollinearity (see **Table 1**).

To address H1, which predicted relationships between individual-level risk factors and viewing the first season of 13RW, we ran a logistic regression with viewership (yes/no) as the dependent variable, and loneliness, resilience, social anxiety, age, gender, and race/ethnicity as independent variables. The full model was significant, pseudo $R^2 = 0.03$, *LR chi 2* (10, 1,100) = 38.98, $p < 0.01$. Social anxiety ($OR = 1.15$, $p = 0.05$) and resilience ($OR = 1.25$, $p < 0.05$) both positively predicted viewership. Loneliness was not significantly related to viewership. There were also differences by age and gender (see **Table 2**), such that females and older participants were more likely to report viewing. Thus, H1c is supported; resilience was positively related to viewership. H1a was not supported; loneliness was not related to viewing. H1b was also not supported; interestingly, social anxiety was positively related to viewing, counter to our predictions.

To address H2 and examine how these risk factors were associated with whether individuals viewed the entire first season of 13RW or a portion of episodes, we ran a logistic regression with the complete season viewed as the dependent dichotomous variable (watched entire season or watched less than the entire season), and loneliness, resilience, social anxiety, age, gender, and ethnicity as independent variables. The full model was significant, pseudo $R^2 = 0.08$, *LR chi2* (10, 471) = 50.50, $p < 0.01$. None of the risk factor variables predicted watching all of the episodes. There were differences by age and gender (see **Table 3**), such that females and older participants were more likely to report viewing all 13 episodes. Thus, H2a-c are not supported; individual-level risk factors were not related to viewing the entire first season.

TABLE 3 | Relations Between Individual-Level Risk factors, Demographic Variables, and Entirety of Season Viewed.

	OR	z	*p*	[95% Conf. Interval]	
Loneliness	1.02	0.12	0.90	0.74	1.41
Social anxiety	1.03	0.27	0.79	0.82	1.30
Resilience	0.81	–1.23	0.22	0.58	1.13
Gender	1.83[b]	2.47	0.01	1.13	2.94
Age	1.18[b]	4.29	0.00	1.10	1.28
Black	0.89	–0.44	0.66	0.52	1.51
Asian	0.57	–1.34	0.18	0.25	1.30
American Indian	0.58	–0.82	0.41	0.16	2.13
Pacific Island	0.52	–0.63	0.53	0.07	4.02
Other race	4.85[a]	2.05	0.04	1.07	21.94
_cons	0.06[a]	–2.42	0.02	0.01	0.59

[a]p ≤ *0.05*.
[b]p ≤ *0.01*.

DISCUSSION

Overall, these analyses answered our research question and partially supported our hypotheses. Consistent with the selective exposure framework, the reasons youth chose to view the first season of 13RW were largely related to how interested and/or appropriate they found the content to be, or because those in their friend group watched it or suggested it. Additionally, however, one-fourth to one-third of non-viewing youth recognized that the content may not be relevant or appropriate for them. Indeed, between one-fifth and one-third of non-viewers reported that the content was either too upsetting, inappropriate, or graphic, and thus, was the reason why they chose not to view. Similar to viewers, about one-quarter of non-viewers reported that members of their friend group suggested they not view the series due to the nature of the content. Viewers, however, were likely to report that the content was interesting or that they watched because they saw it while using Netflix. In all, these descriptive findings suggest that viewers may have selectively viewed the series based on their interest in the content as well as their perceptions of the appropriateness of the content.

This conclusion is partially supported through our hypothesis testing. For example, we found a positive relationship between resilience and viewership, suggesting that individuals higher in the feeling that they have the ability to persevere through adverse

life events were more likely to view season 1. While there was no relationship between viewing and ratings of loneliness, we did find a positive relationship between social anxiety and viewership, suggesting that individuals higher in social anxiety were more likely to view season 1. This finding ran counter to our prediction. In contrast, H2 was not supported, as only youth demographics of age and gender were related to whether participants watched all of the episodes or only a portion of the episodes in season 1. Therefore, there is some evidence that individual-level risk factors related to participants' decisions to view season 1 but did not relate to viewing the entire first season of episodes.

Thus, the descriptive and inferential findings of this research study show some general support for the predictions set forth by the selective exposure framework (Zillmann and Bryant, 1985; Sherry, 2001; Sherry, 2004; Sherry et al., 2006). As resilience is characterized by one's ability to overcome adversity (Jain et al., 2012), it is logical that this individual-level variable would be positively related to viewing. It appears that adolescents and young adults with this ability may have felt more comfortable in dealing with the difficult mental health-related topics portrayed in the 13RW, and thus were more likely to view season 1, in comparison to those lower in resilience. This explanation would also serve to contextualize our null finding pertaining to viewing the entire first season; individual-level factors appear to relate to the *decision* to view, but once an individual began viewing, individual-factors do not appear to relate to viewing all of the episodes. This might also suggest that resilience is an individual-level factor that may predict adolescent and young adult exposure to other mental health-related media content.

A second key finding is the relationship between social anxiety and viewing. Although our significant finding ran counter to predictions, certain types of youth may opt into watching this series, or television in general, to satisfy a level of peer connection and comfort that they are less comfortable obtaining from live interactions with peers. This is consistent with research of viewers of other platforms including YouTube. For example, social anxiety is related to addictive viewing of YouTube (de Bérail et al., 2019), suggesting that media can fill a void in the lives of youth who are less comfortable in non-mediated interactions with peers. Further, those higher in social anxiety may have been more likely to view 13RW as a function of the nature of the content. Indeed, research studies demonstrate that topics relating to mental health are difficult to discuss (Jorm et al., 2008), and this may be compounded among individuals who already feel a poor sense of social connection with peers (Luhmann and Hawkley, 2016). We note, however, that we did not find a significant relationship between loneliness and viewership. Thus, although loneliness is also characterized by a sense of poor connection with others (Luhmann and Hawkley, 2016), the differences in findings between loneliness and social anxiety may be attributable to an additional sense of anxiety. That is, those who are socially anxious both feel cut off from others, but also feel a sense of self-consciousness and fear when communicating with others (Leary and Kowalski, 1997). Therefore, based on the present findings, it appears that individuals higher in social anxiety may turn to media as a relative safe space to learn about mental health topics. More research is necessary in order to clarify this relationship; however, this finding does suggest the possibility for media to support those at risk for mental health concerns, in addition to those less at risk (e.g., those higher in resilience).

Therefore, this research adds to the literature on adolescent-directed health-related media, which previously has largely focused on the correlates of viewing on physical health. Research on selective exposure, however, provides key information on who views such content, and why they view such content. This type of information can be used to contextualize patterns of relationships and effects, thus providing insight into who is more or less susceptible to viewing and being affected by such programming (see Valkenburg and Peter, 2013). As mental health-related programming becomes more prevalent, it will increasingly be important to consider individuals' own experiences with mental health, and how they shape viewing decisions and interpretations of different types of portrayals.

This study also adds to the research on the correlates of viewing 13RW, which, to date, have been mixed. When studies sample from small, at-risk samples of adolescents and young adults, results demonstrate that exposure to 13RW relates to maladaptive mental and physical health outcomes (e.g., Hong et al., 2018; PlagerZarin-Pass and Pitt, 2019). Analysis of ecological data initially pointed to an increase in suicides relative to expectations (Niederkrotenthaler et al., 2019; Bridge et al., 2020), but a re-analysis of the Bridge et al. (2020) data showed no such increase (Romer, 2020). Other researchers have concluded that there is little current support for a suicide contagion effect stemming from exposure to fictional media (Ferguson, 2019). In contrast, larger samples of 13RW viewers featuring non-at-risk youth largely show positive outcomes related to mental health (e.g., Ferguson, 2021) or prosocial mental-health related behaviors, such as reaching out to help others (e.g., Carter et al., 2020).

This study is among the first to use a selective exposure framework to examine the antecedents of viewing 13RW, showing that at least some at-risk individuals may have opted not to view the series due to the potential triggering nature of the content. This may especially be the case, as the portrayal of suicide was widely reported in the popular press (e.g., Saint Louis, 2017), and thus, was likely known to the potential viewer or the viewer's friends. While some viewers certainly appear to have experienced negative outcomes as a function of viewing, as demonstrated in multiple studies (Hong et al., 2018; PlagerZarin-Pass and Pitt, 2019), the present study shows that the scope of these adverse outcomes may have been attenuated somewhat through selective exposure. Other studies show that viewing the series may have positive correlates among non-at-risk viewers (see Carter et al., 2020; Ferguson, 2021). Thus, research that examines the conditions under which and the processes through which media, particularly 13RW, contribute to and mitigate against mental health continue to be vitally necessary. This study, however, adds to the literature on 13RW and adolescent-directed mental health-related programming by considering the characteristics of the audience and how they

relate to viewership, especially considering that most existing studies focus on the correlates of viewing. A study involving selective exposure provides information on who viewed, which is especially important when the content focuses on mental health and suicide, and can be used to help contextualize correlates of viewing.

It will be important for future research to examine other risk factors and their role in selective exposure to other series like 13RW, particularly variables such as depression or suicidal ideation. In addition, adolescent-directed mental and physical health programming is quite popular on Netflix currently (e.g., *Sex Ed; Insatiable*); thus, understanding the antecedents of viewing will continue to be timely. Further, media can influence adolescent development and learning, and may have the power to influence conceptions of adulthood; namely, priorities, expectations around relationships with others and definitions of success (Wartella et al., 2018). Therefore, it is imperative to think about the implications of media use in a way that will help increase understanding of media effects throughout the lifespan. Evidence in our study suggests that future research should examine more individual difference variables that relate to the selection of media content in the first place, rather than only examining the outcomes of those who selectively choose to view the media content.

Limitations. Although this work does provide some insight on how individual-level factors relate to adolescent and young adult viewing of the first season of 13RW, it is not without caveats. First, these data were cross-sectional, thus calling into question the directionality of our findings. We also focused on one show for many of our survey questions. Despite the popularity of the series, there is risk to studying responses to one series due to questions of generalizability. While this is a limitation, we would note that the *content* of the series is not unique to *13 Reasons Why*. Indeed, a number of other series available around the world via Netflix (e.g., *Insatiable*), as well as in specific countries (e.g., *Euphoria*), and including movies (*To the Bone*), have recently begun to include storylines related to mental and physical health in their plots. Further, research has demonstrated that such topics are of great importance to adolescents and young adults around the world (e.g., Lauricella et al., 2018). Third, we note that our statistical effect sizes are small in nature, suggesting that other individual-level characteristics might be important to consider in this context. Future research should continue to examine individual difference variables as they predict media content exposure. Overall, more research is needed to examine not just the outcomes of media consumption among adolescents and young adults, but also the antecedents of use, with particular attention to individual differences in culture, age and context.

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 the Northwestern University Institutional Review Board. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

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

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Motives for Texting During Early Adolescence

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Research on adolescent texting has largely focused on whether the frequency of texting is associated with well-being. Whether the motives for texting is associated with well-being is not well known. We surveyed 130 young adolescents (M_{age} = 12.41 years) and identified user-clusters based on their motives for texting. We then examined whether the clusters were associated with phone habits that may affect health and learning (e.g., phone placement when sleeping). Participants were asked how often they texted someone when they were excited, proud, frustrated, angry, anxious, sad, needed help with homework, wanted to make plans, and needed advice [0 (never) to 4 (always)]. Using k-means clustering, we identified six clusters. On one end of the continuum were *Frequent-Texters* and *Positive-Frequent-Texters*. *Frequent-Texters* texted often for all purposes and *Positive-Frequent-Texters* frequently texted for all purposes except expressing negative emotions. On the other end of the continuum were *Selective-Texters* and *Positive-Selective-Texters*. *Selective-Texters* rarely texted for any reason and *Positive-Selective-Texters* rarely texted except for expressing positive emotions. In between were the *Moderate-Texters* and the *Positive-Practical-Moderate-Texters*. *Moderate-Texters* texted less frequently than *Frequent-Texters* and more frequently than *Selective-Texters* for all purposes. *Positive-Practical-Moderate-Texters* texted more frequently than *Moderate-Texters* for positive emotions and for practical reasons. Clusters differed by gender, texting experience, and Fear of Missing Out (FOMO). *Frequent-Texters* started texting at a marginally younger age than *Selective-Texters*, had high FOMO scores, and were all girls. Clusters also differed in their phone habits. For instance, when sleeping, *Frequent-Texters* were more likely than other groups to have their phones on or next to the bed. When doing homework, *Selective-Texters* were less likely to keep their phones on or near them. Interestingly, *Positive-Frequent-Texters* were more likely to have the ringer on or to have their phone on vibrate while doing homework, but not more likely to keep their phones nearby. Given that texting is a common communication method, it is important to understand the heterogeneity of reasons why youth text and how those reasons relate to phone habits.

Keywords: texting, sleep, adolescence, homework, cell phone

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INTRODUCTION

Nearly 80% of adolescents in the United States report texting daily and a third say that texting is their preferred mode of communication with friends (Rideout and Robb, 2018; Rideout and Robb, 2019). Given the popularity of texting and messaging platforms, such as WhatsApp concerns have been raised about whether the amount of time texting and the number of texts sent can affect adolescents' health and academic achievement (e.g., Rosen et al., 2013). In one study, the number of daily texts sent and received was associated with negative outcomes such as sleep problems (Murdock, 2013). In another study, WhatsApp use was positively associated with well-being (Bano et al., 2019). However, a focus solely on the frequency of texting and not how, why, or with whom, treats texting as a homogeneous activity and does not capture the many ways in which it is used (e.g., making plans, joking, sexting; Lenhart et al., 2010; Harrison and Gilmore, 2012; O'Hara et al., 2014). It is possible that it is not only the amount of texts that affects youth's health and academic achievement, but also their motivations for use, which include specific needs (e.g., seeking advice) and emotional states (e.g., anger, excitement). The goal of this study, therefore, is to identify patterns of texting behavior based on adolescents' motivations for texting, and to examine how these patterns relate to Fear of Missing Out (FoMO; Przybylski et al., 2013), sleep, and schoolwork. A person-centered approach is used, as it enables the detection of groups, or clusters, of individuals whose texting behaviors are similar to those in their cluster but distinct from those of individuals in other clusters (Laursen and Hoff, 2006).

Texting, like other forms of media use, is goal oriented. According to the uses and gratifications theory, individuals use media in order to fulfill certain needs (Rubin, 2009). For young adults and adolescents, texting can be used for a variety of purposes such as discussing positive and negative events, showing affection, relaxing, coordinating offline activities, and discussing schoolwork (Jin and Park, 2010; Lenhart et al., 2010; Grellhesl and Punyanunt-Carter, 2012; Ehrenreich et al., 2020). It is possible that there are different patterns of texting use. For example, some adolescents may text to coordinate offline activities, but not to share about positive and negative emotions. Others may text for emotional support. Emotional experiences, both positive and negative, are often shared soon after they occur when they are most present in one's consciousness (Rimé et al., 1998). Given the preference for sharing immediately, for some adolescents, texting may be a valuable tool that facilitates rapid communication of emotional experiences (Vermeulen et al., 2017).

Studies conducted in Europe, Asia, and North America have explored characteristics of users (i.e., clusters) based on motivations for using social networking sites (SNS). Most of this research was conducted with adult participants. In a study of adult SNS users in Norway, five clusters were identified. The clusters were advanced users (i.e., used SNS frequently and for many purposes), debaters (i.e., used SNS to share content and to engage in discussions and debates), socializers (i.e., used SNS to interact with friends and family), lurkers (i.e., used SNS to pass the time and to browse through content that others shared), and sporadics (i.e., used SNS only when others had contacted them; Brandtzæg, 2012). In a study of adult SNS users in Turkey, four clusters were identified: advanced users (i.e., used SNS for many purposes, especially to share content), business-oriented users (i.e., used SNS for business and to obtain information), communication seekers (i.e., used SNS to interact with friends and family and to obtain information), and dawdlers (i.e., used SNS for few purposes; Bulut and Doğan, 2017). Four clusters were also identified in a study of adult Facebook users in the United States: entertainment chasers (i.e., used Facebook for entertainment), attention seekers (i.e., used Facebook to share about their lives and to seek compliments from others), devotees (i.e., used Facebook for social support), and connection seekers (i.e., used Facebook to interact with friends they know offline; Hodis et al., 2015). While some of the clusters identified by these studies were unique to each study (e.g., business-oriented users), others, such as users who used SNS for many purposes, users who used SNS for few purposes, users who communicated with friends and family, and users who shared content, were identified by multiple studies.

Similar patterns of SNS use were identified in young adolescents. In a study of sixth-grade students in Taiwan, four clusters were identified: highly motivated (i.e., used SNS for many purposes), less motivated (i.e., used SNS for few purposes), relaxed oriented (i.e., used SNS to decrease stress and anxiety), and socially oriented (i.e., used SNS to stay in touch with family and friends, make new friends, share content, gain popularity, obtain information, and follow celebrities; Su et al., 2018). These studies demonstrate that SNS users can be categorized into clusters based on their motives for use and that many of these clusters exist across cultures and age groups.

