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Community series: Towards a meaningful instrumental music education. Methods, perspectives, and challenges, volume II

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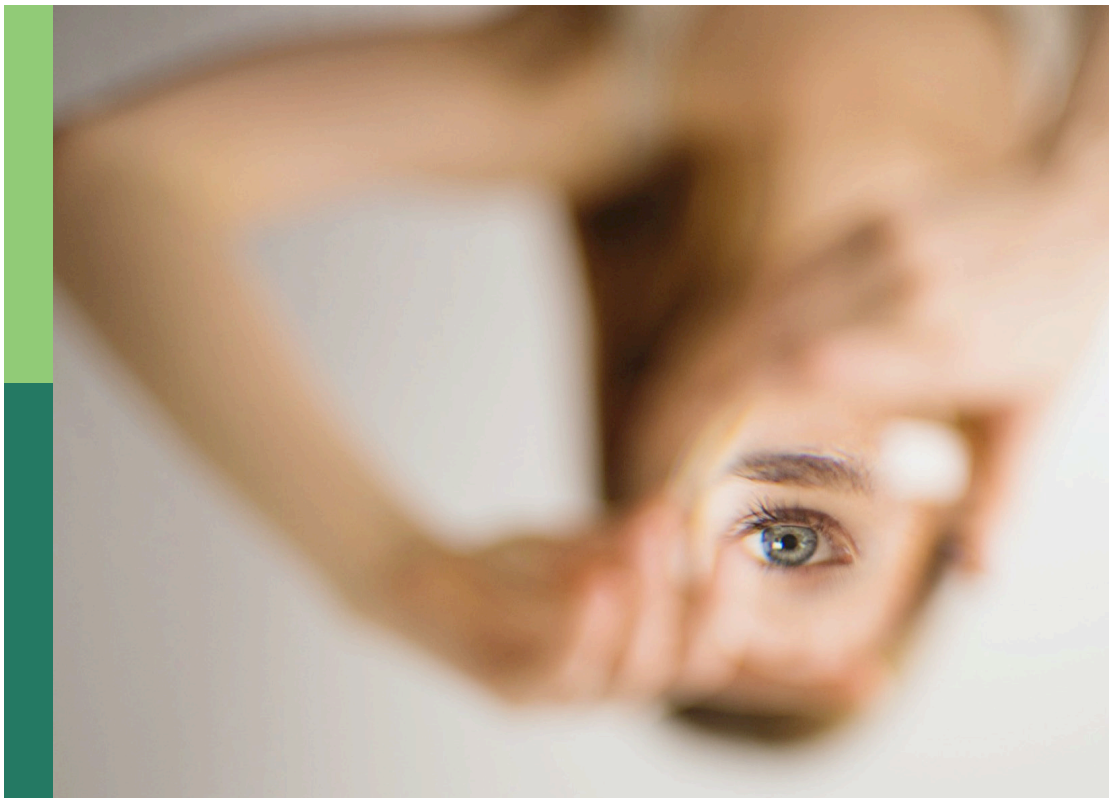

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Community series: Towards a meaningful instrumental music education. Methods, perspectives, and challenges, volume II

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Editorial: Community series: towards a meaningful instrumental music education. Methods, perspectives, and challenges, volume II

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Editorial on the Research Topic
Community series: towards a meaningful instrumental music education. Methods, perspectives, and challenges, volume II

Our Community Series introduces a comprehensive and dynamic perspective within the evolving field of instrumental music education. The first volume of this series, entitled *Towards a meaningful instrumental music education: methods, perspectives, and challenges*, examined a range of pivotal topics including technology, meaning, and expression. Likewise, the 11 contributions to this second volume are collaborative and draw upon a diverse spectrum of perspectives—they integrate empirical insights, engage robust theoretical frameworks, and develop reflective insights from pedagogical practice. In doing so, they enrich our comprehension of music's role within broader pedagogical contexts and showcase possibilities for catalyzing transformative shifts within music education itself. Like the first volume, this Research Topic provides insights that resonate with educators, researchers, and students alike.

The paper by Tullberg is an excellent example of a contribution that draws a strong link between theory and practice. This article addresses the concept of "affordances" in the context of engagement with musical instruments, highlighting a gap in the development of this concept within music research. The article emphasizes the importance of enhancing the application of the theory of affordances in the exploration, discussion, and development of innovative approaches to musical learning. It also underscores the ontological implications associated with the concept of affordances, urging caution when merging it with other theoretical domains or when incorporating it into empirical studies. Tullberg suggests that the analytical focus in studies involving musical instruments should be on the sensorimotor relationship that unfolds spatiotemporally during a musical event and concludes by discussing the educational implications stemming from this perspective as well as proposing avenues for further research in this field. Overall, Tullberg's work contributes to bridging

the gap between theory and practice by elucidating the necessary components for a comprehensive understanding of the affordances of musical instruments.

Another important contribution based on a reflective integration of theoretical and practical insight is provided by Southcott and de Bruin. Their article employs a post-qualitative technique to delve into the intricate interplay between effective learning and personal experience in instrumental music education. Drawing from their own histories as instrumental performers and educators, they explore the connections between musicians, as learners and teachers, and their environments. The article discusses the experience of the authors, both of whom are performers (trumpet and clarinet, respectively) who also assume the roles of music educators. Through a continuous process of re-enactment and resistance against established norms, Southcott and de Bruin examine their transformative journeys from musicians to pedagogues. By delving into their multifaceted experiences, they strive to uncover insights into becoming the kind of teacher they aspire to be. This pathway is extended to their students as they explore the question of how one can evolve into a better music educator. This journey, according to the authors, is a perpetual series of turns, each leading to new avenues of being and becoming.