The patterns of texting use are likely to differ from the patterns of SNS use, as the audiences and functions of these two platform types differ. SNS are perceived as semi-public spaces where profiles are crafted to appeal to a broad audience. Users may curate their profiles to appear well liked and attractive to a large network of friends and acquaintances (Yau and Reich, 2020) or to avoid negative perceptions from some members of their network. For example, LGBTQ users who have not identified as LGBTQ to their extended family may remove references to their sexual identity on their Facebook profiles for fear of marginalization (Duguay, 2016). Conversely, texting platforms are perceived as private spaces where adolescents can share details about their daily lives and disclose emotions with close friends (Yau and Reich, 2020). A recent study categorized adolescents according to their frequency of texting from early to late adolescence (Coyne et al., 2018). Four clusters were identified: perpetuals (i.e., high frequency throughout adolescence), decreasers (i.e., high frequency during early adolescence, but low frequency during middle and late adolescence), moderates (i.e., low frequency throughout adolescence) and increasers (i.e., low frequency during early adolescence, but high frequency during middle and late adolescence). These groups differed on measures of depression, anxiety, physical and relational aggression, relationships with their father and their friends, and problematic cell phone use, which was defined as excessive usage that interfered with school, work, and relationships. To

our knowledge, no studies have identified clusters based on motivations for texting. The first goal of this study, therefore, is to segment young adolescents (6–9th grade; M_{age} = 12.41) according to their motivations for texting and to identify differences in demographic characteristics, specifically gender, cell phone ownership, age at which they started texting, and FOMO, as FOMO is associated with problematic cell phone and social media use (Oberst et al., 2017; Franchina et al., 2018).

Research on other forms of media such as television, general cell phone use, and SNS suggest that motivations are associated with media habits. Individuals who binge-watch television and consider themselves television addicts are more likely to watch television to regulate their moods (e.g., when feeling lonely, anxious, frustrated, and bored; McIlwraith, 1998; Rubenking and Bracken, 2018). Similarly, high frequency cell phone users tend to use their phones for boredom relief (Lepp et al., 2016). Using SNS as a means of escape is also associated with greater SNS use and using SNS to develop and maintain friendships is associated with more frequent and greater SNS use (Cha, 2010). The amount and frequency of media use may, thus, depend on individuals' motivations.

Motivations for media use may also be associated with well-being. Individuals who primarily used SNS to interact with friends and family reported less loneliness (Brandtzæg, 2012), in addition to having more interactions and acquaintances offline. For individuals who used Facebook to make new friends and date, more time on Facebook was associated with depression, anxiety, and loss of behavioral and emotional control. Conversely, using Facebook to keep in touch with friends was associated with positive affect (Rae and Lonborg, 2015). Little is known, however, about whether motivations for texting relate to behaviors while sleeping and completing homework.

Adolescents' texting habits before bed and after they have fallen asleep are of concern, as nearly 60% of middle school students and 70% of high school students in the United States do not get the recommended amount of sleep (Wheaton et al., 2018). One habit that may affect the quantity and quality of adolescents' sleep is whether they leave the phone's ringer on. Over a third of adolescents reported waking up in the middle of the night to check their phone and among those, half cited that it was because they were awakened by notifications (Robb, 2019). Hearing and seeing notifications before bed and after sleep onset is also associated with sleep problems (Murdock et al., 2017; Murdock et al., 2019).

Another habit that may affect the quantity and quality of sleep is whether adolescents sleep with their cell phones on their beds. Over a quarter of adolescents and young adults sleep with their phones on their beds (Dowdell, 2019; Robb, 2019) and one study found that adolescents who slept with their phones nearby were more likely to be woken up by notifications (Adachi-Mejia et al., 2014). A study with college students, however, found that placing the phone on or near the bed was associated with fewer sleep problems (Rosen et al., 2016). Thus, our second goal is to understand how different behavior habits are associated with healthful phone behaviors during sleep (e.g., turning the ringer off, not sleeping with phone in or near the bed).

Phone habits, like leaving the ringer on and placing the phone nearby may also affect the quality or time required to complete homework. According to the memory for goals theory, when attention is shifted from one task to another, there is a lag when individuals resume the first task, as individuals must recall their progress before the interruption (Altmann and Trafton, 2005). This suggests that texting while working on homework may be disruptive because adolescents need to reorient themselves to the task every time they read or respond to a message. Sixty percent of adolescents report sometimes or often texting while doing homework (Common Sense Media, 2015). While most (64%) report that it does not affect the quality of their work (Common Sense Media, 2015), research suggests otherwise. It takes longer to read a passage when instant messaging concurrently (Chen and Yan, 2016). Moreover, when texting during a lecture, notes tend to be less complete and less is recalled (Chen and Yan, 2016). Simply receiving notifications is enough to impede performance in an attention demanding task (Stothart et al., 2015), suggesting that leaving the ringer on and placing the phone nearby, which alerts adolescents to notifications, may disrupt homework completion even if adolescents do not send messages. Thus, the third goal of our study is to explore how different texting clusters relate to distraction reducing behaviors such as turning the ringer off and not keeping phones nearby when working on homework.

In sum, the goals of our study are to identify whether young adolescent texters can be grouped into clusters based on their motivations for use and then to determine how these clusters differ in their tendencies to engage in recommended healthful phone behaviors, specifically when sleeping and completing homework.

MATERIALS AND METHODS

Participants

The data for this paper were gathered during a larger experimental study on whether texting a friend can improve mood and reduce stress after a stressful situation (Yau et al., 2020). Participants were recruited from afterschool programs and summer school classes and through snowball sampling. Our sample, which consisted of 130 young adolescents (51% female; M_{age} = 12.41, SD = 1.23; range 10–16 years) was ethnically diverse (32% Asian, 28% Latinx, 19% Multi-ethnic, 16% White, 5% other; see **Table 1**). Most participants owned a cell phone (85%) and of those, nearly all owned a smartphone (95%). The age at which participants started texting ranged from 7 to 14 years (M = 10.35, SD = 1.35) and the most popular texting platforms were the default texting app/iMessage (used by 83% of participants in the past week), Instagram Direct Message (43%), SnapChat (38%), in-game chat or Discord (36%), and Google Hangouts (33%). We did not ask participants to specify whether the platforms were used for one-to-one messaging or for group messaging. Since texting can be done through any wifi connected device, phone ownership was not a requirement for eligibility. After excluding one participant who decided not to include their data (their data was also excluded from the sample description

TABLE 1 | Cluster demographics.

			Selective Texters	Positive Selective Texters	Moderate Texters	Positive Practical Moderate Texters	Frequent Texters	Positive-Frequent-Texters	Total	Significance
Reasons for texting	Positive	M (SD)	0.50 (0.56)	2.82 (0.71)	1.85 (0.66)	2.81 (0.73)	3.60 (0.39)	3.32 (0.80)	2.50 (1.04)	—
	Negative elevated	—	0.11 (0.33)	1.18 (0.64)	1.10 (0.60)	2.19 (0.54)	3.30 (0.89)	1.00 (0.59)	1.54 (1.00)	—
	Negative depressed	—	0.06 (0.17)	1.03 (0.72)	1.21 (0.58)	1.95 (0.48)	3.35 (0.53)	1.58 (0.55)	1.54 (0.92)	—
	Practical	—	0.89 (0.49)	1.26 (0.73)	2.25 (0.64)	2.64 (0.66)	3.40 (0.61)	3.18 (0.46)	2.33 (0.95)	—
	Advice	—	0.11 (0.33)	0.59 (0.51)	1.68 (0.64)	2.24 (0.83)	3.70 (0.48)	3.43 (0.65)	1.95 (1.22)	—
Gender	Female	n	2	7	14	23	10	6	62	Fisher's
		% of cluster	22%	41%	41%	62%	100%	43%	51%	exact = 0.003
		Adjusted residual	−1.810	−0.895	−1.384	1.595	3.221	−0.667	—	
	Male	n	7	10	20	14	0	8	59	
		% of cluster	78%	59%	59%	38%	0%	57%	49%	
		Adjusted residual	1.810	0.895	1.384	−1.595	−3.221	0.667	—	
Cell phone ownership	Yes	n	8	12	29	32	9	13	103	Fisher's
		% of cluster	89%	71%	85%	86%	90%	93%	85%	exact = 0.673
		Adjusted residual	0.330	−1.817	0.033	0.28	0.452	0.865	—	
	No	n	1	5	5	5	1	1	18	
		% of cluster	11%	29%	15%	14%	10%	7%	15%	
		Adjusted residual	−0.330	1.817	−0.033	−0.28	−0.452	−0.865	—	
Age started texting	—	M (SD)	11.57 (0.79)^{a}	9.82 (1.01)^{b}	10.82 (1.26)^{ab}	10.22 (1.12)^{ab}	9.80 (1.55)^{ab}	10.29 (1.86)^{ab}	10.38 (SD = 1.34)	F (5, 111) = 3.17, p = 0.01
Fear of Missing Out	—	M (SD)	1.42 (0.25)^{a}	1.96 (0.70)^{ab}	1.79 (0.58)^{a}	2.35 (0.53)^{b}	3.01 (0.63)^{c}	2.50 (0.52)^{bc}	2.14 (SD = 0.69)	F (5, 111) = 12.84, $p < 0.001$
Total	—	—	9	17	34	37	10	14	121	—

Notes. For Reasons for Texting, range: 0 (never) – 4 (always). For Age Started Texting and Fear of Missing Out, mean values with the same superscript denote clusters that are not significantly different at the $p < 0.05$ *level based on a Tukey's adjustment for multiple comparisons. (e.g., A cluster with the subscript "a" is significantly different from a cluster with the subscript "b," but NOT significantly different from another cluster with subscript "a." A cluster with the subscript "ab" is NOT significantly different from clusters with subscript "a" or "b.").*

above) and eight participants with missing data, we were left with an analytic sample of 121.

Procedure

Adolescents were asked to come to the lab with a same-gender friend with whom they messaged at least once a week. As part of the larger study, participants were directed to separate rooms and both completed the Trier Social Stress Task, which was used to induce stress. Pairs were randomly assigned to message their friend, watch a video independently, or sit quietly for 5 min (see Yau et al., 2020). The data for this paper were drawn from a demographic survey that participants completed before the experiment and a survey about their media use that was completed after the experiment. The study received approval from the university's Institutional Review Board and both surveys were pilot-tested prior to use. Participants received two movie tickets each (valued at approximately $20 USD) as compensation.

Measures

Reasons for Texting

On a scale of 0 (never) to 4 (always), participants indicated how frequently they texted someone when they were excited, proud, frustrated, angry, anxious, sad, needed help with homework, wanted to make plans, and needed advice (see **Supplementary Materials**). On average, participants messaged someone in order to express excitement (M = 2.74, SD = 1.19) and to make plans (M = 2.58, SD = 1.22) most frequently. Expressing anger (M = 1.42, SD = 1.11) and sadness (M = 1.43, SD = 1.11) were the least frequent.

Phone Habits

Participants were asked what mode their phone was usually in when they were sleeping and when they were doing homework (see **Supplementary Materials**). The options were 1) volume on, 2) vibrate, but the sound is turned off, 3) silent, but not on airplane mode, 4) do not disturb mode (calls and notifications are silenced), 5) airplane mode, and 6) turned off completely. For analysis, we categorized the responses based on the likelihood that participants would be aware of notifications. The responses "volume on" and "vibrate, but the sound is turned off" were combined as participants may hear and be alerted to notifications. The responses "silent, but not on airplane mode," "do not disturb mode," "airplane mode," and "turned off completely" were combined, as participants were choosing not to be disturbed by notifications. Participants were also asked where they typically placed their phone when they were sleeping and when they were doing homework (see **Supplementary Materials**). The options for phone placement during sleep were 1) on your bed, 2) next to your bed, 3) somewhere else in the room where you sleep, and 4) in a different room. The options for phone placement during homework were 1) in hand or pocket, 2) next to you, 3) somewhere else in the room, and 4) in a different room. The responses for phone placement were also categorized for analysis based on the likelihood that participants would be aware of notifications. As such, for phone placement during sleep, the responses "on bed" and "next to your bed" were combined and the responses "somewhere else in the room where you sleep" and "in a different room" were combined. For homework, the options "in hand or pocket" and "next to you" were combined and "somewhere else in the room" and "in a different room" were combined.

Fear of Missing Out

The ten-item FOMO scale was used (Przybylski et al., 2013). Participants rated how true a series of statements (e.g., "I fear my friends have more rewarding experiences than me," "Sometimes, I wonder if I spend too much time keeping up with what is going on") were on a scale from 1 (not at all true of me) to 4 (extremely true of me). The mean of the ten items were then computed; α = 0.82, M = 2.14, SD = 0.69.

Demographic Survey

The demographic survey consisted of questions about participants' gender, age, and ethnicity, as well as questions about cell phone ownership, age at which they started texting, and the texting platforms they use most frequently.

Analytic Plan

Before creating the clusters, we grouped the motives for texting into latent variables based on an exploratory factor analysis and subsequent comparisons of latent measurement models. We compared models in which the items loaded onto one, three, four, and five factors, respectively. We then conducted a difference in chi-square test among the competing models to determine which one provided the best balance of goodness-of-fit with parsimony.

After deciding on a factor structure, we conducted a k-means cluster analysis in Ropstat (Vargha et al., 2015). Consistent with the two-step procedure for exploratory cluster analysis, this was preceded by hierarchical clustering using Ward's method to first determine an appropriate number of clusters for a k-means analysis (e.g., Conley, 2012; Vargha et al., 2015). Solutions were generated containing two through fifteen clusters. A scree-like plot was then generated to visualize large changes in within-cluster homogeneity as clusters were collapsed (Wormington et al., 2012), with two relatively large jumps or "elbows" bookending a range of solutions from four to nine clusters that were statistically viable (see **Supplementary Materials** for elbow plot). From these options, we used theoretical considerations to select a final solution that best balanced parsimony, within-cluster homogeneity, and between-cluster heterogeneity. Our final k-means analysis used the centroids generated from the chosen solution of hierarchical clustering. To identify differences in demographics between the clusters, Fisher's exact test and ANOVA were used. Fisher's exact test was used to identify gender and cell phone ownership differences as the expected values for more than 20% of the cells were less than five (Kim, 2017). ANOVA with Tukey's post-hoc test was used to identify differences in FOMO and the age at which they started texting.

To determine differences between clusters in likelihood of engaging in risky cell phone habits when sleeping and doing homework, we used Fisher's exact test. We restricted these analyses to participants who owned a cell phone.

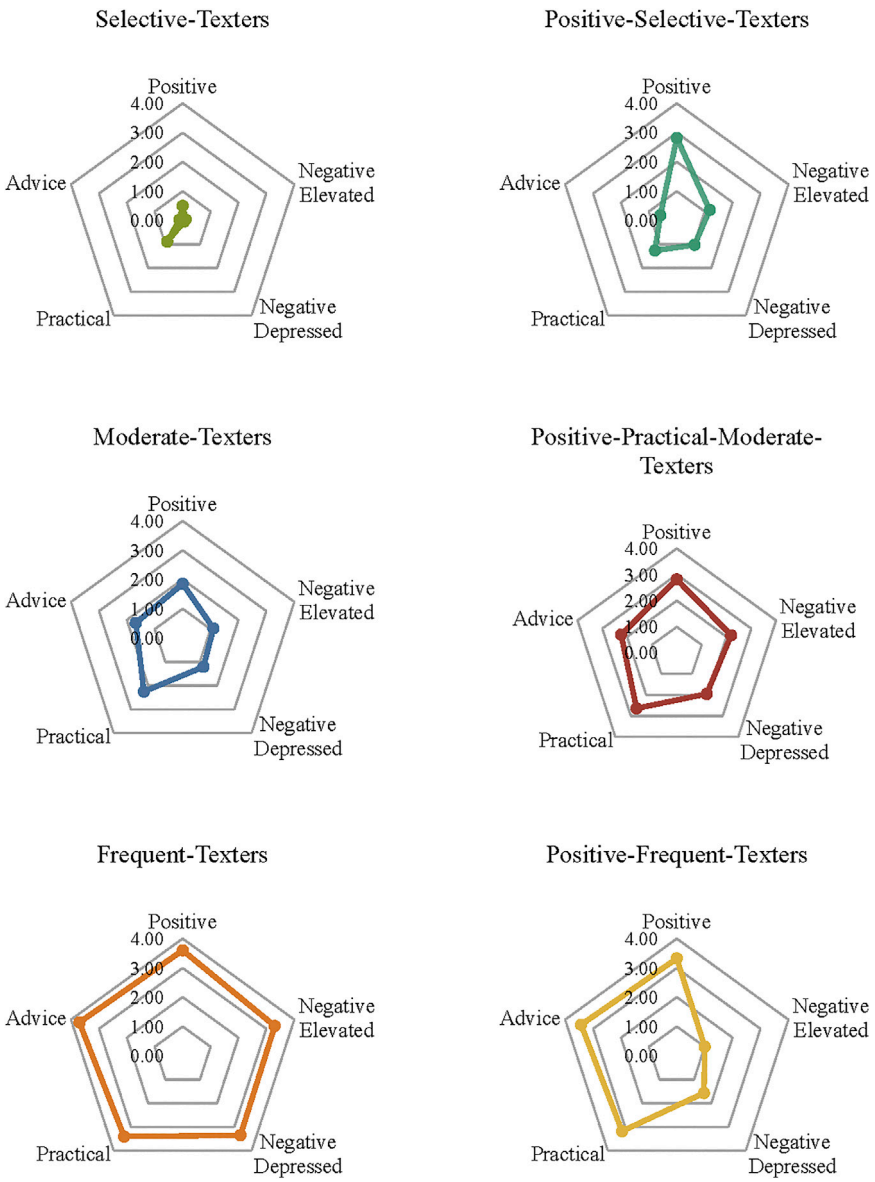

FIGURE 1 | Texting clusters. Scale: 0 = never, 1 = rarely, 2 = sometimes, 3 = often, 4 = always.

RESULTS

The factor analyses that were conducted to group the texting motives into latent variables showed that the five-factor model fit the data significantly better than each of the other models. The resulting factors were positive (i.e., "you are excited about something," "you are proud of something you did), negative elevated (i.e., "you feel frustrated about something," "you feel angry about something"), negative depressed (i.e., "you feel anxious about something," "you feel sad about something"), practical (i.e., "you need help with homework, you want to make plans"), and advice ("you need advice").

RQ1: Texting Use Clusters

Using these five factors, we then identified six clusters of texters based on young adolescents' motives for texting: Selective-Texters (i.e., texted infrequently for all reasons), Positive-Selective-Texters (i.e., texted infrequently except for sharing positive emotions), Moderate-Texters (i.e., texted more frequently than Selective-Texters, but less frequently than Positive-Practical-Moderate-Texters and Frequent-Texters across all reasons), Positive-Practical-Moderate-Texters (i.e., texted more frequently than Moderate-Texters for sharing positive emotions and for practical reasons, but less frequently than Frequent-Texters for all reasons), Frequent-Texters (i.e., frequently texted for all reasons), and Positive-Frequent-

Texters (i.e., frequently texted for all reasons except to share negative emotions; see **Figure 1**). Adolescents in some of the clusters endorsed all motives equally. For example, Frequent-Texters frequently texted to express positive emotions, negative elevated emotions, negative depressed emotions, for practical reasons, and for asking for advice. Adolescents in other clusters, however, endorsed some motives more than others. For example, Positive-Frequent-Texters often texted for expressing positive emotions, for practical reasons, and for asking for advice, but less frequently for expressing negative emotions.

The clusters differed by gender (Fisher's exact, $p = 0.003$), the age at which they started texting, (F (5,111) = 3.17, $p = 0.01$), and FOMO scores (F (5, 115) = 12.84, $p < 0.001$; **Table 1**). However, there were no differences across clusters in cell phone ownership (Fisher's exact, $p = 0.673$).

Selective-Texters

The Selective-Texter cluster ($n = 9$, 7% of sample) rarely used texting for expressing positive emotions ($M = 0.50$, $SD = 0.56$), expressing negative elevated emotions ($M = 0.11$, $SD = 0.33$), expressing negative depressed emotions ($M = 0.06$, $SD = 0.17$), practical reasons ($M = 0.89$, $SD = 0.49$), or asking advice ($M = 0.11$, $SD = 0.33$). Selective-Texters tended to start texting later ($M = 11.57$ years, $SD = 0.79$) than Positive-Selective-Texters ($M = 9.82$, $SD = 1.01$), $p = 0.034$, and marginally later than Frequent-Texters ($M = 9.80$, $SD = 1.55$), $p = 0.063$. Selective-Texters were also characterized by low FOMO scores ($M = 1.42$, $SD = 0.25$).

Positive-Selective-Texters

Like Selective-Texters, Positive-Selective-Texters ($n = 17$, 14% of sample) rarely used texting for expressing negative elevated emotions ($M = 1.18$, $SD = 0.64$), negative depressed emotions ($M = 1.03$, $SD = 0.72$), practical reasons ($M = 1.26$, $SD = 0.73$), or asking advice ($M = 0.59$, $SD = 0.51$). However, Positive-Selective-Texters did use texting to express positive emotions ($M = 2.82$, $SD = 0.71$). Positive-Selective-Texters ($M = 1.96$, $SD = 0.70$) had significantly lower FOMO scores than Frequent-Texters and marginally lower scores than Positive-Frequent-Texters. Their FOMO scores did not differ from Selective-Texters and Moderate-Texters.

Moderate-Texters

Moderate-Texters ($n = 37$, 31% of sample) endorsed all of the reasons for texting more frequently than Selective-Texters: expressing positive emotions ($M = 1.85$, SD = 0.66), expressing negative elevated emotions ($M = 1.10$, $SD = 0.60$), expressing negative depressed emotions ($M = 1.21$, $SD = 0.58$), for practical reasons ($M = 2.25$, $SD = 0.64$), and asking advice ($M = 1.68$, $SD = 0.64$). Moderate-Texters ($M = 1.79$, $SD = 0.58$) had significantly lower FOMO scores, on average, than Positive-Practical-Moderate-Texters and Positive-Frequent-Texters.

Positive-Practical-Moderate-Texters

Positive-Practical-Moderate-Texters ($n = 34$, 28% of sample) texted more frequently than Moderate-Texters for sharing positive emotions and for practical reasons and less frequently than Frequent-Texters for all purposes: expressing positive emotions ($M = 2.81$, $SD = 0.73$), expressing negative elevated emotions ($M = 2.19$, $SD = 0.54$), expressing negative depressed emotions ($M = 1.95$, $SD = 0.48$), practical reasons ($M = 2.64$, $SD = 0.66$), and asking for advice ($M = 2.24$, $SD = 0.83$). On average, FOMO scores for Positive-Practical-Moderate-Texters ($M = 2.36$, $SD = 0.53$) were higher than those of Selective-Texters and Moderate-Texters, but lower than those of Frequent-Texters.

Frequent-Texters

Frequent-Texters ($n = 10$, 8% of sample) often texted for expressing positive emotions ($M = 3.60$, $SD = 0.39$), expressing negative elevated emotions ($M = 3.30$, $SD = 0.89$), expressing negative depressed emotions ($M = 3.35$, $SD = 0.53$), practical reasons ($M = 3.40$, $SD = 0.61$), and asking for advice ($M = 3.70$, $SD = 0.48$). Frequent-Texters were all girls (adjusted residual = 3.22), who started texting at an early age ($M = 9.80$ years, $SD = 1.55$) and had high FOMO scores ($M = 3.01$, $SD = 0.63$). They started texting marginally earlier than Selective-Texters and their FOMO scores were, on average, significantly higher than Selective-Texters, Positive-Selective-Texters, Moderate-Texters, and Positive-Practical-Moderate-Texters.

Positive-Frequent-Texters

Participants in the Positive-Frequent-Texter cluster ($n = 14$, 12% of sample) often used texting for expressing positive emotions ($M = 3.32$, $SD = 0.80$), for practical reasons ($M = 3.18$, $SD = 0.46$), and for asking advice ($M = 3.43$, $SD = 0.65$). Unlike the Frequent-Texters, they rarely used texts for expressing negative elevated emotions ($M = 1.00$, $SD = 0.59$) or for expressing negative depressed emotions ($M = 1.58$, $SD = 0.55$). Positive-Frequent-Texters ($M = 2.50$, $SD = 0.52$) had higher FOMO scores than Selective-Texters and Moderate-Texters and marginally higher scores than Positive-Selective-Texters.

RQ2: Differences in Cell Phone Habits During Sleep

Cell Phone Mode

Among participants with their own cell phone, less than half left the ringer on (17%) or put their phones on vibrate (29%) while they slept. It was more common for participants to silence their phones: 18% on silent, 17% turned off completely, 12% on airplane mode, and 8% on do not disturb. There were no differences between clusters in the tendency to leave the ringer on during sleep (Fisher's exact, $p = 0.618$) or to have the ringer or vibrate mode on (Fisher's exact, $p = 0.524$, **Table 2**).

Cell Phone Location

Over 40% of participants kept their cell phone on or near their bed. Eleven percent kept their phone on the bed and 32% kept their phone near the bed. A quarter of participants kept their phone somewhere else in the room and 31% kept their phone in a different room. There were differences

TABLE 2 | Cell phone habits during sleep.

			Selective Texters	Positive Selective Texters	Moderate Texters	Positive Practical Moderate Texters	Frequent Texters	Positive-Frequent-Texters	Total	Significance
Mode	Ringer or vibrate on	n	3	4	16	15	2	7	47	Fisher's exact = 0.524
		% of cluster	38%	33%	55%	47%	22%	54%	46%	
		Adjusted residual	−0.481	−0.910	1.217	0.170	−1.476	0.636	—	
	Ringer and vibrate off	n	5	8	13	17	7	6	56	
		% of cluster	63%	67%	45%	53%	78%	46%	54%	
		Adjusted residual	0.481	0.910	−1.217	−0.170	1.476	−0.636	—	
Location	On or near bed	n	3	6	14	10	8	3	59	Fisher's exact = 0.029
		% of cluster	38%	50%	48%	31%	89%	23%	57%	
		Adjusted residual	−0.311	0.542	0.714	−1.580	2.931	−1.532	—	
	Not on or near bed	n	5	6	15	22	1	10	44	
		% of cluster	63%	50%	52%	69%	11%	77%	43%	
		Adjusted residual	0.311	−0.542	−0.714	1.580	−2.931	1.532	—	
Total	—	—	8	12	29	32	9	13	103	—

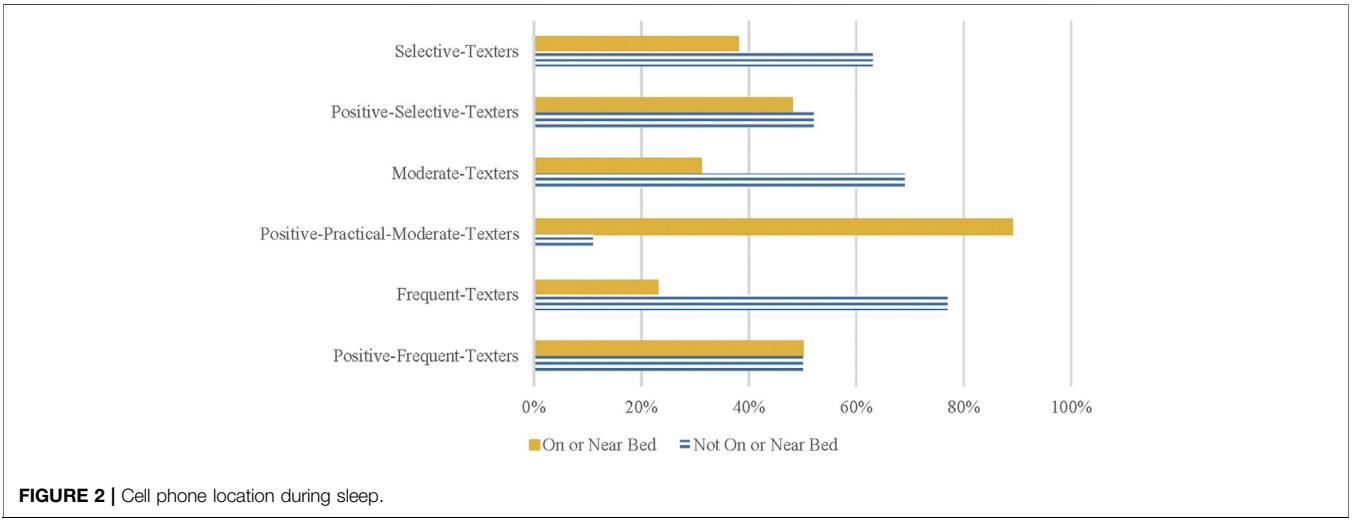

FIGURE 2 | Cell phone location during sleep.

between clusters in the likelihood of keeping their cell phone on or next to their beds (Fisher's exact, $p = 0.029$, **Table 2** and **Figure 2**). All but one Frequent-Texter kept her cell phone on or next to her bed (adjusted residual = 2.93).

RQ3: Differences in Cell Phone Habits When Completing Homework

Cell Phone Mode

Nearly a quarter of participants with their own cell phone kept the ringer on (23%) when they did their homework and half (51%) put their phone on vibrate mode. Silencing their phones during homework time was much less common: 13% on silent, 8% on airplane mode, 4% turned off completely, and 1% on do not disturb. However, the clusters differed in their likelihood of having the ringer on or putting their phone on vibrate (Fisher's exact, $p = 0.036$, **Table 3** and **Figure 3**). All Positive-Frequent-Texters left the ringer on or had their phone on vibrate (adjusted residual = 2.65).

Cell Phone Location

Many participants kept their phone near them while they did their homework: 13% in their hand or pocket and 50% next to them. There were also differences between clusters in their likelihood of keeping their phones on or near them—Selective-

TABLE 3 | Cell phone habits while completing homework.

			Selective Texters	Positive Selective Texters	Moderate Texters	Positive Practical Moderate Texters	Frequent Texters	Positive-Frequent-Texters	Total	Significance
Mode	Ringer or vibrate on	n	3	8	19	22	5	13	70	Fisher's exact = 0.036
		% of cluster	38%	67%	66%	69%	56%	100%	68%	
		Adjusted residual	−1.923	−0.102	−0.333	0.115	−0.835	2.648	—	
	Ringer or vibrate off	n	5	4	10	10	4	0	33	
		% of cluster	63%	33%	34%	31%	44%	0%	32%	
		Adjusted residual	1.923	0.102	0.333	−0.115	0.835	−2.648	—	
Location	On or next to participant	n	2	8	14	22	8	10	64	Fisher's exact = 0.044
		% of cluster	25%	67%	48%	69%	89%	77%	62%	
		Adjusted residual	−2.255	0.344	−1.815	0.929	1.732	1.176	—	
	Not on or next to participant	n	6	4	15	10	1	3	39	
		% of cluster	75%	33%	52%	31%	11%	23%	38%	
		Adjusted residual	2.255	−0.344	1.815	−0.929	−1.732	−1.176	—	
Total	—	—	8	12	29	32	9	13	103	—

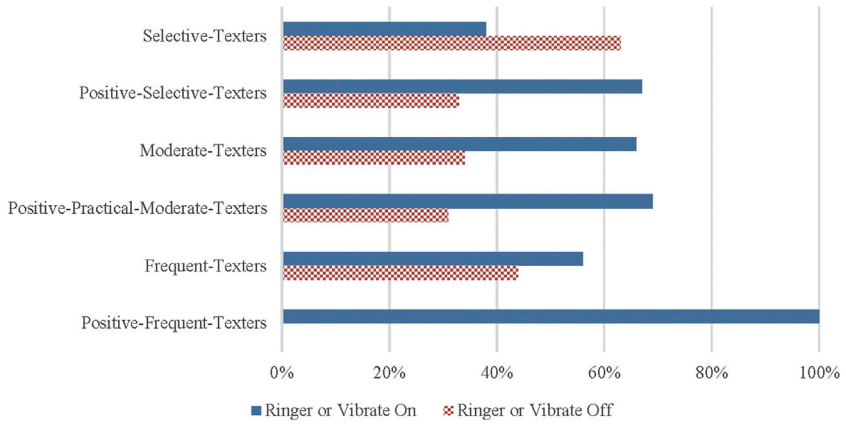

FIGURE 3 | Cell phone mode when completing homework.

Texters were less likely than expected to do so (adjusted residual = 2.26, **Table 3** and **Figure 4**).

DISCUSSION

These findings demonstrate that young adolescents vary not only in the frequency, but also in the motives for texting. We identified demographic differences between clusters that were similar in frequency of texting but were different in motives. For example, all the Frequent-Texters were girls, compared to less than half (41%) of the Positive-Frequent-Texters. It seems that the boys who texted frequently tended to use texting primarily to share positive emotions or for practical reasons. Our findings are consistent with research on gender differences in expressing emotions, which suggests that men are more likely to suppress emotions rather than to express them (Gross and John, 2003) and less likely to seek social support when dealing with stress (Nolen-Hoeksema and Aldao, 2011). Our findings, along with studies demonstrating that girls spend more time texting (Twenge and Martin, 2020) and are more likely to report having "long text exchanges on personal matters" (Lenhart et al., 2010 p. 3) are further evidence that gender differences and norms in digital communication may mirror those in face-to-face interactions.

We found that Frequent-Texters started texting at an earlier age (marginally) than Selective-Texters, suggesting that the age at which adolescents begin texting may explain the frequency of use. A survey of middle-schoolers found that young adolescents text

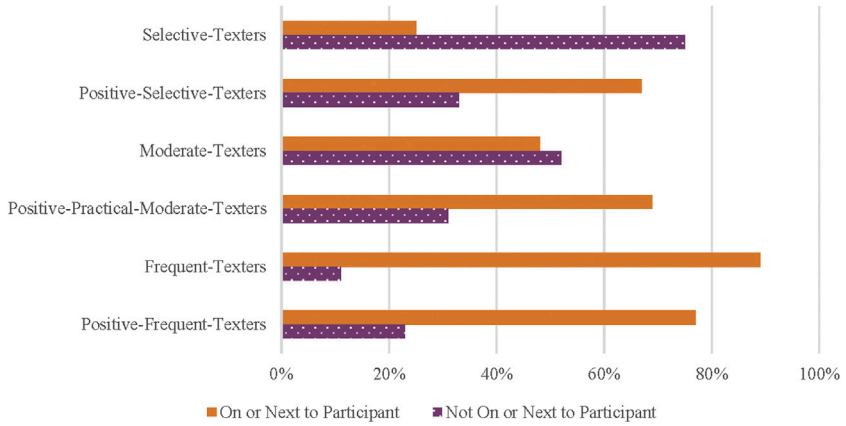

FIGURE 4 | Cell phone location when completing homework.

more frequently over time (Schroeder et al., 2016). Interestingly, Positive-Selective-Texters tended to start texting at an earlier age than the Selective-Texters. It is possible that with more experience, Positive-Selective-Texters chose other forms of communication for sharing negative emotions.

Patterns of texting among young adolescents were related to differences in their cell phone habits while sleeping and completing homework. Frequent-Texters were the only cluster where nearly all participants kept their cell phone on or near their bed. These behaviors may result in greater risk of disrupted sleep, as prior research indicates that adolescents who took their phone to bed were more likely to be awakened by a text message (Adachi-Mejia et al., 2014). These patterns of use were not observed among Positive-Frequent-Texters, suggesting that among high frequency texters, texting to express negative emotions may provide a uniquely important reason for keeping one's phone nearby at night. As the mere presence of a cell phone can buffer against stress when individuals experience social exclusion, perhaps having a phone nearby at all times is especially comforting for those who rely on it the most for emotional support (Hunter et al., 2018). Almost all Frequent-Texters kept their phone on or near them while doing homework, although the frequency was not greater than the expected frequency.