Morgan and O'Neill provide an empirical study that employs a mixed-methods approach to explore the relevance of European classical music within the context of music education in the United Kingdom. Notably, the study sheds light on the enduring pedagogical value of J.S. Bach's compositions, contributing to the broader conversation about curriculum diversification and the preservation of historically significant musical contributions. The authors conducted semi-structured interviews with music educators and implemented a listening experiment. The experiment involved participants rating their emotional responses to pieces composed by Bach, Beethoven, and Mozart. A reflexive thematic analysis was employed to defend the inclusion of Bach's music in mainstream education. Additionally, participants' emotional responses were quantified using a standardized scale, while ratings for valence, arousal, familiarity, and overall enjoyment were also collected. The outcomes reveal a statistically significant connection between the music of specific composers and certain emotion categories, suggesting that the emotional impact of music can vary depending on the composer. Such findings, it is argued, may potentially confirm the continued admiration for J. S. Bach in music education.

Another important empirical contribution in our Research Topic is by Lippolis et al.. Their study explores the impact of musical learning on behavior and cognitive development during the transition from childhood to adulthood. Amid the multitude of music training programs, the study zeroes in on instrumental training integrated into the public middle school curriculum in Italy. This involves a comprehensive curriculum encompassing individual, group, and collective (orchestral) lessons multiple times a week. Conducted at three middle schools, the research tested 285 preadolescent children aged 10–14 years. The test and questionnaire battery included adaptive assessments for visuo-spatial working memory skills, fluid intelligence, and music-related perceptual and memory abilities. The study found significant distinctions between students in the music and standard curricula across both perceptual and cognitive domains. These differences persisted even when accounting for pre-existing individual variations in musical sophistication. Among the noteworthy findings, preadolescents enrolled in the music curriculum during their third and final year of middle school exhibited superior performance and the most substantial advantage compared to the control group in both audiovisual working memory and fluid intelligence. Taken together, these findings—although not establishing causality—provide valuable insights that can steer future research toward longitudinal assessments, contributing to the ongoing dialogue about the integration of music training and cognitive development during this pivotal life stage.

Kruse-Weber et al. present a comprehensive case study centered on a professional development project aimed at facilitating collaborative reflection among instrumental music teachers. This qualitative study underscores the vital role of collaborative reflection in professional and social growth. The investigation, conducted by a university research team in collaboration with 13 music educators from a Styrian music school in Austria, spanned from 2019 to 2021, including the initial phase of the COVID-19 pandemic. The study addresses several research areas: the participants' perspectives on collaborative professional development, their use of reflection tools, identification with workshop interventions, factors impacting the outcomes of reflection tools, their evolving thinking and attitudes, group dynamics, and the development of trust among participants. Thematic analysis of the data generated five themes: forming group cohesion, inspiring and appreciating collaboration, bridging theory and practice, addressing challenges and potentials during the pandemic, and identifying the music school's identity and significance. This research shows how a collaborative reflective approach not only enriches professional development but also contributes to redefining the identity of music schools and teaching practices.

The qualitative study by Stolp et al. brings together theory and practical insights, this time bridging the theoretical concepts of agency and entrainment within the realm of music education. Their paper involves an interview-based approach that delves into the interplay between these two concepts in collaborative music-making, as reported by students and teachers. Drawing from the experiences of 23 Grade 6 and 11 students and their music teachers from various primary schools, the study investigates how agency and entrainment interact to shape joint musical activities. The authors identify four central themes: presence, belonging, safety, and continuity. These themes encapsulate the nuanced relationship between agency and entrainment in the context of classroom-based joint music-making. The study's findings offer insights into the complementary experiences of students and teachers during collaborative musical endeavors. This exploration provides educators with a unique perspective on the potential of joint music-making to foster group cohesion and social interaction, rendering it a platform for the cultivation of agency among participants.

Looking directly at more contextual pedagogical settings, the contribution by Jordhus-Lier et al. examines music teachers' content-related decision-making processes in Norwegian municipal schools of music and arts. These publicly funded institutions offer extra-curricular activities in music and other

art forms for children and adolescents. The study recognizes that teaching content is central to whether students feel included or excluded, indicating that music teachers' beliefs and actions play a pivotal role in shaping the learning environment. To uncover the approaches that teachers take to select content and methods in instrumental music teaching, the authors conducted a survey among 151 music teachers and interviewed 11 music teachers. The findings reveal several meaningful approaches that guide music teachers' decision-making processes. These approaches emphasize the centrality of students in content selection, advocating for genre versatility that exposes students to a broad range of musical genres and styles.

Schiavio and Nijs' contribution also explores practical and pedagogical contexts. The authors devised a novel collaborative online music course, emphasizing creativity, interaction and bodily movement. In this course, four musical novices learned how to play the clarinet. Despite the challenges inherent in distance learning environments, the study's goal was to explore the learning experience and outcomes of the participants. To do so, the authors conducted semi-structured interviews with the learners and employed thematic analysis to gain insights into their experiences. The interviews revealed several key themes. Firstly, the establishment of meaningful relationships with the musical instrument was identified as crucial for building musicality. The participants highlighted how their connection with the clarinet deepened over time, enabling them to engage more effectively with the instrument and the music they produced and contributing to a more enriching learning experience. Secondly, building relationships with fellow students was highlighted as important. Collaborative learning allowed the novices to share their experiences, challenges, and successes with each other. This interaction fostered a sense of community and camaraderie, promoting a supportive and motivating environment for learning. Furthermore, the interplay between creativity and control emerged as a notable aspect of the learners' experiences. The study showcased how the learners were encouraged to engage in creative and expressive music-making activities, which enhanced their understanding of musical concepts and techniques. The study suggests that remote music tuition within a small group can serve as a valuable resource for individuals starting their musical training. Additionally, it emphasizes the positive impact of a teaching approach that integrates creativity, collaboration, and bodily movement. This approach not only addresses the challenges of distance learning but also suggests possibilities for promoting musical growth and wellbeing in an online pedagogical context.