Conversely, Selective-Texters may be at a lower risk for being disrupted while completing homework. They were less likely to keep their phone on or near them, which is expected given that they do not text often and report low levels of texting to share emotions. However, it is also worth considering the potential benefits to having phones on hand while completing homework, such as the ability to ask for help (Eisenhart and Allaman, 2018). Texting others while doing homework may also increase positive affect, as middle school students reported greater interest and more positive affect when they did their homework with their friends than when they worked independently (Kackar et al., 2011). Boys tend to be less impacted by working alone and reap fewer benefits from working together (Kackar et al., 2011), which may explain why the Selective-Texter cluster, which consisted primarily of boys, were less likely to keep their phones on or near them.

Other findings on cell phone habits when completing homework were less expected. Positive-Frequent-Texters were more likely to have the ringer on or to have their phone on vibrate and , but were not more likely to keep their phone nearby. Perhaps they wanted to be notified of incoming messages, but also wanted to reduce the impulse to read and respond. Positive-Selective-Texters were more likely to keep their phone in hand or in their pocket. Perhaps they felt more comfortable having their phone nearby as they were less likely to impulsively use it. Interviews and surveys of youth find differences in the abilities to self-regulate cell phone use while doing schoolwork (e.g., Tulane et al., 2014).

Notably, in identifying differences between Frequent-Texters and Positive-Frequent-Texters and between Selective-Texters and Positive-Selective-Texters, we suggest that future studies on the health impacts of texting, or social media use more broadly, consider not only the frequency of, but also the motives for use. A recent study found that for half the sample, social media use had a positive effect on mental health. For the other half, social media use had a negative or neutral effect (Beyens et al., 2020). Perhaps differences in motives may explain the heterogeneity of effects. A different study found that using social media to escape from negative emotions was associated with addictive social media use, but using social media for other reasons, such as to search for information and to interact with others, was not (Brailovskaia et al., 2020).

Limitations

It is important to note that a participation requirement for the larger study was that participants come with a friend with whom they texted at least once a week. Thus, truly infrequent texters (less than once a week) may have been excluded. A second limitation is that we may not have been able to detect smaller clusters because our sample size was determined by the larger study rather than the recommended sample size for a person-centered analysis (Howard and Hoffman, 2018). Moreover, our sample size may limit the replicability of our results. Although

our sample is ethnically diverse, studies with larger samples from broader geographical areas are needed to help establish the replicability of our clusters. A third limitation is that our reasons for texting were global and did not differentiate between texting with friends, romantic partners, parents, or other family members. Adolescents tend to text about negative emotions and events more frequently with their peers than with their parents (Ehrenreich et al., 2020); thus, future studies may consider whether motives for texting vary depending on the texting partner. Fourth, our questions focused on motivations for texting and did not ask questions about reasons for replying to texts (e.g., respond to friend's negative emotions or need for help). Finally, self-reported cell phone use may be inaccurate. Adolescents may under-report poor cell phone habits (i.e., keeping the ringer on during sleep) due to social desirability bias. They may over-report their texting use, as cell phone usage is difficult to recall (Verbeij et al., 2021). Nonetheless, self-reported cell phone use and actual cell phone use are often correlated (Boase and Ling, 2013; Andrews et al., 2015), suggesting that we may still be able to distinguish between high and low frequency texters. Despite these limitations, our study demonstrates the utility of person-centered analyses, laying the foundation for future studies that look at adolescents' motives of media use.

Future Studies

Future research should explore different types of texting partners (e.g., parents, friends), other reasons for texting (e.g., to share content, to pass the time, reply to a request), and the links between experiencing specific emotions and texting behaviors (e.g., experiencing anger and venting, experiencing sadness and seeking distractions). This study focused on instances of meeting one's own needs (e.g., asking for advice, expressing emotions), rather than texting to meet the needs of others (e.g., giving advice, providing encouragement). Future work should explore the patterns of texting responses. Contextual information about texting interactions (i.e., when, why, and with whom) may be gathered at the end of the day or even in real-time. Additionally, future research should examine whether cell phone placement and mode are associated with less and lower quality sleep and learning (e.g., poorer concentration, greater affect from working collaboratively). Finally, researchers should examine the factors adolescents consider when deciding where to place their phone and what mode to put it on. Identifying these factors will help inform interventions that promote healthy cell phone habits.

CONCLUSION

By highlighting the heterogeneity in how much and why young adolescents use text messaging and identifying unique clusters of users (i.e., Frequent-Texters) that are at greater risk for disrupted sleep or learning, our study demonstrates the utility in measuring not only the frequency of texting, but also the motives for use. Texting is ubiquitous in young adolescents' lives (Rideout and Robb, 2019) and researchers need to understand the motives for use as well as the frequency, in order to determine the impacts of texting on health and learning.

DATA AVAILABILITY STATEMENT

The dataset for this article is not publicly available because participants were not asked if they would consent to their data being shared. Requests to access the datasets should be directed to the corresponding author.

ETHICS STATEMENT

This study was reviewed and approved by the University of California, Irvine Institutional Review Board. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin and participants provided written assent.

AUTHOR CONTRIBUTIONS

JY contributed to all aspects of the study, PM contributed to the analyses and writing, and SR contributed to the design of the study and revised the manuscript critically for intellectual content.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fhumd.2021.602368/full#supplementary-material

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frontiers in Human Dynamics

BRIEF RESEARCH REPORT
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Digital Acculturation or Displacement?: Examining the Link Between Social Media and Well-Being

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The current study applies digital media and acculturation models to assess the links between offline social connection, online social media use, and well-being. Acculturation research suggests that intercultural contact can create conflict that individuals must resolve using four acculturations strategies: marginalization, separation, assimilation, or integration. It suggests that those who fare best adopt strategies in which they maintain heritage connection, identity and values [e.g., offline, face-to-face (F2F) social connection] while also connecting with people and norms in the new context (i.e., online). The social interaction displacement hypothesis suggests that high media use that displaces in-person social interaction (i.e., assimilation strategy) can lead to poor outcomes. The results from a survey of 60 college students (M_{age} = 22.02, SD = 3.54; 73.3% female) suggest that individuals who maintain high offline, F2F social interaction (i.e., separation strategy) fared better than those who adopted assimilation or even integrations strategies. The findings have implications for people who spend more time online, perhaps at the expense of in-person socialization, and introduce novel opportunities for the understanding of the link between social media and poor mental health outcomes.

Keywords: social media, acculturation, well-being, self-esteem, social support

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INTRODUCTION

In the last 2 decades, mobile and social media have made it easier to "connect" with others. Although this increased capacity for social communication and support may have benefits for psychosocial functioning, particularly for adolescents (Jensen et al., 2019; Orben, 2020), meta-analyses have linked digital media use to lower self-esteem, greater loneliness (Song et al., 2014; Liu and Baumeister, 2016) and depressive symptoms (Yoon et al., 2019). At the societal level, increases in technology have also been linked to increases in depression and suicidality rates (Twenge, 2020). Frameworks that examine the interaction between the two social contexts (i.e., the offline and online) with highly permeable boundaries rather than focusing on either offline contexts or online use solely would shed light on this paradox. Given the cultural nature of each social context and frequent "border-crossings," the current study tests two frameworks in the domains of digital media and acculturation (i.e., the cultural and psychological change in the adaptation from one cultural context to another) to examine how people navigate and engage in relationships offline and online in ways that differentially affect psychological and social well-being: a digital media acculturation model based on Berry's (2005) cultural psychological work and displacement of in-person social interaction, a mechanism proposed by Twenge (2020) to explain how digital media use may affect mental health.

Berry (2005) hypothesized that intercultural contact, that occurs in "cultural migration" between physical and geopolitical spaces, creates internal conflict between two major issues that people must

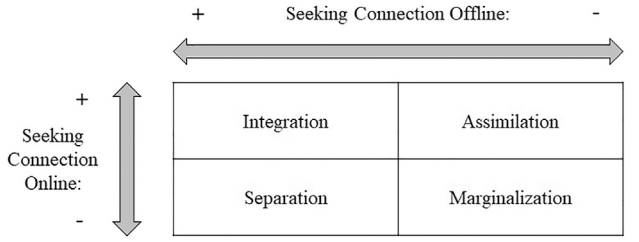

FIGURE 1 | Digital Acculturation Model and Strategies.

reconcile: 1) their orientation or "a relative preference for maintaining one's heritage culture and identity, and 2) a relative preference for having contact with and participating in" the host society (Berry, 2005, p. 704). Their adaptive strategy is derived from reconciliation of these two issues and results in four types of acculturation strategies: marginalization (cultural loss and exclusion from the new social context), separation (cultural maintenance but avoidance of interaction with new social norms), assimilation (cultural loss that coincides with seeking interaction with another culture), and integration (cultural continuity while also incorporating new social structures and interactions with people in the new context).

The same can be said for movement into digital and virtual social spaces. In **Figure 1**, I have reimagined the acculturation strategies in the cultural migration from the offline to online digital media contexts. The focus in the current study is on social media rather than other technology use because culture is socially constructed and, therefore, inherently social. Additionally, social experiences have important implications for mental and physical well-being (e.g., Uchino, 2006). The idea of "cultural migration" from offline to online contexts is what spurred education writer, Marc Prensky (2001), to coin the phrase "digital natives" to describe recent generations of youth who have grown up fully immersed in digital media (or at least, who are more frequent sojourners) relative to previous generations of "digital immigrants." For example, there is evidence that "digital natives," who have presumably assimilated to online contexts, experience social connection differently than their "digital immigrant" counterparts (Chan, 2015).

In the acculturation literature, pursuing an integration strategy has been associated with the most positive outcomes (e.g., lower acculturative stress, higher self-esteem and sense of well-being; Berry, 2017). There is also evidence to suggest that maintaining ties to heritage culture in general (i.e., adopting integration or separation strategies), perhaps due to maintained access to economic and social resources during the potentially-fraught adaptation process, may promote mental health relative to adopting an assimilation or marginalization strategy (Berry and Hou, 2016). Therefore, a digital media acculturation model would lead to the following hypotheses:

H1: Broadly, people who maintain high offline social connection (i.e., use an integration or separation strategy) will report greater psychological well-being than those who report low offline social connection (i.e., use a marginalization or assimilation strategy), though those who relate to both online and offline communities (i.e., integration) will fare best psychologically.

H2: People who maintain high offline social connection (i.e., use an integration or separation strategy) will report greater social well-being than those who report low offline social connection (i.e., use a marginalization or assimilation strategy), though those who relate to both online and offline communities (i.e., integration) will fare best socially.

In line with acculturation literature, digital media research suggests that both complete exclusion from online social communication among nonusers as well as high social media use (e.g., greater than 2 h a day), perhaps at the expense of in-person social interaction, can be risk factors for poorer mental health (Przybylski et al., 2020; Twenge, 2020). That is, high digital media use that displaces time away from face-to-face (F2F) social interaction might explain the link between digital media use and mental health. Additionally, the greater use of digital devices and modalities for social communication has been associated with poorer psychological well-being (e.g., life meaning, relationship quality), particularly in the face of weaker in-person connections for young adults age 18–34 (Chan, 2015). If the social displacement hypothesis is true, the following will be supported:

H3: People who report high online communication but low offline communication (i.e., adopt an assimilation strategy) will have the poorest psychological and social well-being outcomes.

The current study expands on the existing digital media literature as well as incorporates perspectives from cultural psychology in ways that help explain how changing social media landscapes and people's responses to them can affect individual health and development. These frameworks are not necessarily at odds. Testing both can help identify the conditions in which cultural adaptation and negotiation between offline and online social contexts shape people's experiences and sense of well-being.

MATERIALS AND METHODS

Participants and Procedure

College students ($N = 60$; $M_{age} = 22.02$, $SD = 3.54$; 73.3% female) from diverse backgrounds (e.g., 5% African American, 26.7% Asian American, 43.3% Latino, 10% White or Caucasian, 11.7% multi-ethnic, and 3.3% other ethnicity such as Middle Eastern) were recruited via campus fliers, class presentations, and emails in 2017. Average mother's education and father's education was between technical/trade school and community college (*Ms* = 3.32, 3.33, *SDs* = 1.54, 1.67 on a scale from 0 = *no formal education* to 6 = *graduate/law/medical school*) and average years in the United States was 18.63 ($SD = 6.14$).

Measures

Social Media Use. Issue 1 (**Figure 1**: maintaining ties offline) was assessed using a frequency of in-person social connection (i.e., "how much time do you spend having face-to-face conversations?") and Issue 2 (**Figure 1**: preference for having contact with and participating in the host online society or environment) was assessed using a frequency of social media use item (i.e., "how much time do you spend emailing, sending messages, and posting on

social media?") on a scale from 1 = *less than 1 h/day*, 2 = *about 1–2 h/day*, 3 = about 2–3 h/day, 4 = *about 3–4 h/day*, and 5 = *more than 4 h/day* from a general media use scale (Pea et al., 2012).

Self-esteem. The Rosenberg Self-Esteem Scale (Rosenberg, 1965) was used to assess self-esteem on a 4-point scale with items such as "On the whole, I am satisfied with myself" and "I take a positive attitude toward myself." Select items in the 10-item scale were reverse-coded and all averaged such that higher numbers indicated higher self-esteem. The measure had good internal consistency (α = 0.92).

Depressive Symptoms. Depressive symptoms was assessed using the 20-item Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977). Participants reported on a 4-point scale how often they experienced depressive symptoms (e.g., "You were bothered by things that usually don't bother you," "You felt sad") in the past month (α = 0.90).

Support. Perceived availability of instrumental, informational, and emotional support was assessed using a 12-item scale of general social support developed for the National Institutes of Health (NIH) PROMIS (Patient-Reported Outcomes Measurement Information System). Items (e.g., "I have someone to take me to the doctor if I need it," "I have someone to give me good advice about a crisis if I need it," and "I have someone to talk with when I have a bad day") were rated on a 5-point scale from 1 (*never*) to 5 (*always*) and had good internal consistency (α = 0.96).

Analytic Strategy

As shown in **Figure 1**, acculturation strategies are derived from two dimensions or issues 1) maintaining offline ties and 2) preference for online connection. Therefore, issue 1 was assessed using the frequency of face-to-face (F2F) conversations and issue 2 was assessed using a frequency of digital media use for social connection. Four categories of integration (i.e., high F2F, high social media use), assimilation (i.e., low F2F, high social media use), separation (i.e., high F2F, low social media use), and marginalization (i.e., low F2F, low social media use) were created for each of the strategies based on mean-splits of measures for both dimensions of offline and online social connection. As a result, those in the low social media use group spent less than 2 h a day and those in the high social media use group spent more than 2 h a day emailing, messaging, and posting on social media, a cut-off recommended for practical importance in previous literature (Twenge, 2020).

Preliminary analyses suggests that participant age was negatively correlated with perceived support ($r = -0.31$, $p = 0.016$) and females were marginally more likely to spend time using social media ($t(58) = -1.76$, $p = 0.084$). Additionally, ethnicity was coded into three groups based on sample sizes for each group: Latino, Asian American, and other ethnicities (e.g., African American, White, multi-ethnic). Participants from the other ethnicities group reported higher parent education ($F(2,57) = 9.75$, $p < 0.001$) and higher depressive symptoms than Latino participants ($F(2,57) = 3.99$, $p = 0.024$). However, there were no ethnic differences in in-person or online connection ($Fs(2,56\text{-}57) = 0.197, 0.09$, ps = 0.822, 0.912), self-esteem ($F(2,57) = 0.21$, $p = 0.812$), or social support ($F(2,57) = 1.63$, $p = 0.204$). Given preliminary differences by age, gender, ethnicity, and socioeconomic status, these covariates were entered in ANCOVA models. Additionally, to account for the multiple ways participant identities and acculturation processes may overlap, years in the United States was included as a covariate. However, in the full models, gender, age, and parent education were not significant. Therefore, to conserve power, only ethnicity and years in the United States. were controlled for as covariates in final analyses. Furthermore, participants were part of a larger study that included an experimental manipulation in which they wrote a supportive letter to a friend, family member, or about their day. Experimental condition was controlled for in follow-up analyses and removed if it did not change the final results.

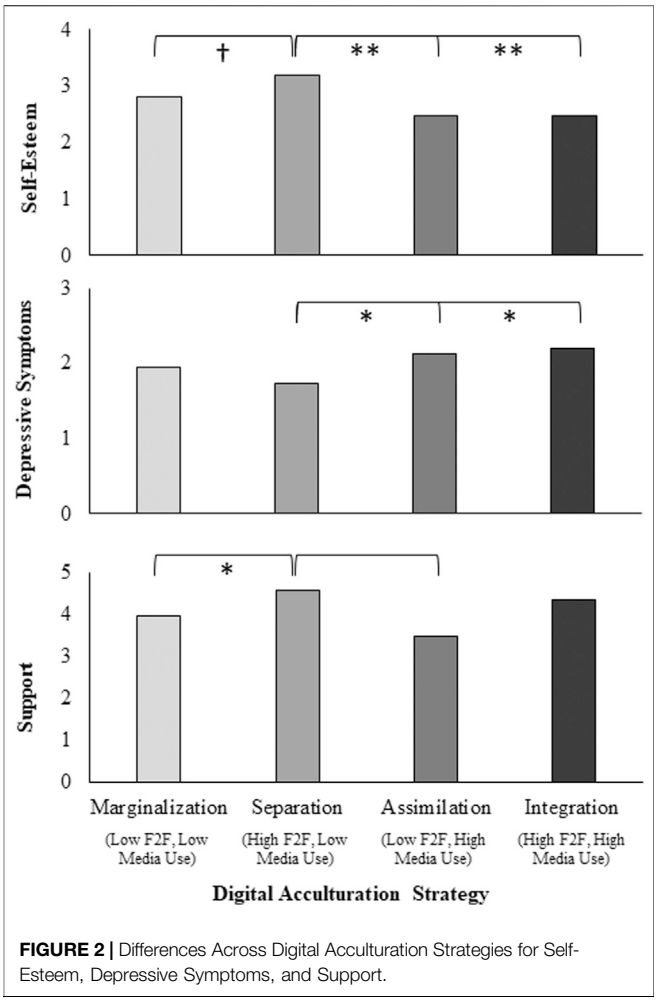

FIGURE 2 | Differences Across Digital Acculturation Strategies for Self-Esteem, Depressive Symptoms, and Support.