The remaining contributions cover three fundamental aspects that, in one way or another, encompassing many of the previous studies: technology, meaning, and expression.

The study conducted by Michałko et al. contributes to the exploration of interactive technologies in instrumental music education. As current research and theory increasingly recognizes the potential of interactive tools to support learning and teaching methods, the gap between proposed technological solutions and their integration into daily teaching routines remains evident. The authors conducted an online survey involving violin and drum kit teachers to address this gap. Their findings unveil distinct learning profiles among novice violin and drum kit students, reflecting the diverse teaching approaches employed for adults and children. This differentiation underscores the need for adaptable and tailored teaching methods based on the age and background of the learners. Moreover, the study delves into teachers' perspectives on the use of virtual reality and smart wearable technologies for early instrumental training. Teachers' opinions and attitudes toward technology design are highlighted, emphasizing the importance of involving educators in the initial stages of technology development. This approach ensures that the technology aligns with the practical requirements of teaching and effectively addresses the actual needs of both teachers and students.

The article by Tullberg and Sæther delves into the concept of meaning within the context of musical learning, focusing on instrumental music education. The authors emphasize the role of social interactions in shaping a meaningful music education, using Swedish folk music as a backdrop for their exploration. Their objective is to provide analytical tools that shed light on the intricate processes through which meaning is negotiated within the context of learning music. To achieve this, the authors employ a theoretical foundation based on situated cognition, situated learning, and communities of practice. Central to their analysis is the concept of "negotiations of meaning". They view these negotiations as continuous, evolving processes that offer insights into how individual learning experiences, educational contexts, and the broader musical environment intersect and influence each other. The authors offer practical application of their analytical framework through an ongoing research project centered on various communities within Swedish folk music. They showcase how specific aspects such as the identity of a musician and approaches to notation serve as pivotal points for meaning negotiations across diverse communities. The authors adopt an ethnographic approach, embracing the concept of "messy research" and incorporating musical research sensibilities and stepwise-deductive induction. This methodological mix allows for a comprehensive exploration of the intricate dimensions involved in negotiating meaning within musical learning environments. The article contributes to a deeper comprehension of how meaning takes shape and evolves in the realm of instrumental music tuition, thereby offering valuable insights into the pedagogical dynamics that shape music learning experiences.

Finally, the paper by Juntunen et al. presents a unique theoretical framework rooted in Merleau-Ponty's phenomenological philosophy to explore the concept of expression in popular music singing and its implications for pedagogy. Departing from the conventional understanding of expression, the study delves into an embodied perspective, focusing on the interconnectedness of intentionality, body schema, gesture, reversibility, and intersubjectivity to illuminate the intricate and multifaceted nature of vocal expression in singing. The authors advocate for the conception of expression as an intentional endeavor, driven by the holistic functioning of the body, and guided by the content of the song's lyrics and intended emotions. They use the notion of a "free voice" to characterize healthy vocal production. It enables the immediate manifestation of expression through voice and gestures that give life to the intended meaning. In emphasizing the interpersonal aspect, the article highlights the interactive and intersubjective process through

which performers and listeners mutually influence each other. The concept of reversibility, which intertwines perception and the perceived object, underscores the inseparability of action and perception, while acknowledging the perpetual gap in fully comprehending one's own expression. Amidst their theoretical discourse, the authors offer pedagogical insights that align with their phenomenological perspective. They propose a shift away from primarily technical approaches to expression in singing, advocating for a holistic integration of body understanding and trust in voice production and expression. The authors also suggest that the teaching of expression should not be separated from the teaching of vocal technique, but integrated into it. By viewing expression as an internal process rooted in one's personality and emotional experiences, they advocate for an inside-out approach to nurture authentic and meaningful vocal expression.

In all, the contributions in our Community Series enhance understanding of instrumental music education. They combine diverse viewpoints, empirical research, and pedagogical insights, fostering a transformative impact. This synthesis empowers educators, students, and researchers and provides tools for enriching learning environments. The volume encourages reflective engagement and evidence-based practices in music pedagogy. It promotes continuous growth and adaptation, leading to improved teaching methods, inclusive learning environments, and lifelong learners engaged with complexity and challenges of music and its praxis.

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Implementation of a Remote Instrumental Music Course Focused on Creativity, Interaction, and Bodily Movement. Preliminary Insights and Thematic Analysis

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In a newly designed collaborative online music course, four musical novices unknown to each other learned to play the clarinet starting from zero. Over the course of 12 lessons, a special emphasis was placed on creativity, mutual interaction, and bodily movement. Although addressing these dimensions might be particularly challenging in distance learning contexts, a thematic analysis of semi-structured interviews with the learners revealed how the teaching approach proposed has generally facilitated learning. Qualitative findings highlight the importance of establishing meaningful relationships with the musical instrument as well as with other students to build musicality, and of the interplay between creativity and control in individual and collective music-making activities. We suggest that remote music tuition with a small group can be a valuable resource to start learning music and that a creative, collaborative, and movement-based approach can contribute to musical growth.