RESULTS

Psychological Well-Being

To test H1, an ANCOVA controlling for ethnicity and years in the United States assessed the effect of digital acculturation strategies on psychological well-being (i.e., self-esteem, depressive symptoms). There was a main effect of digital media acculturation strategy on self-esteem, $F(3, 51) = 3.50$, $p = 0.022$, $\eta^2 = 0.17$. As shown in **Figure 2**, follow-up t-tests indicate partial support of H1 and H3 in that those in the separated group (high F2F, low social media use) had

significantly higher self-esteem than the assimilated group (low F2F, high social media use; $t(26) = 2.97$, $p = 0.006$) and marginally higher than the marginalized group (low F2F, low social media use; $t(38) = 1.82$, $p = 0.077$). However, contrary to hypotheses, they also reported higher self-esteem than the integrated group (high F2F, high social media use; $t(29) = 3.55$, $p = 0.001$).

A similar ANCOVA controlling for ethnicity and years in the United States showed a marginal main effect of digital acculturation strategy on depressive symptoms, $F(3, 51) = 2.67$, $p = 0.057$, $\eta^2 = 0.14$. Follow-up t-tests indicate that the separated group reported significantly lower depressive symptoms than the assimilated group ($t(26) = -2.31$, $p = 0.029$). However, similar to earlier findings, they also reported lower depressive symptoms relative to the integrated group ($t(29) = -2.55$, $p = 0.017$).

Social Well-Being

Lastly, an ANCOVA controlling for ethnicity and years in the United States showed a significant main effect of digital acculturation strategy on perceived social support, $F(3, 51) = 4.64$, $p = 0.006$, $\eta^2 = 0.21$. In support of H2 and H3, follow-up t-tests indicate that the separated group reported significantly higher social support than the marginalized ($t(38) = 2.48$, $p = 0.018$) and assimilated groups ($t(26) = 3.10$, $p = 0.005$). People in the integrated group were not significantly different to the separated group in social support ($t(29) = 1.13$, $p = 0.269$).

DISCUSSION

There was partial support for the hypothesis that people who maintained offline social connection reported higher mental well-being (i.e., higher self-esteem and lower depressive symptoms) relative to people who reported low offline social connection (H1). However, this was sustained primarily by people who adopted a separation strategy (i.e., high F2F conversations, low social media use) and particularly relative to those who adopted assimilation strategies (i.e., low F2F, high social media use). Again, partially consistent with H2, people who maintained high offline social connection, particularly those who reported high F2F conversations and low social media use (i.e., separated group), reported higher social well-being or social resources in the form of social support than those in the marginalization and assimilation groups.

Contrary to the acculturation literature, those who adopted an integration strategy (i.e., high F2F, high social media use) often fared similar to those in the assimilation group in terms of self-esteem and depressive symptoms. Although the integration group reported significantly poorer psychological well-being relative to the separation group, people in both groups perceived high levels of social support. It could be that people high in need (e.g., experiencing high stress due to a crisis) are more likely to seek out a wider range of social support (Uchino, 2006), as in those adopting an integration strategy. However, the results can also suggest that large social networks, especially those that consist of weak ties, can represent more of a burden than a blessing, reducing cognitive resources and increasing information overload (Chan, 2015).

Though the separation strategy for low social media use may be protective, it may also have negative implications for mental health as prior research suggests that not actively engaging or interacting with others online is associated with lower self-esteem (i.e., "lurking"; Liu and Baumeister, 2016) and poorer psychosocial functioning (Przybylski et al., 2020). It could be that people who experience rejection or negative experiences online are more likely to reject it in a form of "reactive identification" and adopt a separation strategy to protect against or promote mental well-being (Berry and Hou, 2016). Given the correlational design, these explanations are post hoc and speculative. More information is needed to fully conceptualize these groups (e.g., have those who adopt marginalization or separation strategies experienced more negative experiences or issues of access online?).

Finally, there was support for H3 in which participants using a strategy that most displaces in-person social interaction (i.e., high social media use combined with low F2F among the assimilated group) exhibited the worst psychological and social well-being. Altogether, rather than establishing the benefits of seeking connection in both online and offline contexts, the results provide stronger support for the idea that high use of social media that detracts from in-person connection can come at a cost to cognitive and psychological capacities (Chan, 2015; Twenge, 2020). Although multimodal connection helps cultivate larger social networks, it may contain weaker social ties (e.g., acquaintances, former classmates) that are less protective than stronger ties (e.g., close family and friends). High social media use and low F2F frequency alone did not guarantee poorer outcomes; instead, the interplay between offline and online social connection highlighted the complexities of multiple modes of connection for psychological and social well-being. This is consistent with reviews of the literature that suggest null or small effects for screen time or time spent on social media alone on mental health (Yoon et al., 2019; Orben, 2020) and point, rather, to specific usage patterns (Liu and Baumeister, 2016).

Although age was not correlated with offline conversation frequency or social media use, it could be that people who are not active on social media (i.e., utilized a marginalization or separation strategy) are merely later-adopters of social media who will become more entrenched online with time or circumstances (e.g., pandemic-related lockdown due to COVID-19). It could also be that people who have poorer self-esteem or health are more likely to self-select in or out of social media contexts given longitudinal studies strongly suggest a link from self-esteem to social media use rather than vice versa (Valkenburg et al., 2017). The cross-sectional and correlational nature of the current study limits our exploration of these alternative explanations or to establish causal links and future studies that assess how strategies change over time can identify generational trends. In addition to longitudinal methods, examining patterns of use among individuals at-risk or suffering from depression and other mental health disorders may shed light on these relationships (Orben, 2020).

The study was also underpowered due to small and unequal sample sizes across groups. The results of this study, with our diverse sample of mostly female, young adult college students, can not generalize to populations of older "digital immigrants" who may use social media to connect with existing and emotionally-close ties (Chan, 2015). Our preliminary analyses showing marginally higher female social media use is in line with prior research that suggests gender differences in

motives and patterns of media use (e.g., Liu and Baumeister, 2016; Orben, 2020). Also, although there were no ethnic differences in social media use or F2F communication, Latino participants reported lower parent education levels, a proxy for socioeconomic status that can indicate reduced access to either online or offline communication (e.g., participants who own multiple devices, such as a smartphone and laptop, are likely to have more opportunities for social media or multitasking during F2F conversations). Given that patterns of use and access are not universal or ubiquitous, future research should examine how factors like age, gender, ethnicity, socioeconomic status, and even region can determine strategies for adopting media and how those strategies affect well-being.

Additionally, there are several limitations to the measures in the current study. The social media use item included email, which may be different from other forms of social media use, particularly for this young adult population who are more likely to use it for school or work where there are weaker emotional ties (Chan, 2015). Although the outcome measures in the current study were selected to parallel previous research that has linked acculturation and psychosocial well-being (e.g., Berry, 2017), we did not measure other forms of relating to different cultural contexts (e.g., identity, language, norms) or acculturative stress (i.e., stress associated with adjusting to new cultural environments) and future studies should consider how psychological, social, or cognitive stress specific to acculturating to cultural contexts online affect well-being. Finally, the measures were self-report and may be prone to recall bias. Capturing media use with daily diary, ecological momentary assessment (EMA), or objective measures that track feature use may reduce bias in reporting (e.g., Jensen et al., 2019; Orben, 2020).

Lastly, there are differences in how the acculturation model, that has focused on immigrant-receiving countries and permanent resettlement processes rather than temporary sojourners (e.g., international students, diplomats, guest workers), and the proposed digital acculturation model, which can involve more regular and recurrent interchange between online and offline environments, can be applied to cultural and psychological development. Given the interactivity of digital media, users can shape their online environments as well as be shaped by them (Hong and Na, 2017). Relatedly, although years in the United States (a potential indicator of other occurring acculturation processes) were accounted for in the current study, the intersectionality of participant identities can interact in ways that shape mental well-being. For example, in the current study, individuals from Latino backgrounds reported lower levels of depressive symptoms compared to individuals from other ethnicities. Disparities in media use by sociodemographic factors may shape use and how it affects individuals from different immigrant and cultural backgrounds (e.g., Liu and Baumeister, 2016; Guan et al., 2017).Future research should further unpack and test different mechanisms in explaining how social media use affects the mental, social, and psychological health and development for incoming generations of immigrants and digital denizens (e.g., multiple sources of acculturative stress, specific social media activities and cultural self-presentation, health behaviors like sleep).

Despite limitations, many of the results showed medium to large effect sizes, suggesting the utility of drawing from frameworks in acculturation and digital media research. Recent research suggests that social displacement may occur at different levels of experience (e.g., at the daily, within-person level vs. between-person level; Verduyn et al., 2020). The results show concerning implications for people who spend more time online, perhaps at the expense of in-person socialization and particularly if these trends are part of generation-level shifts in cultural norms (Twenge, 2020). However, the findings may also be reflective of on-going acculturation or support-seeking processes rather than purely due to problematic or intractable offline traits.

The recent COVID-19 pandemic has highlighted the negative consequences of reduced in-person interaction and the transition to virtual on mental well-being, particularly for adolescents (Guessoum et al., 2020; Magson et al., 2021). However, in the face of limited face-to-face connection, social media has provided important means to communicate and alleviate anxieties (Magson et al., 2021). The American Psychological Association (APA) even recommends individuals stay connected virtually to promote mental well-being while face-to-face interactions are limited during the pandemic. Although this research suggests that social displacement can leave individuals vulnerable to poorer mental well-being, the current pandemic has highlighted how modern communication technologies can still provide opportunities for connection that may mitigate some of the negative consequences of lack of in-person connection as has been suggested in the literature (Jensen et al., 2019). Given the increasing prevalence of digital media and technology, especially in light of the COVID-19 pandemic, the current study highlights the need to successfully navigate between multiple social contexts and how some groups may be more vulnerable to the loss of supportive social ties critical to mental and physical health during periods of digital, cultural, and social transformation.

DATA AVAILABILITY STATEMENT

The data used in this article can be made available from the author upon reasonable request.

ETHICS STATEMENT

All procedures involving human participants were reviewed and approved by California State University, Northridge IRB #1516-221-d. The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

The author confirms being the sole contributor of this work and has approved it for publication.

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Of Young People and Internet Cafés

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This study examines how adolescent experience in Internet cafés (known as wangba in Chinese) relates to academic attainment in urban, rural, and Tibetan schools of China. By documenting the frustrations teenagers express in their negotiations with adults surrounding access to and use of wangba and, by comparing self-reported academic standing of students from similar backgrounds with how they differ in their experience in wangba, the study finds that visiting wangba is not strongly correlated with the probability of students reporting either high- or under-achievement. While students without any experience in wangba are substantially less likely to report academic underperformance, the association disappears after matching when the logit regression model is less model-dependent and vulnerable to the problems associated with missing data. The paper concludes that visiting wangba alone is not systematically correlated with academic attainment, and that much adult anxiety concerning adolescent visit to wangba represents moral-technological panic and, offers a simplified explanation for educational problems that have deep macrosocial roots.

Keywords: China, social media, moral-technological panic, teenagers, academic performance

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OPPORTUNITIES AND RISKS IN CYBERSPACE

Views on what various Information and Communication Technologies (ICTs) such as computers and the Internet can do for and to students are mixed, perhaps reflecting sociocultural myths in societies around the world (Hollis et al., 2020). In countries like the United States and China, adults are torn between their belief in ICTs' empowering nature and the anxiety about the risks that ICTs may pose to their children (Livingstone and Bober, 2006; Liu, 2011; Xiao, 2019). Parents value education and recognize the opportunities ICTs have to offer for their children's development and learning in key subjects such as reading, mathematics, and science (Skryabin et al., 2015). As Latino immigrant parents do in America, Chinese parents expect their children to treat ICTs "seriously" and avoid using them "like a game" (Tripp, 2011, p. 557) too. While ICTs begin to influence children's learning and development earlier and earlier (Dong, 2018; Dong and Mertala, 2019), parents and teachers are increasingly aware of the limitations they have and are alert to the potential risks ICTs might pose to children and young people (Davies et al., 2019), amongst which are addiction to computer games, inappropriate online content, and a decline in academic performance. In China, academic concerns are probably the primary source of distress for many parents and teachers in middle and high schools (Liu, 2011; Xiao, 2019, 2020). However, such anxiety usually results from the general public's limited knowledge of and negative media coverage about ICTs in China as well as many other countries around the world (Herring, 2007; Boyd, 2008; Golub and Lingley, 2008; Przybylski and Orben, 2017; Van Rooij et al., 2018), which in turn have a negative

impact on how adults regulate adolescent interactions with ICTs. Recent research studies report that the more restrictive adult approaches are, the more likely adolescents are to develop problematic use of the Internet (Xu et al., 2014; Wu et al., 2016).

Adult uneasiness with adolescent engagement with ICTs beyond their supervision is understandable. Social media scholar danah boyd (*sic*) links the disquiet to the panic adults used to hold about outdoor space—young people are vulnerable to the dangers of the outside world and they need protection from adults (2008). Likewise, the Internet is sometimes viewed as a "gateway to harm," suggesting that "innocent" children must be protected from the dangers of cyberspace such as pornography (Buckingham, 2008), and "dangerous" young people prevented from causing trouble (Valentine and Holloway, 2001). In China, public uneasiness with Internet cafés (wangba in Chinese), a public space often attracting young people from diverse backgrounds to powerful computers connected to the superfast Internet, is not simply about potential harms to the bodies and minds of youths; it has moral implications too (Rao, 2019). For instance, some commentators view Internet addiction as digital opium, analogous to the opium of the late Qing dynasty (1644–1911) that corrupted the moral order of families and societies (Golub and Lingley, 2008). Like the opium in history, the Internet today appeals to "addicts" from all backgrounds, be they poor or rich, of high or low social status, employed or not. Yet it is more difficult to control than the opium, as it is associated with science and technology that also represent progress and civilization.

The addiction analogy, once broadcast to the public, makes people feel uneasy. But the analogy is flawed in at least two ways. First, as Turkle (1995) argued, it attaches more power to the external (wangba) than the internal (students). A more progressive understanding about youths and wangba should thus focus less on the addiction cliché and more on the forces that have kept students so engrossed in wangba and the cyberspace they proffer. Those forces, like the love and emotion we feel toward others, can help us better understand what students are attracted to, what they are missing, and what they need—problems that have deeper meanings (Van Rooij et al., 2018). Second, the argument based on addiction subverts the best possible solution, for it implies that we must get rid of the addictive substance in order to resolve the problem and that, it is the only option for action. But, as Turkle (2011) contended more recently, we are not going to discard the Internet, and the solution the metaphor implies is not going to be the one the society in large will take, even though schools can ban students' visits to wangba and parents can regulate their children's access to the Internet. Therefore, constructing students as victims of a harmful substance only makes even more adults feel at a loss and ignores adolescents' social and informational needs to develop as whole persons.

Young people gather in wangba not merely for access to the Internet, they engage in a wide range of activities that youths normally do in a public place. Just as a personal computer can be used for varied purposes, wangba refer to many things at the same time to different people. To many high school students in this study, they are places where young people can gain access to the Internet outside home and school, play computer games, and socialize with others. To many teachers and parents, they are signs of youth addiction to the Internet, computer games, or anything else they do not want to see. And yet, wangba were easy to find in the three regions where the study took place, particularly near the schools the students attended. As such, it is rather difficult to separately talk about wangba, the Internet, computer games, and addiction the first three may imply.

The research described here is part of a broader study, which employed mixed methods (Johnson et al., 2007; Creswell, 2009; Creswell and Creswell, 2018) to examine how social and educational factors related to adolescent access to and use of ICTs in and out of school, and to understand the meanings and values with which students invested their devices such as computers, mobile phones, and the Internet (Hargittai, 2004, 2010; Hargittai and Hinnant, 2008; Eynon and Geniets, 2016). This manuscript is specifically about adolescent engagement with wangba, which were, and still are, widely available and frequented by students in urban (School Nanshan in Shenzhen), rural (School Hengshan in Hunan), and Tibetan (School Basum in Tibet) regions of China where the fieldwork of the project took place.

The primary focus of this study is on the perplexing relationship between visiting wangba and academic performance, which many adults in China view as causal, as the semi-structured interview data of the research will illustrate. The perceived causal relationship means that visiting wangba can surely *cause* a student's academic performance to decline, or even *make* them a "worse" person (Liu, 2011; Rao, 2019). Using quantitative data from a survey, the study also seeks to understand more about the relationship by uncovering the "real" effect (as in Modecki et al., 2020) of wangba on academic attainment. Although the primary project did not employ an experimental design, the analysis reported here uses an advanced matching method to draw causal inference from observational data, a technique that is increasingly popular in other disciplines, such as political science (Iacus et al., 2009, 2012, 2019; Ho et al., 2011), where an ideal experiment is not possible to implement, as in this research.

MATERIALS AND METHODS

The broader sequential mixed methods research (Teddlie and Tashakkori, 2009; Creswell and Creswell, 2018) first examined how frequently students in different schools visited wangba using the above-mentioned survey (as reported in **Table 1**). It then interviewed a subset of the survey respondents to understand their attitudes toward and/or lived experiences with wangba and what (perceived) consequences any of their engagement with the technology had on their learning (Selwyn, 2011a,b, 2015).

This research therefore draws on two types of data, one from a paper-and-pencil survey (see also Hargittai and Hinnant, 2008; Murphy, 2008) and the other from in-depth semi-structured interviews (see also Liu, 2009; Micheli, 2016; Xiao, 2019). Prior to the fieldwork, the research project received ethical approval from the School of Education, Durham University. In each school during the fieldwork, permission was sought from teachers

TABLE 1 | The first row reports quantified frequency of visits to wangba in the three regions—the higher the value, the more the students visit wangba on average.

	Shenzhen	Hunan	Tibet
Frequency of visits to Internet cafés	0.41	1.65	1.83
Negative views of Internet cafés	2.12	1.80	1.70

The second row is about student attitudes toward wangba—the higher the value, the more negative attitudes students hold on average toward wangba.

who helped distribute the survey to the students they were responsible for. Note that permission from parents was not sought for two reasons. First, all students approached for this research were second year high school students and mature enough to give consent. Second, the majority of the students in rural areas lived in school and their teachers were their guardians. Many students rarely saw their parents throughout the year, and migrant parents usually lived in big cities far away from their children.

Following multiple presentations about the study, the students could ask questions of the researcher, the first author of the paper, before completing the survey in class and with the researcher present to elaborate on any point that was unclear to them. The average age of the participants was 17.4 years when the data were collected and, they all came from the same year group, which means the variation in age was controlled for by design. In total, 698 students from across the three schools, regardless of their residential status (living at home or in school dormitory), filled in the survey.

In addition, at least 15 students were interviewed in each school. The three schools were typical state schools in the three regions, and they all prepared students for the same National College Entrance Exam called Gaokao in Chinese (for more details about the sampling strategy, see Xiao, 2019, 2020). Within each school that resembles many other schools of the same region not selected for the research, at least four classes were selected to represent Arts versus Science, as well as Key versus Ordinary classes, two key variables that are strong predictors of academic performances and opportunities for higher education in China. All students present in the chosen classes completed the survey at the same time. Interviewees were purposively selected from different socioeconomic backgrounds (Teddlie and Yu, 2007), which were approximated by years of parental education and highly correlated with overall (sum of access to the Internet, computers, and mobile phones in and out of school) levels of access to ICTs [see Xiao (2020, p. 263) for a detailed statistical context].

It is worth mentioning that students in all three regions visited wangba, regardless of their overall levels of access to ICTs in school and/or at home. Also, most students in the study lived in school and rarely visited home during term time. Wangba were amongst the most popular places for many students to spend their free time. As schools usually believe time spent in wangba has negative consequences for student learning and adolescent development, they normally ban student access to wangba, even though they are outside and beyond the control of schools. However, young people visit wangba for varied purposes, and their attitudes toward wangba vary from person to person and region to region. As shown in **Table 1**, Tibetans hold the least negative attitudes toward wangba. Shenzhen students are least likely to visit wangba, but most likely to distain wangba.

Interviews

Depicting Wangba, Defining People

While the condition of wangba is sometimes regarded as an indication of economic development for a town, visiting wangba is often viewed as a sign of a person's quality (suzhi). Dark, messy, smelly, and crowded, the unpleasant environment in many wangba is due to underdevelopment of Shihong as a town where School Hengshan is located. Implicit in such student perceptions is the view that wangba in bigger cities should be more comfortable than theirs.

In China's Southern metropolis Shenzhen, Nanshan students also associate wangba conditions with users' personal qualities. For instance, Sin admitted that most wangba are distasteful. However, he emphasized that one can find pleasant ones in Shenzhen:

It depends on which type of wangba you visit, some bigger ones have better visitors, they would not smoke there; but if you go to those smaller ones, there is nothing you can do about it, cos people there have lower quality.

Although Sin regarded visitors of smaller wangba as having lower quality, he challenged the view that students visiting wangba are "bad." He treated such stereotyping as outright prejudice. "Following this logic," continued he, "no student could be counted as a "good" student. To be honest, in my former class, nobody would believe that one had never visited wangba, the best students all went there."

Student views of wangba in Shihong and Shenzhen reflect their perceptions of socioeconomic development level of the town or city they are situated in. Students in both places agree that the conditions in some wangba are not pleasant, but those in Shenzhen emphasized that it is possible to find better ones in their city, which many Shihong students could only imagine.

But to many adults in Shihong, visiting wangba has a moral connotation. To them, according to Qing, students visiting wangba frequently are not "good" students. Weizhou's parents do not want him to surf the Internet in wangba. In their view, wangba are not places "good" students ought to visit, and those who frequent wangba are generally speaking not "good" at their studies, or they would become "bad" should they carry on going there. While student views on wangba conditions differ from region to region, their understanding of adult attitudes toward their engagement in wangba is largely consistent—socioeconomic development can improve the material conditions of wangba, but it cannot change the pejorative views of wangba many adults hold.

The above adult views on wangba, once endorsed in media, also affect how students see wangba and themselves (see also Van Rooij et al., 2018). In Shenzhen, some students' aversion to wangba can be so intuitive that they call it "common sense." For instance, Xiumeng argued that students visiting wangba are

"no good," for the conditions there are poor. With a computer at home, she did not see any point of going there. Wangba to her are simply places for computer games, which girls like her do not play. Without any time ever spent in wangba, she said her impression of them had never been positive. She then remarked: "It has been internalized since we were little. It's like your first reaction to cockroaches. You don't need to experience it. It is intuitive."

As shown above, both conditions of wangba and discourses surrounding young people's engagement in wangba are subject to the forces of broader socioeconomic and sociocultural factors, which can change the former, but uphold the latter across regional differences.

Monitoring Behavior, Managing Wangba

Parents' knowledge of wangba influences how they regulate their children's engagement with wangba and how students view and use them. With parents working in another province as migrant workers for most of his formative years, Yao of School Hengshan in Shihong recalled that his mother returned to specifically monitor his behavior, for he was once fanatical about the Internet. But his mother was not always that effective in her control. What she could do was often left to catching him in wangba. When successful, she normally scolded him, and occasionally beat him. Most of the time, however, the battle between Yao and his mother took the form of quarrels. He confided: "She always insisted wangba were bad for me, but I never felt that!" Unsurprisingly, he kept doing what he wanted to do with the Internet, and simply ignored his father's admonition conveyed over the phone.

In Shihong, Yao's parents are not unique in their way of regulating their children's engagement with wangba. To Wei's parents, wangba are associated with "only disadvantages, no advantages," lamented Wei, for "they know nothing about the Internet... all they see is people playing games." Ting, from the same school, also reported that her parents "believe whatever others have to say about the Internet."

School Hengshan of Shihong is a typical school in rural China and the majority of the students in the school are children of migrant parents. Common in the student views reported there is the absence of presence—on the one hand, parents are far away, often throughout the year; on the other hand, they want their influence in their children's education and development, however, impotent, to be felt, if not effective. Both parents and students, again, are too powerless to resist the invisible forces of social machinery—students could not migrate together with their parents and study in host cities, and parents had to leave their children behind to seek better job opportunities in other places than their home town.

Parents knowing more about wangba thought their children should have computers and the Internet at home. Involved in an IT business in Shenzhen, Lu's father bought her a computer and had it connected to the Internet. He himself visited wangba often for commercial reasons during his time at home in rural Hunan, where home access to the Internet was not common at that time, but his experience in wangba convinced him that he should keep his teenage daughter away from wangba. According to Lu of Shihong, her father did not want her to surf the Internet in wangba, for people there are "complicated" (fuza) and the environment there "messy" (luan).

When it comes to the control of a student's visit to and experience in wangba, teachers do not differ that much from parents. All three schools in the study ban students' visit to wangba during weekdays. Hengshan in Hunan and Basum in Tibet even warn their students that anyone who dares to go there would be expelled. Dunzhulaba of School Basum found this policy unacceptable, arguing that appropriate amount of time spent in wangba is okay and his school should only penalize those who use it excessively, for instance, those who break out of the school during weekdays. "Expelling students because they frequent wangba is a fascist rule," commented the student. "Everybody visits wangba today, even those kids do! We are over 18 and grown up," he continued. Zaxipubu shared a similar view. He believed high school students are able to discipline themselves well, and the Internet can be of value to their studies. Student views in Tibet, as in those of the other two schools in the study, once again reflect the disconnection between adult views of wangba and what wangba really mean to the adolescents they have a duty of care for.

In School Hengshan, as Qing of Shihong reported, a few students she knew were expelled. The narratives given by those students who were punished can better show how seriously their teachers took the issue. Yao, once caught and then subjected to some disciplinary action, recalled his experience in Hengshan:

Once, we broke out from the school during lunch break in order to surf the Internet in wangba. After we returned, the teacher in charge began to investigate... I eventually confessed the misdeed, but was later asked to write an essay and a note of apology . . . My parent was also asked to visit the school. The teachers insisted that a parent must come. It is important to inform my parents that I am such a (bad) student in the school, and it is not their fault if I fail — don't blame teachers if that happens... I then had to read the apology in front of my class. In the essay, I first described what I did wrong, and then listed all the disadvantages of wangba (I could imagine).

Teachers undoubtedly shoulder great responsibilities in the above schools, particularly when parents are migrant workers and/or far away from school. The school policy to ban student visits to wangba appears to represent a crude display of force, but one that can prevent potential risks to the students under their duty of care, risks often beyond their control. This reality thus reveals the vulnerability of schools to many unforeseeable risks in modern societies (Giddens, 1999).

Time Spent in Wangba and the Consequences for Learning

As reported above, it is widely held that spending too much time in wangba has negative consequences for learning. Those who have experienced a fall in examination score agree with the view to a certain extent, but they do not necessarily believe that it is the Internet that has the undesirable effect. Yao in School Hengshan, for instance, did not attribute his decline in academic ranking to the technology alone. Upon analyzing his own experience and

observation, he was not quite sure if there is a direct link between addiction to the Internet and academic performance, just as some recent studies (Etchells et al., 2016; Przybylski and Orben, 2017; Orben and Przybylski, 2019) report about the link between social media use and young people's health and wellbeing outside China. He first argued that people around him in the real world—in wangba—posed no risk to him if he managed his own business in cyberspace. Instead, it was those in the virtual world—in games—who affected him as a player. Upon consideration, Yao concluded that what really matters is not the people in the virtual; rather, it is down to himself—if he could discipline himself well, the Internet would do no harm to him at all.

Yao was no longer "addicted" to the Internet and wangba were no longer important to him when he was interviewed—he could better control himself than before, so his exam scores rose again. However, he noted that his performance could have been better had he visited wangba less—his Internet use certainly affected his academic standing. While he realized that his time spent in wangba resulted in a decline in his academic standing, he still performed much better than did his friend who dropped out from school, suggesting that playing with ICTs simply deflated his academic score, but ruined his friend's academic career. Eventually, he concluded that the effect varies from person to person—while it did not have a devastating impact on him, it had on others around him. Another 17-year old from the same school, Wei, shared Yao's view and affirmed that there are only benefits associated with wangba if students can control themselves well. As such, this echoes well with findings from other studies that not all students are equally prepared to withstand the effects of online risks (Turkle, 1995) and digital technologies such as wangba are "bad for some teens, not all" (Odgers, 2018; Orben et al., 2019). The differentiated impacts of wangba on different teenagers attest to the fact that some students can still develop agency for themselves–they are not just victims of a harmful technology.

Regarding online benefits, students also differ in how they use wangba to their advantage. In School Hengshan, Guoyu found the Internet so helpful that he could easily find example essays when he really struggled with his own. He revealed that his teacher once asked them to write a report, which he did not know how to even start. Then he went to wangba after school and copied one from the Internet by hand. He justified his decision by pointing to the fact that his teacher did not say students could not copy from the Internet, and that there were simply too many assignments and they were all very difficult. Weizhou did not copy model essays verbatim—he rewrote them according to his memory after he had read them online. He also said homework assignments were too difficult to cope with. If they were easy, stressed Weizhou, he would not have copied them. However, he searched on whatever website that happened to have a search engine. In his words, "I search wherever the home page is." Yao also used online search engines to find similar essays. But he said he did that usually after he had submitted his own. He maintained that he could learn from others by reading their essays.

The broad social-lingual environment shapes how students learn in wangba too. In Basum where students need to learn Tibetan, Mandarin, and English concurrently (Xiao and Higgins, 2015), wangba provide opportunities for teenagers such as Dunzhulaba to develop interests in music and English. Apart from gaming and chatting, he actively participated in rap forums, particularly those in English. He said most English words he knew were learnt from rap. When he came across a sentence he could not understand, he copied and pasted it in Baidu, the then most famous search engine in China, for a translation/explanation and sometimes even a pronunciation. He regarded the Internet as a better place to learn English than his real classroom. Finally, he emphasized: "It all depends on how you use it."

Adolescent use of the Internet, according to the above reports, reflects not only what students learn, but also how they are taught in schools. Teachers in the schools studied did not seem to have realized that their students could copy from the Internet the homework tasks they assigned, nor did they teach students how to search resources from the Internet and use them appropriately. As discussed elsewhere (Liu, 2010; Xiao, 2019), the high school curriculum focuses primarily on the high-stake examination, the Gaokao, which limited the amount of time students in the study had at their disposal. In Tibet, adolescent use of the Internet even reveals a linguistic element less visible in the other two schools.

Survey

Experience in Wangba and Academic Attainment

Since all the schools in this analysis have in place some wangba policy and it affects students in varying ways and to varying degrees, it is important to see how experience in wangba relates to academic attainment. In the survey, students were asked about the frequency of their visits to wangba (see Question 13 of the **Survey**). This variable is converted into a group status indicator for the quantitative analysis, where those who reported "Never before" in terms of experience in wangba are considered "treated," as if in an experimental design; and those who selected other options such as "Only weekends or holidays," "Often, even during term time," "Cannot cope without it," or "Prefer not to say" form a comparison group for the quasi-experimental design. The outcome is a binary variable called "achieve" or "undera." The former refers to high academic achievement, where "Above average" or higher in self-reported academic ranking is coded as 1, "Average" or lower as 0. The latter means underachievement, where "Below average" or lower is 1, otherwise 0. Self-reported academic ranking may be a sensitive issue and invalid as a measure of academic attainment in a Western context, but in Chinese schools, just as classes are classified as Key or Ordinary, students are usually acutely aware of where they stand relative to their peers, and the measure is largely valid, as verified in how students answered interview questions and how strongly this variable correlated with other statements relevant to academic performances in Question 11 of the survey (Xiao, 2013). Moreover, other studies conducted in similar contexts in China also employed self-reported academic ranking as key outcomes (see Lau and Leung, 1992; Xiao, 2013; Xu et al., 2014; Xu and Li, 2018). Nevertheless, it would still be better to have had their actual performances in official and high-stake tests, but these were too much to ask for from those teachers and schools who had already helped a lot in facilitating the study. Even with official test results, arguments could still

be made that mock exams were not as valid as the real Gaokao, which would not take place until after the end of their third year in high school.

To see the difference in probability of students reporting high achievement or underachievement between the two groups, a logit model is employed to conduct the analysis, with the following stochastic and systematic components: $Y_i \sim Bernoullie\,(\pi_i)$ and $\pi_i = (1 + e^{-X_i\beta})^{-1}$, where $Y_i \perp Y_j$ for $i \neq j$, assuming all observations are independent. The log-likelihood function derived from the model is as below:

$$L\left(\pi_i \mid y\right) \propto \prod_i^N (\pi_i)^{y_i}(1-\pi_i)^{1-y_i},$$

$$lnL(\pi_i|y) = \sum_i^N y_i \ln(\pi_i) + (1-y_i)\ln\,(1-\pi_i),$$

$$= \sum_i^N -y_i \ln(1+e^{-X_i\beta}) + (1-y_i)\ln(1-(1+e^{-X_i\beta})^{-1}),$$

$$= \sum_i^N \ln\left(1+e^{(1-2y_i)X_i\beta}\right).$$

Following the model specification, simulations are then run in R to calculate the differences in outcomes between the two groups by holding constant all relevant covariates at their median values. The means of 50,000 simulated differences in the probability of students reporting high or low achievement and their 95% confidence intervals are reported in **Table 2**. The simulated results show that all the confidence intervals in the Achievement column contain 0, suggesting no statistically significant effect of experience in wangba on the probability of students reporting high achievement in each of the three schools. However, when the outcome is Underachievement, those who never visited wangba are significantly less likely to report underachievement than those who did.

However, it is worth noting that the differences reported above assume independence of observations within schools. If we take into consideration the fact that students in the same school have more in common than those from different schools, the uncertainties surrounding those estimates would be more conservative or wider than those reported in **Table 2** (Gelman et al., 2012; Xiao et al., 2016), meaning any statistically significant differences we see in **Table 2** are likely to be due to chance. Also, the comparisons in **Table 2** are between students who are in the middle of various dimensions or covariates used to run the simulations and, the academic ranking variable has 94 missing values, the robustness of the findings is thus questionable.