Keywords: music learning, musical creativity, musical interaction, music and movement, remote learning

INTRODUCTION

When the COVID-19 pandemic was at its peak, many school activities were urged to adopt e-learning platforms to avoid physical contact and close interaction between students and between students and teachers (Hodges et al., 2020; Aurini and Davies, 2021). A wealth of recent studies has reported that many learners might have been exposed to considerable psychological stress and associated learning shortfalls when transitioning from live to remote education in such a dramatic period (Cao et al., 2020; Engzell et al., 2021). As noted by Habe et al. (2021), settings such as music and sports, in which human presence and physical contact are seen as fundamental dimensions for the learners' flourishing, have suffered significantly (Antonini Philippe et al., 2020; Mehrsafar et al., 2020; Spiro et al., 2021; Woodford and Bussey, 2021). For this reason, exploring in detail how students may or may not benefit from distance activities in contexts such as instrumental music education can be of paramount importance to improve our current knowledge on both domain-specific and general pedagogical issues

(Biasutti et al., 2021; de Bruin, 2021). Consequently, a thorough examination of the weaknesses and strengths associated with the different manifestations of distance learning can help improve existing pedagogical settings based on virtual interaction, stimulating new research, theories, and practical insights that can be applied to a variety of contexts in which the extensive use of technological resources for remote learning is necessary (see also Dammers, 2009; Cayari, 2011; Burrack, 2012; Daffern et al., 2021; MacDonald et al., 2021).

The present article contributes to this line of research by reporting on the verbal descriptions and personal insights of four adult, musical novices[1] who were invited to enroll in a newly created 12-week online music course dedicated to learning how to play the clarinet. As we shall see later in more detail, the course—taught by author LN—was developed with the precise intention to foster an inclusive pedagogical experience based on creativity, interaction, and bodily movement in the context of remote learning. These latter aspects are often deemed crucial in face-to-face lessons and are generally seen as fundamental factors to facilitate the development of musical skills and a meaningful pedagogical experience in a variety of settings (Burnard, 2002, 2016; Odena, 2018; Addessi, 2020; Schiavio et al., 2021b). However, it has been argued that such categories are not always given the attention they deserve in many musical learning contexts (see Persson, 1994; Rostvall and West, 2003; Borgo, 2007); furthermore, addressing creativity, interaction, and bodily movement could also be more difficult in group distance learning contexts when compared to more traditional musical settings (e.g., one-to-one tuition), given the inherent differences between physical and virtual presence (Pike and Shoemaker, 2013; Hash, 2020; Obrad, 2020; Willatt and Flores, 2021). And indeed, an important aspect of the present study is that our participants started learning to play the clarinet in a remote environment right away. This differs from other studies focused on the pedagogical transformation faced by many students who have suddenly been confronted with the transition from face-to-face to online music tuition due to the COVID-19 pandemic in music as well as other disciplines (e.g., Gillis and Krull, 2020; Hoss et al., 2021).

The general aim of this research is to report and contextualize the personal perspectives of the learners involved in this course on how these three categories (again, creativity, interaction, and bodily movement) can be experienced in remote learning, offering in turn new considerations that may be relevant for implementing similar programs in the future. We proposed in our course several creative musical situations and collaborative learning experiences based on movement and action, which the participants were invited to engage with, reflect on, and comment upon. We chose to work with a group of four participants as previous research highlighted how group creativity—i.e., a set of people working together to produce unique and meaningful outcomes and ideas (Hoever et al., 2012)—might be enhanced in small- and medium-sized groups, promoting an optimal balance between individual and collaborative behaviors (De Rosa et al., 2007). Music provides an ideal context in which this can be put to test, as learning to play an instrument involves a good deal of solo (i.e., individual practice) as well as joint activity (i.e., musicking with teachers and peers; Zhukov, 2012; Reid and Duke, 2015; Creech and Hallam, 2017; Längler et al., 2018).

In what follows we briefly frame the three main categories at the heart of this study (creativity, interaction, and bodily movement) relative to music and music pedagogy research, providing specific examples of relevant activities carried out during the course. Having done so, we report on and contextualize our preliminary qualitative findings in the sections that follow.

The Main Ingredients: Creativity, Interaction, and Bodily Movement

While defining *creativity* with precision remains highly problematic (see, e.g., Sternberg and Lubart, 1996), this phenomenon might be conceived of as a capacity to think "outside the box" and to act accordingly, giving rise to items (e.g., musical phrases, learning exercises, etc.) that are at the same time innovative, surprising, and task efficient (see Boden, 1990, 2010). There is excellent work in music performance and music education research addressing such a topic from an interdisciplinary perspective (see Deliège and Wiggins, 2006; Running, 2008; Burnard, 2012, 2013; Cook, 2018; Barrett et al., 2021). In his book *Musical Creativity Revisited*, for instance, Odena (2018) illustrates a rich variety of findings from systematic investigations conducted across several countries, offering theoretical and practical insights that concern both the concept of (musical) creativity itself and the notion of pedagogy of creative collaboration. By considering the impact of reciprocal interaction for creative musicking in diverse educational settings, the author refers to creativity as "the development of a musical output that is novel for the individual(s) and useful for the situated musical practices" (Odena, 2018, p. 51).

Inspired by such insights, the course was organized to let students find their own creative path through bodily/instrumental exploration as well as through collaborative work. To do so, throughout the 12 lessons not only did the teacher propose "guided" creative activities, but also encouraged participants to explore different nuances of the group setting to find an optimal, constructive synergy. An example of a creative exercise put forward by the teacher was to turn a *haiku*[2] into music: students were given, in pairs, a poetic component and were asked to collaboratively "translate" it into music. This task was followed by a performance in which each student showed his or her interpretation and then by a moment of joint reflection, where all participants could comment on both improvisations (one per pair) and describe verbally *how* the music was generated. Students were also asked to come up with their own creative ideas and present them to the group in various ways. They were given the opportunity to propose specific topics and address them collaboratively.

[1]We considered our participants "musical novices" as they reported that they never formally or informally learned to play a musical instrument (including voice).

[2]A haiku is a style of poetry from Japan that features very short lines and that usually evokes natural imagery.