To address the problems identified above, Amelia (Honaker et al., 2012), an R package, is then employed to impute 10 complete datasets, which have exactly the same observed values but differ in the missing ones. Within each complete dataset, a method called Coarsened Exact Matching (Ho et al., 2011) is used to establish two groups of students who are in the same school, from similar socioeconomic backgrounds, equally motivated to do well in school, and engage with ICTs for about the same range of purposes—measured covariates used to establish the comparison. After matching, the same logit model introduced earlier is implemented to compute the mean differences in outcomes in another R package called Zelig (Imai et al., 2013), which makes it possible to see how strong the relationship really is between experience in wangba and academic attainment. This time, the point estimate for achievement is −0.0463 (−0.2676, 0.1749), and that for underachievement is −0.0354 (−0.1936, 0.1227), showing a random relationship in either direction. Taken together, the results suggest that experience in wangba is not systematically correlated with academic achievement or underachievement, which is consistent with recent findings published outside China on the relationships between screen time and a number of outcomes concerning children and young people (Etchells et al., 2016; Orben and Przybylski, 2019; Orben et al., 2019).

Nevertheless, the quantitative strand of the study is not a real experiment, which requires random allocation of students to treatment or control (Xiao et al., 2017). Instead, it aims to make "fair" comparisons between the two groups (Chalmers, 2014; Jones and Podolsky, 2015; Xiao et al., 2016). Therefore, the findings from the procedures described above are less model dependent and more robust to untenable assumptions and challenges associated with missing data than those reported in **Table 2**. As in many other studies on young people and new media, detecting causal relationships is challenging but the questions we want to answer are usually causal in nature. This is the case even in large-scale, nationally representative cohort and longitudinal studies (Van Rooij et al., 2018; Orben and Przybylski, 2019; Orben et al., 2019; Orben, 2020). That said, this study has in-depth interview data borne out of the lived experiences of those affected and, the qualitative findings reported earlier not only provide some in-depth domain knowledge that is crucial for the decisions made in later analytical processes, but they also undergird the conclusions from the quantitative strand that has taken robust measures to establish a fair comparison based on observed covariates and deal with any bias associated with missing data.

TABLE 2 | Means and their 95% confidence intervals of 50,000 simulated differences in the probability of students reporting achievement or underachievement in each of the three schools studied.

School	Achievement	Underachievement
Basum	−0.1056 (−0.0115, 0.2180)	−0.0926 (−0.1711, −0.0141)
Hengshan	−0.1064 (−0.0115, 0.2220)	−0.1193 (−0.2195, −0.0163)
Nanshan	−0.1028 (−0.0114, 0.2126)	−0.1435 (−0.2785, −0.0176)

LIMITATIONS

This analysis suffers from a number of limitations and the conclusion drawn should be treated with caution. First, we used observational data to draw some causal inferences, which is less ideal than a true experimental design. However, randomly

allocating the target group of high school students into wangba and non-wangba groups would be impossible to implement, practically and ethically. We made the best use of the data collected and aimed to answer the questions that are causal in nature. A recently published study did show that the conditional independence assumption is largely valid, as is the case for this analysis using matching, and that non-experimental approaches to causal inference can satisfactorily answer such questions in an often more cost-effective and ethical manner and, should play an increased role in socio-educational research (Weidmann and Miratrix, 2020). Second, the primary outcome used for the analysis is self-reported academic standing. It would be better to have test results from standardized tests such as the Gaokao or the mock exams for the Gaokao. But, again, it would be too much to ask for when the research relied upon the good will of the schools and teachers involved, or it would take another year before we could have had access to the data, let alone the challenges associated with data protection and other ethical issues that might bring about. That being said, many research studies rely upon self-reported data (Stavropoulos et al., 2013; Xu et al., 2014; Wu et al., 2016), the validity and reliability of self-reported academic standing may not differ too much from the use of interviews. Finally, the students surveyed came from three schools in three different regions of China. The sample could have been more representative. However, the types of schools chosen for the study were typical state schools in the three regions, and within the schools, key variables such as key versus ordinary classes and arts versus science tracks were considered when students were sampled within the schools. There are many studies about young people's engagement with digital technologies and many of them are large-scale or even longitudinal in nature (Etchells et al., 2016; Van Rooij et al., 2018; Orben and Przybylski, 2019; Orben et al., 2019). Smaller studies such as this can contribute to the body of knowledge in its unique ways, particularly when they utilize multiple types of data. In this study, for example, a number of decisions made in the quantitative analysis stage were informed by findings from interviews with the students, although the integration of the findings from the two strands could have been made stronger, particularly in how they answered the research questions in a more effectively way.

CONCLUSION

Wangba and the narratives about wangba, though largely constructed by adults, have the capability to "script" adolescents (Miller, 2013). The concerns adults repeatedly express to young people clearly exhibit a "technologically deterministic" (Aagaard, 2017) tone—while they ban adolescents' visits to wangba, they also consider unavoidable the impact on those students with poorer will power, a sign of poor character in the eyes of many. Although schools regard it as vital to implement a strict wangba policy due to various pressures, students also consider it essential to visit wangba for varied purposes.

The concerns surrounding wangba are essentially social, familial, and educational challenges, which are unlikely to be solved through technological interventions alone. Since experience in wangba appears to have little bearing on academic attainment and students need access to both real and virtual worlds in order to mature (Davies, 2017), it might be more desirable than an outright ban if adults adjust to helping them navigate through the virtual as well as the real (Boyd, 2008, 2014) and, if relevant authorities improve wangba conditions so that they become safer and more youth-friendly public spaces outside home and school environments.

DATA AVAILABILITY STATEMENT

The dataset and its associated R codes can be found in this open repository: https://doi.org/10.7910/DVN/25720.

ETHICS STATEMENT

The research involving human participants was reviewed and approved by the Ethics Committee of the School of Education, Durham University. The students were old enough to give informed consent, and their teachers acting as their guardian gave consent too and helped recruit the students for the study. The research was conducted in accordance with national legislations and institutional requirements.

AUTHOR CONTRIBUTIONS

ZX conducted the research, collected and analyzed the data, and authored the manuscript. SH supervised the overall research project, contributed to the conception of the research design, offered critical feedback for earlier drafts of the manuscript, and revised the manuscript after peer review. Both authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

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frontiers in Human Dynamics

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Examining the Associations Between Online Interactions and Momentary Affect in Depressed Adolescents

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Concern has been raised over parallel increases in youth depression and online interactive media use over the past two decades. The aim of this study was to determine whether online interactions are associated with users' affective states. Using ecological momentary assessment, we measured depressed adolescents' momentary affect during and residual feelings following online interactions with offline friends and family, online friends, and acquaintances/strangers. We found that depressed adolescents use texting services and social networking sites to interact online, most frequently with offline friends and family, followed by online friends. Results of generalized estimating equations showed associations between negative affect and digital interactions with offline friends and family. Participants were less likely to report feeling better after interacting with online friends than after interacting with any other relationship type. Our findings highlight the heterogeneity of depressed adolescents' online interactions and suggest that their affective experience varies depending on the nature of the relationships they have with those with whom they interact.

Keywords: depression, ecological momentary assessment (EMA), affect, online interactions, social support, social media, social network site use

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INTRODUCTION

Media Use and Psychological Well-Being

Increases in daily interactions on digital platforms and in the prevalence of depression have raised concerns about possible associations between media use and adolescents' mental health. On average, teenagers spend seven and half hours per day online (Rideout and Robb 2019), and nearly two-thirds report spending time online with friends (Anderson and Jiang 2018a). In 2019, 3.8 million teenagers reported experiencing at least one major depressive episode (Substance Abuse and Mental Health Services Administration 2020). Youth suffering from depressive symptoms spend more time using media than their peers (Primack et al., 2011), highlighting the importance of investigating the media use patterns of this especially vulnerable population to better understand how contemporary uses of media serve as risk or protective factors for psychological well-being.

For almost two decades, researchers have examined the association between depression and the use of Social Networking Sites (SNS), finding inconsistent evidence of negative, positive and mixed effects (Best, Manktelow, and Taylor 2014; Hoge, Bickham, and Cantor 2017; Vidal et al., 2020) with a recent meta-analysis finding a small, but significant association between SNS use and increase in depressive symptoms (Odgers and Jensen 2020). Prior literature often associates

increases in depressive symptoms with increases in media use or exposure. For example, some suggest based on social comparison theory that the viewing of TV shows and movies, and exposure to SNS provide opportunities for social comparison, leading to dissatisfaction with oneself and increases in negative affect (Nesi and Prinstein 2015; van den Berg et al., 2007; Vogel et al., 2015; Yoon et al., 2019). Researchers acknowledge, however, that depression may precede and motivate SNS use, or that vulnerable youth may engage with interactive media in maladaptive ways that have been associated with increases in depressive symptoms (Raudsepp and Kais 2019). Conversely, youth suffering from depressive symptoms may turn to interactive media as a respite to cope with negative emotions. They may seek out humorous or uplifting content to mitigate negative feelings, increase positive affect, and potentially alleviate depressive symptoms (Morgan and Jorm 2008; Rideout, Fox, and Trust 2018). Perhaps more effectively, youth may use social media or texting to connect with friends, family, and peers with similar experiences (Lerman et al., 2017), seeking online social connection and support that can serve as a protective factor against depressive symptoms (Frison and Eggermont 2015; Seabrook, Kern, and Rickard 2016).

Employing a person-specific, experience sampling method, recent research has found varying associations between social media use and affect across individuals, with no associations in some adolescents and associations with positive or negative affect in others (Beyens et al., 2020; Valkenburg et al., 2021). Variations found in associations between social media use and affect may be attributable to differential susceptibility of individual adolescents and to differences in individuals' use of social media. Those with whom an adolescent is interacting and the nature of the interaction can influence the user's affective state, including their depressive symptoms. More detailed research is necessary to reveal what characteristics of individual youth and what features of online interactions influence associations between social media use and mental health.

Differences in User Experiences and Effects on Mental Health

Two proposed hypotheses, the rich-get-richer hypothesis and the social compensation hypothesis (Kraut et al., 2002), propose different mechanisms by which personality and social behaviors shape the online interactions young people experience and their subsequent impact. The rich-get-richer hypothesis proposes that extroverted, socially adept individuals who have established social networks and strong social ties use online communication to increase social interactions and benefit from associated improved well-being. The social compensation hypothesis suggests that socially anxious or introverted youth who have difficulty forming real-life relationships with peers benefit by using online communication to compensate for a lack of offline social networks. While the majority of research tends to support the rich-get-rich hypothesis (e.g., Khan et al., 2016), some findings indicate that social compensation may be more applicable to youth experiencing symptoms of depression (Desjarlais and Willoughby 2010; Valkenburg and Peter 2007). Considering that social anxiety and loneliness are linked to depression (Qualter et al., 2010; Stein et al., 2001) and that depressed youth have higher levels of online media use (Primack et al., 2011), it is possible that youth with depression are using social media to compensate for limitations in their face-to-face social resources. Further research is needed to better understand how depressed adolescents use online communication to facilitate social interactions and whether and to what extent they use interactive media to cope with depressive symptoms.

The extent to which adolescents develop new relationships or foster existing ones online may contribute to the impact of their interactive media use on their affect and mental health. According to a 2015 Pew Research Center report (Lenhart 2015), adolescents are increasingly establishing online friendships that do not transition out of the digital space. Depressed and other at-risk youth, in particular, seek community and social support via online platforms (Frison and Eggermont 2015). This is in part because perceived social support, including online relationships, can provide protection against depressive symptoms (Frison and Eggermont 2016). Despite this protective quality and shift in the dynamics of social relationships to the online environment, few studies have investigated how these types of online relationships influence adolescent mental well-being. One study examined conjoint, exclusively online, and exclusively offline relationships, finding a positive association between exclusively online relationships and increased self-esteem among shy adolescents (Zalk et al., 2014). Another found that online only friends offer protective benefits against suicidal ideation (Massing-Schaffer et al., 2020). While this research demonstrates that disparate, online relationships may influence mental health and well-being in different ways, more detailed and precise measurement than self-report and focus groups is needed to map the directionality, severity, and timing of fluctuations in individuals' affective states in relation to their social media use.

Capturing Differences Through Ecological Momentary Assessment

Given the heterogeneity of individual digital experiences and fluctuations in depressive affect, ecological momentary assessment (EMA), a method that collects real-time momentary data from participants in their natural environments, may be especially effective at assessing associations between media use and mental health (Bickham, Hswen, and Rich 2015; Shiffman et al., 1997; Solhan et al., 2009). Prior studies using this method have found that Facebook use predicted negative shifts in momentary affect and life-satisfaction (Kross et al., 2013), and have found positive associations between major depressive disorder and exposure to popular music (Primack et al., 2011). These findings, however, were based on a single social media platform or general media use, which may obscure mental health effects that are influenced by specific types of user experiences (e.g., whom a user is communicating with). Similarly, recent studies have used EMA to assess the relationship

between mental health symptoms and the amount of time spent daily on technology (George et al., 2018; Jensen et al., 2019), but do not examine characteristics of media use that may be driving their findings. Given that recent work using experience sampling and an N = 1 approach (Beyens et al., 2020; Valkenburg et al., 2021) has identified varying associations between mental health and social media across individuals, and that different types of online relationships may afford varying protection against depressive symptoms, it is important to explore with whom young people are communicating online and how interacting with different types of people can shape the effects of social media use.

EMA can ask detailed questions in real time, such as how and with whom users are communicating, and the qualities of their current affect and residual feeling following an event. Such ephemeral details are critically important to social media users' experiences and immediate affective state, but are easily lost to social desirability or recall bias by methods that do not collect data in the moment. To the best of our knowledge, no previous studies have used EMA to examine individuals' interactive media use with different types of interaction partners and affective states among adolescents at risk for depression.

Current Study

This study explores depressed adolescents' online social media interactions with different types of communication partners in relation to their positive and negative affective states. Sampling random moments throughout their day, we observed individuals' digital interactions with offline friends and family, online friends, and acquaintances and strangers and assessed their momentary affect in relation to their communication partners. Our aim was to address the following research questions:

- With whom do depressed adolescents interact online and through what platforms?
- Do adolescents' affective states vary with their relationship to the person with whom they connect online?
- What changes in their affective states do adolescents report after they have interacted with different types of people?

METHODS

Participants and Recruitment

Adolescents aged 14–19 years were recruited from an urban adolescent medicine practice in Boston, MA, from August 2016 through March 2018. Using a recruitment protocol established previously by the practice, age-eligible patients who were not in the clinic for sensitive or confidential procedures were approached. To ensure patient privacy, these patients were asked to read a brief description of the study that detailed patient eligibility criteria, including the wording "currently experiencing symptoms of sadness," and were asked if the criteria applied to them. Interested patients who self-identified as sad reviewed and signed an informed consent if they were 18 or 19 years of age; for patients under the age of 18 years, parental/legal guardian consent was obtained. Potential participants completed the Patient Health Questionnaire-9 (PHQ-9) depression screener (Kroenke, Spitzer, and Williams 2001) (a second PHQ-9 was completed after the EMA procedure, but this score was not used for this study). Patients who reported at least mild depressive symptoms (a PHQ-9 score of 5 or higher) were invited to participate in the study. Of 66 screened patients, 8 did not meet eligibility criteria. For patients who reported any non-zero response on the suicidality question (n = 12), a safety procedure was followed that included paging an on-call mental health provider. Informed consent and all study procedures were approved by the Boston Children's Hospital IRB.

Procedure

Enrollment session. Enrolled participants downloaded MetricWire app (MetricWire 2020) onto their smartphones to deliver the EMA procedure and administer a baseline questionnaire. Three participants did not own a smartphone and were loaned an iPod Touch (with all non-study functionality disabled) for the duration of the study. The 189-item baseline questionnaire collected demographic information, as well as additional measures not used in the current study. Participants were compensated $10 in cash for completing the enrollment survey.

EMA procedure. The day following the enrollment session, participants began a 7-day data collection procedure in which they completed up to 5 EMAs a day, delivered at random times to their phones with a minimum of 30 min between each EMA signal. Metricwire was programmed to deliver EMA signals between the hours of 8AM-10PM for participants not attending school and from 6AM to 8AM and 3–10PM for those who were, in order to avoid disrupting their school day. If participants did not respond to a signal within 10 min, a reminder push notification was automatically sent. Following standard EMA protocol (Shrier et al., 2007), if participants did not complete the EMA within 5 min of the reminder, the EMA expired and was no longer available to the participant. Participants received up to $30 compensation in the form of a gift card based on the percentage of EMAs they completed.

EMA Measures. Three subscales of the Positive and Negative Affect Schedule expanded form (PANAS-X) were used to assess participants' momentary affect (Watson and Clark 1994). The PANAS-X assesses general positive affect and negative affect via 10 items each, and sadness with 5 items. Positive affect includes items such as attentiveness and enthusiasm; negative affect includes irritability and being upset; and sadness, which is most like momentary symptoms of depression, includes being sad, lonely, and blue. When signaled, participants rated the extent to which they felt each affect item in the moment on a 5-point Likert scale from "very slightly or not at all" to "extremely." In this study, the three subscales demonstrated a high level of internal reliability (Cronbach's Alpha for positive affect, negative affect, and sadness = 0.85, 0.95, 0.93, respectively).