In one of the final lessons of the course, for instance, students almost unanimously suggested to work on sound production, with a specific focus on low notes and tonguing in relation to tempo. Both aspects were then explored through a creative exercise based on an integration of hearing and tonguing, which was jointly designed on the spot: one student was first asked to invent a melodic pattern using three low notes; then, another participant was invited to rapidly imitate this pattern without thinking too much. This also led to a discussion between students concerning the quality of the original pattern and the accuracy of the imitation. Understanding how similar opportunities for creative musical thought and action arise and are experienced in a context where face-to-face interaction is hindered can be particularly important for shedding new light on how creative teaching and learning may unfold in similar participatory settings (see Haddon, 2016).

This last point speaks of the role of *interaction* for musical skill acquisition—the second dimension we wished to point up in the clarinet course we have developed. There is already a vast literature highlighting how forms of learning involving more students at the same time can foster positive learning experiences (see, e.g., Burnard et al., 2008; Gaunt and Westerlund, 2013a; Hanken, 2016; Nielsen et al., 2018; Schiavio et al., 2019, 2020a). In these works, the profound connection between creativity and collaboration is also often emphasized from a pedagogical perspective, complementing contributions that explore such a phenomenon in domains, such as management, economy, sport psychology, and music-making (Amabile, 1983; Sawyer, 2003; Perry-Smith, 2006; Gesbert et al., 2022; van der Schyff and Schiavio, 2022). The context of teaching instrumental music is therefore, in a sense, unique when it allows to combine group creativity and collaborative learning in a seemingly natural way. Indeed, despite the Western traditional focus on individual practice and one-to-one education modalities (see Gaunt et al., 2012; Hallam and Bautista, 2018; Lehmann and Jørgensen, 2018), much learning occurs in groups, and peers often make music together (both formally and informally), acquiring and developing their skills in the process (see Cope, 2002; King, 2008; Gaunt and Westerlund, 2013b; Forbes, 2020). Two recent empirical studies, for instance, have demonstrated that novices who learn to play the piano or the drums with another peer can produce musical performances as accurate as those generated by novices learning by themselves, suggesting that the individual forms of learning can be complemented with more participatory approaches without disrupting the learning trajectory of the student (Schiavio et al., 2020b, 2021b). But as such work focuses on peer interaction unfolding in mutual presence, the possibilities that a collaborative approach holds for remote learning and the experiences it gives rise to students remain to be further addressed.

For this reason, during the course, participants were actively encouraged to work in pairs or all together, exploiting the potential of technology (e.g., Zoom) in different ways. For example, in each lesson, Zoom "breakout rooms" were used with a variety of intentions and purposes: students could chat or greet each other to build a sociable atmosphere at the beginning, then could discuss possibilities for creating new exercises, practice a difficult passage jointly, or execute a particular task which they were mutually responsible for. For example, as will also be discussed later, the teacher could invite students to generate a musical phrase (e.g., a simple melodic or rhythmic theme) or a linguistic phrase (i.e., a series words constituting a grammatical unit), which could then be examined and transformed from multiple artistic perspectives: how to make the musical phrase more expressive? What fingering to use? Or, how to give the linguistic sentence a musical form? Should we be inspired by the meaning of the sentence, or by its phonemic? On such occasions, the teacher could explicitly illustrate the type of task required (e.g., "please create a melody that reflect how this phrase sounds to your ears using the two notes we learned today") or be deliberately ambiguous (e.g., "be inspired by this sentence and create a sonic pattern out of it") letting the pairs discuss options, improvise, or compare ideas. These examples show how the group was constantly invited to explore different possibilities to achieve a concrete result and use information from others to transform and reshape the ideas initially generated[3].

The focus on creativity and collaborative learning discussed above was associated in the course with the role of the body and of *bodily movement*—a category that has been thoroughly examined in a range of musical contexts (see, e.g., Davidson, 2002; Bowman, 2004; Doğantan-Dack, 2006; Hubrich, 2016; Leman and Maes, 2016; Tanaka and Donnarumma, 2019). In these regards, recent *embodied* approaches to musical experience and to human cognition more generally have significantly reshaped the conceptual landscape in which body, action, and movement are studied and understood (Varela et al., 1991; Borgo, 2005; Gallagher, 2005; Leman, 2007; Chemero, 2009; Gallagher, 2017; Reybrouck, 2020; van der Schyff et al., 2022). Very generally speaking, the embodied standpoint holds that the human mind is continuous with (i.e., partly constituted by) body and action rather than being a separate[4] category from it. In other words, where traditional views often equate mind to (the abstract laws and algorithms supporting) information processing (see, e.g., Gardner, 1985), or identify it to neural structures (see, e.g., Lewis, 1966), scholars working from an embodied perspective see mental life as a property of a brain–body system in action. This means that categories such as movements, actions, or gestures can be understood as cognitive tools on their own, which work in tandem with the brain and with other ecological resources to solve problem, think, feel emotion, communicate, and act intelligently (see Sheets-Johnstone, 1999, 2010; Shapiro, 2011; Wilson and Golonka, 2013). In the context of instrumental music education, however, there is a risk that the body can only be considered as an input device that receives information from the world to trigger practical responses or positive changes in learning rather than as a constitutive part of the human

[3]In addition to such collaborative practices, the teacher could also use the breakout rooms to invite students and work individually with them on a specific aspect of their playing.

[4]This orientation can be seen in any form of dualism that separates mind from matter.

mind (see van der Schyff et al., 2016 for discussion). This trend arguably resonates with situations in which students (are asked to) imitate the teacher's actions and movements to improve musicianship and instrumental technique: without real motor autonomy and independence to generate movements, however, we suggest that the body may not become a significant (cognitive) resource for the student's musical flourishing and participate in learning and musicking with its full potential (see Schiavio and van der Schyff, 2018). With this in mind, it has been argued that a larger variety of bodily movements—beyond the necessary ones to play an instrument—might be an integral part of a meaningful learning experience (Nijs, 2017; Bremmer and Nijs, 2020). Free bodily movement can thus be seen as vital for musical learning and human musicality more generally, as it provides a natural way of thinking musically, in turn shaping posture, personal style, and instrument-specific actions (Juntunen, 2016; Nijs, 2019).

Building on such insights, students attending our course were invited to use their bodies creatively and freely in different ways. For instance, they were often asked to explore the degrees of freedom in their joints while playing music (e.g., moving the feet freely during an improvisation). This helped them create a better awareness of the connections between body, instrument, and environment. In other moments they were invited to explore broad lateral movements as well as the multiple possibilities for phrasing and breathing those such movements gave rise to. The newly discovered motor configurations were then contextualized, re-explored, hybridized and, if necessary, transformed on the spot, depending on the task, their mood, taste, or on other variables defined in advance by the teacher. Importantly, while similar movement-inspired individual work was carried out by the learners between the lessons, much exploratory-motor activity was also done when meeting together. This stimulated critical discussion and reflection, also providing each learner with an opportunity to put themselves in the shoes of others when certain movements are performed (or simply explored) in specific moments.

In all, each lesson of the course gravitated around the themes of creativity, interaction, and bodily movement, broadly conceived, whereby doing and reflecting were always integrated. By examining how the first musical-learning experiences of our participants developed in this remote learning environment, we explored how our musical course was experienced by novice learners through an examination of the verbal reports they offered in two individual interview sessions. The present research thus aims at providing concrete examples of how students engage with an online music course that was specifically designed to focus on creativity, interaction, and bodily movement. We expected that not only these categories would be experienced in a positive way by the students, but also that would be conceived of as an essential aspect of their learning trajectory, regardless of the online medium through which the course was offered. In what follows, we first describe the methods of the study, with a focus on the rationale guiding the analytical procedure we adopted. We then report on the qualitative data emerged from the interviews conducted with each participant and discuss how these findings can provide richer understandings of the creative, collaborative, and movement-based aspects at the core of the program, and how these can be helpful for future research and practice.

MATERIALS AND METHODS

The present research is part of a larger collaborative investigation exploring how non-musicians at the initial phases of instrumental musical learning can benefit from collaborative online resources and how a creativity-oriented music course can be designed accordingly. In the present study, we focus on the subjective learning experiences that participants reported during two sessions of semi-structured interviews. The qualitative data reported here have been specifically analyzed considering the following research questions: How does a group of novice adult learners experience a remote instrumental musical course which emphasizes creativity, interaction, and bodily movement? How can this content be optimized and delivered in such a setting? The study was carried out in accordance with the Declaration of Helsinki and the Code of Ethics and Conduct of the British Psychological Society. All participants were informed about each task and procedural step of the study—including data anonymization—and provided written informed consent. As the study was formally conducted in Belgium, ethical approval was not necessary, following Belgian Laws for research practice (see. "May 7, 2004 Law concerning experiments on the human person").

The Course

A 12-lesson course was designed by both authors to facilitate instrumental music learning during the COVID-19 pandemic that took over during 2020 and 2021. The course involved the development of basic instrumental (e.g., posture, fingering, embouchure, and breathing) and musical (e.g., playing rhythms and melodies and hearing) skills based on playing by ear and improvisation. Although such a description may also apply to more traditional teaching approaches, particular attention has been paid to creativity, interaction, and body movement, intended both as learning objectives and as elements on which to develop one's musical skills. Every week, participants took part in a 1-h, collaborative music lesson *via* Zoom. Next to being driven by the main "ingredients" discussed above, we were inspired by a set of pedagogical principles.

The first principle may be labelled as *From Sound to Sight*, whereby new content was always introduced aurally (e.g., Kohut, 1985; McPherson and Gabrielsson, 2002). Gradually, lesson after lesson, theory was added, for example, to explain how basic musical scales are formed. However, traditional notation on a staff was never used. Another guiding principle was named *Exploration and Experimentation* (see Borgo, 2007; Moreira and Carvalho, 2010;). Participants were always invited (individually or collectively) to explore and experiment with the new material being presented during class. This allowed them to playfully engage and familiarize themselves with the building blocks of the lesson content. For example, before learning a song, several creative, movement-based, and collaborative activities based on the rhythm or notes of the song itself were introduced. This involved improvising on

such a musical material, for instance, inventing new melodies and variations on the lyrics. Also, *Multimodality* was an important design principle of the lessons (e.g., Hammel, 2003; Nijs, 2018). This implied that, after a first phase based on the first pedagogical principle described above, musical content was always approached through verbal, visual, and bodily modalities. Consider here how tonguing (i.e., hitting the reed with the tip of the tongue to articulate notes) was introducing through translating self-invented verbal phrases into a "tu-language" (e.g., "hello, how are you?" becomes "tu tu, tu tu tuu?") and then played by repeating a single note. The rhythm was then combined with movements (e.g., lateral movement with the clarinet to suggest air stream, or stepping exercises to introduce meter). Subsequently, different notes were used to differentiate ways of expressing the verbal phrase. Students were often invited to do this in dyads, inventing "musical dialogues" on the spot. Another pedagogical principle may be labeled as *Non-Linearity*, in the sense that lesson content was adapted in real time to the initiatives and needs of the participants instead of strictly following a predetermined series of consecutive steps. For example, at one point, one of the students asked to learn to play a theme from "Star Wars." As a result, novel notes and rhythms were introduced, which in a more traditional approach would only be learned later in the curriculum.