Participants were next asked to indicate which types of media they were using when signaled (TV, video game console, computer/laptop, cell phone, tablet, stereo/radio, or none of the above). For each device selected, participants were asked to select what they were doing on the device (playing a video game,

using social media, checking an online discussion board, messaging, video chatting, voice calling, watching a video, listening to music/radio, schoolwork, shopping, other- write in option) and whether they were communicating with someone while on it. If participants indicated they were using social media, they were asked to identify the platform they were using. When participants indicated yes to communicating with another user, they were asked whether the person with whom they were interacting was a friend whom they only know online (online friend), friend whom they also know offline (offline friend), a family member, an acquaintance, or a stranger. For purposes of analyses, we created categories of relationships that existed entirely online (online friends), were established offline (offline friends/family), and were more distant (acquaintances/strangers). Finally, participants were asked how they felt after their interaction (better, same, or worse).

TABLE 1 | Demographic characteristics of sample.

Variable	*n* = 56
Age	M = 17.46
	SD = 1.49
Female	37 (67.3%)
Race/Ethnicity	
White	27.8%
Black	29.6%
Hispanic	27.8%
Mixed race/other	14.8%
PHQ-9 Score	M = 11.27[a]
	SD = 5.26
EMA Response Rate	M = 17.14[b]
	SD = 9.22

[a]*PHQ-9 score of 10–14 indicates moderate depression.*
[b]*Mean EMA response rate represents the average number of EMAs responded to over a week of data collection. Participants completed approximately 49% of EMAs.*

Accounting for Multiple Communication Partners and Feeling Responses

Individual moments in which communication occurred were categorized according to the type of communication partner: online friends, offline friends/family, acquaintances/strangers, or a mix of these relationship types (e.g., texting on a phone with online friends and an offline family member during the same moment). The majority of EMAs fell into one of these categories. However, because participants could select more than one media type or platform through which they were communicating per EMA survey, some EMAs (n = 23, 11.8%) fell into multiple categories. We resolved these responses by characterizing the moment according to the most frequently reported relationship type, given that a higher occurrence of interactions with a specific type of person may be more strongly associated with the participants' affective state. For example, a participant might have reported that at the moment they were signaled, they were texting on their phone with an offline friend, responding on social media to an offline friend, and using their computer to message with a relative stranger. This moment would be categorized as offline friend/family because two out of three communications were with an offline friend. There were 5 EMAs (3%) that fell into equal categories of relationship types and were, therefore, categorized as "mixed." Similarly, since multiple interactions could be reported per EMA, it was possible for participants to report a different affective reaction to each. In 1.2% of EMA responses ($n = 2$), participants reported multiple affective states and were characterized by the most frequently reported affect. In 5 surveys (3%), participants reported multiple affective states with equal frequency. These moments were excluded from analysis.

Analysis

Generalized Estimating Equations (GEE) were used to determine whether momentary reports of positive affect, negative affect, or sadness differ when adolescents are interacting online with different types of communication partners (online friends, offline friends/family, acquaintances/strangers, or a mix of these relationship types). Separate analyses were conducted for each type of relationship so that results compare affect during moments with the included communication partner type with affect during moments with any other partner type. A similar approach was used to ascertain if participants were more likely to report feeling better (vs. feeling no change) after an interaction with each type of communication partner, but using a logit link function (rather than an identity function) to account for the binary nature of the dependent variable. GEE is a modeling approach that allows for the specification of a working correlation structure and can, therefore, account for different types of relationships among data points and has regularly been used with EMA data (Schwartz and Stone 1998; Shiffman, Stone, and Hufford 2008) including those studying adolescent and adult affect and health behaviors (Shrier, Ross, and Blood 2014; Paganini, Peterson, and Mills 2019). The quasilikelihood under the independence model criterion (QIC) is a goodness of fit statistic that can be calculated for GEE models and used to select the most appropriate correlation structure. QICs from identically specified GEE models using different correlation structures can be compared and the model having the lowest QIC considered the best (Cui 2007). Using this procedure we chose to use the identity structure (in which the data are assumed to be uncorrelated) as it resulted in the lowest QIC across our models. When modeled with the exchangeable correlation matrix that assumes equal correlations across observations within participant, the estimated correlations ranged from approximately 0.01 to .23. These are below the point at which the inefficiency of regression coefficients becomes most apparent (0.4) (Ballinger 2004). Analyses were conducted via IBM SPSS Statistics for Windows, Version 24.0 and controlled for participant age, gender, race/ethnicity, PHQ-9 score pre EMA data collection, and EMA response rate.

RESULTS

Sample Characteristics. Fifty-eight participants were enrolled in the study. Of those, 56 provided usable data. The sample was predominately female (67.3%), and racially/ethnically diverse

TABLE 2 | Generalized Estimating Equation (GEE) model predicting momentary affect by relationship type.

	Negative affect		Positive affect		Sadness	
Variable	**B**	**SE B**	**B**	**SE B**	**B**	**SE B**
Offline friends/Family	0.13*	0.06	0.12	0.12	0.06	0.15
Online friend	–0.03	0.07	–0.26	0.30	0.06	0.15
Acquaintance/Stranger	0.10	0.18	–0.13	0.21	0.34	0.38
Mix	–0.06	0.07	0.08	0.17	0.12	0.15

Note: *Analyses controlled for gender, race/ethnicity, PHQ-9 score, and EMA response rate. Separate analyses were conducted for each relationship type.*
*p < *0.05*, **p < *0.01*.

with an approximately even split between White, Black, and Hispanic participants (**Table 1**). Participants had a mean PHQ-9 score of 11.27 (moderately depressed) and responded to 49% of the EMA signals.

Descriptions of Interaction Moments. In 57.1% (n = 558) of EMAs, participants reported using media, and of those, 35.1% (n = 196) reported communication with another person using interactive media. Of EMAs reporting communication, 45.4% were with offline friends and family members, 24.5% were with online friends, 5.6% were with acquaintances/strangers, and 24.5% were with a mix of these relationship types. In 34.2% of EMA responses, participants reported using more than one type of interactive media.

Of the 56 participants in the study, 25.0% reported zero moments of communicating with another media user. For participants who reported at least one moment of communication, the majority (48.2%) reported communicating with a variety of relationship types, while 21.4% reported only communicating with offline friends or family, 3.6% communicated with online only friends, and 1.8% reported only communicating with acquaintances/strangers.

When conversing with acquaintances/strangers, 43.6% of interactions happened on social media platforms accessed on their phones, with most of these moments happening on Snapchat (52.9%) and Instagram (35.3%). The second most common form of interaction with acquaintances/strangers happened via text messaging on participants' phones (25.6%). In comparison, when interacting with online friends and offline friends/family, participants reported most frequently doing so through text messaging on their phone (39.1 and 41.2%, respectively), followed by social media platforms on their phone (31.2 and 25%, respectively).

In terms of social media platforms, 51.1% of interactions with online friends happened *via* Snapchat, followed by nearly equal reports of Facebook (25.6%) and Instagram (23.2%). When communicating with offline friends/family, Snapchat was also the most frequently reported platform (50.0%), followed by Facebook (31.5%).

Affect During Interactions with Different Relationship Types. Table 2 presents the GEE results of analyses examining the associations between momentary affect and relationship type. Participants reported higher levels of negative affect during moments when they were communicating with an offline friend or family member vs moments of communication with other relationship types. However, no moment of communication with any relationship type was related to either momentary positive affect or sadness.

Feelings After Interactions with Different Relationship Types. Of the moments in which participants reported how they felt after communicating with another media user (n = 162), 48.1% of the time participants reported feeling better, 46.9% of the time participants reported feeling the same, and 4.9% of the time participants reported feeling worse. When communicating with offline friends and family, participants reported feeling better 57.3% of the time, feeling the same 38.7% of the time, and feeling worse 4% of the time, vs. 27.5% better, 70% the same, 2.5% worse when communicating with online friends, and 44.4% better, 33.3% the same, and 22.2% worse when communicating with acquaintances/strangers (communication with acquaintances/strangers happened infrequently, 11 EMA responses). Because of the very few moments of feeling worse, logistic GEE were used to determine whether interacting with certain relationship types was related to feeling better compared to feeling the same following the interactions. Results are presented in **Table 3**. When participants were interacting with online friends vs. moments of communication with other relationship types, they were less likely to report feeling better after the interaction.

DISCUSSION

We examined depressed adolescents' online interactions in real time to determine whether and how their momentary affect and residual feelings vary with the nature of the relationships they have with their communication partner. We found that, among the participants who reported online interactions, nearly half of the interactions occurred with offline friends and family, a quarter were with online friends, and the other quarter were with a mix of relationship types. Reports of communication with acquaintances and strangers were infrequent (5.6%). The two platforms most frequently used for online interaction were texting and SNS. We found a positive association between communications with offline friends/family and negative affect, suggesting that adolescents are experiencing negative emotions more often during moments of online interaction with people with whom they have pre-existing social ties than with other types

TABLE 3 | Generalized Estimating Equation (GEE) model predicting feeling better after interaction by relationship type.

	Feeling better following the interaction			
Variable	**B**	**SE B**	**OR**	**95% CI**
Offline friends/Family	0.62	0.49	1.85	(0.71, 4.83)
Online friend	–1.41**	0.52	0.24	(0.09, 0.67)
Acquaintance/Stranger	0.43	0.79	1.54	(0.33, 7.25)
Mix	0.42	0.56	1.52	(0.50, 4.56)

Note: *Analyses controlled for gender, race/ethnicity, PHQ-9 score, and EMA response rate. Separate analyses were conducted for each relationship type.*
*p < *0.05*, **p < *0.01*.

of communication partners. We also found that when compared to all other interactions, adolescents were less likely to report feeling better after interacting with online friends. These results suggest that when interacting online, young people's affective experience varies depending on the relationships they have with their communication partners.

Interaction With Offline Friends and Family

For adolescents experiencing depressive symptoms, digitally communicating with offline friends and family was associated with higher negative affect, differing from prior literature with a healthy sample suggesting that digital interactions with offline friends and/or family may increase social connection and build stronger relationships (Burke, Kraut, and Marlow 2011; Reich, Subrahmanyam, and Espinoza 2012). Negative affect may have been influenced by social pressures experienced by adolescents interacting online, including peer rejection, normative conformity, and "teen drama" (Nesi, Choukas-Bradley, and Prinstein 2018), which are more likely to occur in established relationships. Pew Research Center (Anderson and Jiang 2018a) reported that teens spent more time online with their friends than in face-to-face interactions with them. As time spent online increases, so does the potential for peer rejection, a possible contributor to adolescent depression (Platt, Kadosh, and Lau 2013). Fearful of being rejected, adolescents may feel added pressure to normatively conform, including posting only content that makes them look good (Anderson and Jiang 2018b), or oversharing content with peers that is exaggerated or risky (Radovic et al., 2017). For depressed adolescents, observing that others seem to be doing better than they are, and hiding their own vulnerabilities or "acting out" in response to them, may increase negative affect.

When teens are exposed to online drama among their friends, they can experience increased negative affect. Online drama is often related to negative interpersonal interactions (Marwick and boyd 2014) and is defined by teens as "conflict between peers" (Lenhart 2015), with 45% feeling overwhelmed by drama on social media (Anderson and Jiang 2018b). Early research has shown that depressed youth experience dysregulated emotions during stressful peer interactions (Rudolph, Hammen, and Burge 1994), and others have found that adolescent girls, in particular, are more susceptible to depressive symptoms due to increased levels of interpersonal stress (Shih et al., 2006). Since our sample was predominantly female, their experience of online drama among friends could explain our findings. Additional research that directly tests this relationship would further advance our understanding of the type of online interactions that can contribute to depression, anxiety and other mental health issues.

If interactions with offline friends and family were contributing to increased negative affect among our participants, we would expect corroborating results from our measure assessing their feelings immediately following the interactions. This was not the case. Very rarely did adolescents report feeling worse after communicating with offline friends and family (4% of the time). Overall, they reported low rates of feeling worse (4.9% of the time), potentially countering the idea that their depression was contributing to maladaptive behavior, which worsened their depression. In fact, participants reported nearly equal, and cumulatively predominant frequencies of feeling better (48.1%) or not different at all (46.9%) after communicating online. Given that depressed adolescents tend to seek social support from friends and family when distressed, our results may indicate that their negative affect preceded, and possibly motivated, their online interaction with established friends or family.

Previous research has found that when depressed adolescents are asked about the impact of using social media on their depressive symptoms, 30% said it makes them feel better, 22% said it makes them feel worse, and 47% report no difference (Rideout, Fox, and Trust 2018). In context with these self-reported results, our findings seem to point toward a conclusion that depressed teens regularly perceive online communication as having a positive impact on their emotional well-being. However, our respondents reported either negative or no impact on their mood after more than half of their online interactions. Such variability opens the door to new questions about what specific types of interactions may lead to an improvement in users' affective states. Additional research is necessary to determine how to use interactive media and with whom to interact that may help depressed adolescents feel better in the moment, and whether or not these momentary affective states translate into long term effects on mood.

Since social support from close ties is effective at reducing depressive symptoms (Fredrick et al., 2018), depressed adolescents' tendency to seek connection with offline friends and family when experiencing higher levels of negative affect is to be expected. However, we found that interacting online with offline friends and family did not increase the likelihood of feeling better following the interaction. This finding, in addition to the lack of positive association between interactions with offline friends and family and positive affect, do not support the rich-get-richer hypothesis, which predicts that reaching out to established strong social ties would lead to improved affect. It is possible that online media interactions with offline family and friends may not be robust enough to provide the support depressed young people are seeking or that expectations of support from friends and family are not met in the online environment because they are attenuated in comparison to face-to-face support. These results are similar to our previous findings in which young adolescents' cell phone use (primarily texting) was associated with increased symptoms of depression (Bickham, Hswen, and Rich 2015). More research is needed to explore the directionality of our finding and to determine whether and how online interactions with offline family and friends might help adolescents cope with depression.

Interaction With Online Friends

Although the majority of digital interaction moments in our study happened with offline family and friends, one-fourth occurred with online friends, highlighting the increasing number of youth building personal relationships with people they have only "met" online (Lenhart 2015). However, our participants were less likely to report feeling better after interactions with online friends. While outreach to online

friends was predicted by the social compensation theory, the lack of positive association between interactions with this relationship type and increased positive affect or feeling better after those interactions that we found suggests that these interactions may not provide effective social compensation for depressed adolescents. This result may be explained by the types of people adolescents chose to befriend online and the interactions that occur within those relationships. Adolescents usually develop online relationships with others who share mutual interests and/or similar personal experiences (Mazur and Richards 2011). Social ties built on casual connections may be less likely to result in strongly positive or negative experiences, thereby leaving participants feeling neither considerably better nor worse after the interaction. More work is necessary to determine the extent to which online friends can serve as effective support for depressed youth.

Interaction With Acquaintances and Strangers

Instances of interactions with acquaintances and strangers did not occur often enough in our study to make generalizations about their impact on mental health. EMA does, however, allow us to describe what moments of interaction with acquaintances and strangers look like for depressed adolescents. It is not surprising that interactions with acquaintances and strangers occurred most frequently on image-based platforms (i.e., Snapchat and Instagram) that feature settings that make communicating with acquaintances and strangers more accessible (Snap, Inc. n.d.; Koch 2016). Texting was the second most frequently used means of online interaction with acquaintances and strangers, indicating that adolescents in our study were willing to exchange their telephone number, a vulnerable personal identifier, with people they do not personally know well (Chen 2019).

There has been long-standing debate about the benefits of applications that allow or encourage adolescents to engage with strangers (Bindley 2020). While some argue that interacting online with unknown partners allows for exploration of self-identity in relative anonymity, others have examined online sexual harassment, cyberbullying and other risky online behaviors, and found them detrimental to psychological well-being (Allen et al. 2014; Uhls, 2017). Conflicting findings require further exploration of potential positive and negative mental health implications of adolescents' interactions with acquaintances and strangers.

Heterogeneity of Adolescents' Digital Interactions

Participants reported interacting on multiple device/platforms per single EMA in roughly 34% of responses, highlighting the complexity of a single moment of adolescent online interaction. The ubiquity and mobility of devices allowing simultaneous use of multiple communication platforms increases the heterogeneity and often contradictory nature of these experiences, with media multitasking potentially exacerbating depression and anxiety (Becker, Alzahabi, and Hopwood 2013). Using multiple channels to communicate varying messages to different people nearly simultaneously may alter the influence of each interaction on mental health. Research is needed to determine the types of online interactions that provide robust social support and best foster positive affect and residual positive feelings among young people suffering from depression.

Limitations

Due to its random sampling of moments in a participant's day, EMA does not capture all online interactions or other experiences that can powerfully influence an adolescent's affective state. The single item we used to assess feelings after online interactions included only 3 levels and may not have been precise enough or the interval not long enough to capture a change in participants' affect during the interaction. Although not surprising given the moderate depression experienced by our sample, the EMA response rate (49%) was lower than other studies using EMA to assess adolescents (52–80%) (Bickham et al., 2013; Shrier et al., 2007; Whalen et al., 2001). Given that our convenience sample is small, primarily female, and includes adolescents with at least some level of depression, results should be considered as applicable to the participants in our study alone and caution should be taken when generalizing to any other population.

CONCLUSION

This study highlights the nuanced heterogeneity of adolescent online interactions. Our findings of the affective experiences of depressed adolescents emphasize the importance of contextualizing online interactions with the intentions and expectations of the adolescent in reaching out and the nature of their relationships with those with whom they interact. It is through understanding the complexities of these interactions that we can begin to provide guidance toward reducing mental illness and promoting digital wellness.

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 Boston Children's Hospital Institutional Review Board. Written informed consent to participate in this study was obtained from the participant's legal guardian/next of kin or from the participant when they were 18 years old or older.

AUTHOR CONTRIBUTIONS

DB and MR conceived and designed this study. SM and DB analyzed the data. All authors contributed to the manuscript and approved the submitted version.

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