It should also be noted that all lessons were supported by digitized learning content, made accessible through a dedicated website. These included videos on technical aspects of playing the clarinet, explanations of content that was addressed during the lesson, as well as visual aids (see **Figure 1**).

Finally, to support communication with the teacher beyond the lesson, the platform Flipgrid®[5] was used. This is a website and app that allows teachers to facilitate the students' engagement, discussions, and collaboration by offering them an opportunity to post tasks (e.g., a recording of their performance) and questions (e.g., a particular issue concerning the fingering of a scale) using videos and other interactive material.

Participants

Four adult non-musicians, unknown to each other, took part in the study (one woman, three men; mean age = 36.75 years; $SD = 7$). They were recruited after a call was circulated through social media (i.e., Facebook). Participants did not have prior experience with playing an instrument or with taking music lessons—even informally. They chose to enroll for different reasons: out of curiosity, to engage in learning something new, or envisioning to play in a wind band. Next to the lessons being tuition free, they were offered a financial compensation for taking part in

[5]https://flipgrid.com

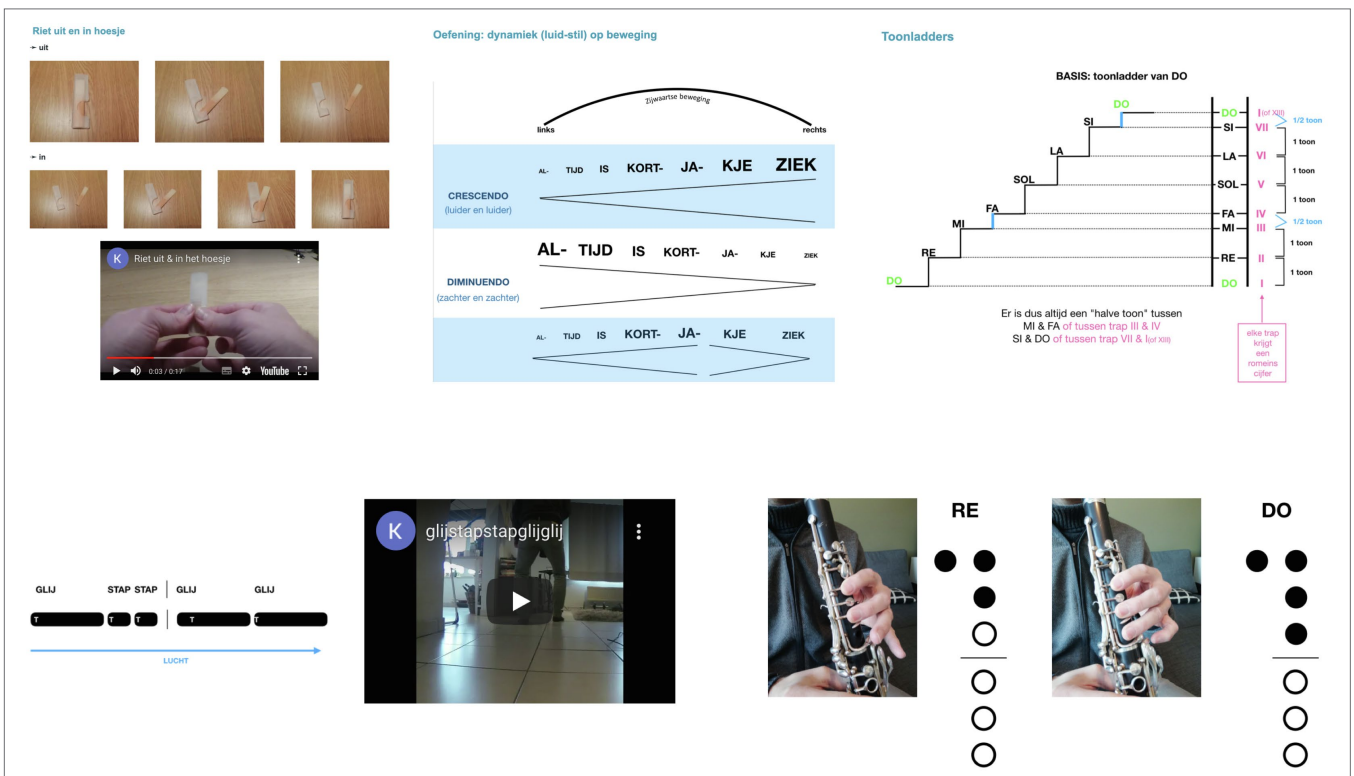

FIGURE 1 | Supporting material accessible *via* a dedicated website. This involved videos on different aspects of the learning process, visual representation of tasks (e.g., rhythm for improvisation) or learning content (e.g., new note fingering), as well as sound-files and other didactic material. Screenshots taken from private Youtube channel "Klarinetles": **(left)** Luc Nijs, "Riet uit and in hoesje [reed in and out cover]", YouTube video, 0:18, 01/04/2021; **(middle)** Luc Nijs, "glij stap stap glij glij [glide step step glide glide]", YouTube video, 0:12, 01/15/2021.

the study. To ensure anonymity, in what follows participants are identified with a number from 1 to 4. The sample size is compatible with other published research focused on group music-making and learning (e.g., Schiavio and Høffding, 2015; Ridout and Habron, 2020) and was chosen because it was considered particularly functional to the type of course developed (as mentioned above).

Procedure

After lesson 4 and 12, participants were interviewed individually through Zoom. A protocol was designed by the authors to guide the interviews and let the participants cover a variety of topics in a systematic way (see **Appendix**). As each interview ($n = 8$, in total) lasted between 34 and 58 min for an average of 48.1 min, there was sufficient time to explore in detail the different topics. Semi-structured interviews are well poised to gain access to the lived experience of participants involved in a collaborative task and have been extensively adopted in musical research (see, e.g., Biasutti, 2018; Crawford, 2019). As each participant was interviewed two times, we use the letters "A" and "B" to differentiate between the two interviews, where A refers to interviews conducted after 1 month (after lesson 4), and B to the final interviews (after lesson 12).

Data Analysis

All interviews were recorded as an mp4 file, transcribed verbatim, translated into English by the second author, and systematically organized for the analysis (i.e., they were segmented into separate quotes and merged into one Word document). The material was then analyzed using a grounded theory approach. The latter's interpretative nature puts the analyst's personal reflections at the heart of the coding processes, such that findings entail an explicit encounter between the participants' constructs and the researcher's theoretical sensitivity (Glaser, 1978; Birks and Mills, 2015). The small group size combined with the close interaction that interviewer and interviewees experienced during the course ensured a mutual exchange of insight during the interviews consistent with the grounded approach we used. Meaningful themes emerging from the data were organized according to specific codes and categories, and different solutions and interpretations were discussed by both authors. The analytical process was initiated by author AS and then verified by author LN. The latter made sure that quotes initially attributed to a particular code could not be attributed to others and confirmed whether the codes generated by AS were broad enough to capture the range of ideas expressed by the quotes. Such an approach based on mutual feedback gave rise to a total of four codes, which were then reduced to two main categories. Each step of the analytical process is depicted in **Figure 2**.

FINDINGS

Here, we report and comment on the students' experiences of participating in the course through verbal accounts extracted from the interviews. In doing so, we contextualize each quotation considering the course's main themes, thereby providing a rationale for discussion that follows. As mentioned above, each quote is accompanied by a number (1–4) and a letter (A or B), indicating participant and time of the interview, respectively.

Building Musical Connections

Knowing the Instrument

Starting a completely new activity as an adult is not an easy task and learning music from scratch is no exception. As this venture is intrinsically associated with the kind of relationships students come to develop with their own instrument, it is very important to examine how the first interactions with the latter may feel:

> "I have the feeling that the instrument suits me, and that it is something pleasant. But I do not have the feeling that it's an 'extension of my arm' or something like that… it's not my own. Still a strange instrument where occasionally I can get something pleasant out of it. But I do not have the feeling that it's my own, that instrument." (2, A)

This initial difficulty might be discouraging as it can be manifested in several ways: For example, as we are told by another participant: "in the first few lessons I […] had a

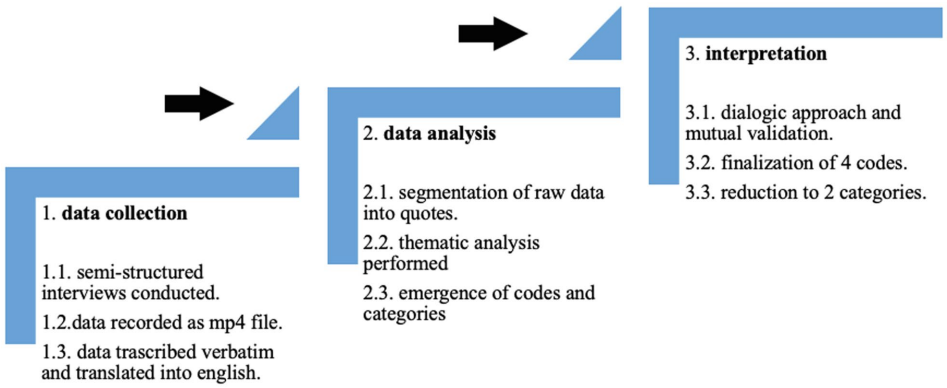

FIGURE 2 | The different steps of data analysis.

lot of trouble blowing through the clarinet" (3, A). However, said issues might be mitigated when put into a broader learning context, where enthusiasm and excitement can inspire the student to develop novel ways to engage with the instrument. Consider the following statements, collected after the first four lessons, by two other participants:

> "I do not like doing things online like this. I really do not like doing that. I'm someone who prefers to talk face to face with people. So, I expected to have more trouble with that. But the first lessons actually went pretty smoothly, I think. It also amazes me how quickly you learn things on the clarinet anyway." (1, A)

> "There are two things that I am positive about. First, just the fact that I'm learning something new. It's been a while. And something not directly in my comfort zone or field of expertise. That in itself is nice, and something I've been thinking about doing for some time now. Whether it would be languages or an instrument. So, I think that's partly where the enthusiasm is situated. I also kind of expected that I was going to […] be intrigued by it. […] I did not expect to find much enjoyment in playing the clarinet or any such instrument. I'm pleasantly surprised by the fact that I actually do like it." (4, A)

The quote suggests that it is precisely the uncertainty of learning that could make this activity a springboard for curiosity, challenge, and personal development. For example, several rhythmic exercises were based on the input of the students: As mentioned earlier, on many occasions they were invited by the teacher to generate simple sentences (e.g., "Hello, how are you today?") and jointly explore how these could be transformed into musical phrases, where, for instance, specific attention was devoted to find what rhythmical patterns could fit the expressive nuances of the sentence. These sentence-inspired, expressive rhythmical forms were then repeated on different notes (e.g., of a pentatonic scale); when doing so, students were also asked to explore different melodic and dynamic solutions to mirror the most salient features of the sentence (e.g., raising pitch at the end of a question, couple loudness to enthusiasm). Students engaged in similar tasks both on their own and together with others, connecting its exploratory dimension to creativity and emotion:

> "I notice that if I have to keep doing the same exercises all the time, it gets boring for me. So, I try to challenge myself by learning to play different notes and then I do the exercises on those notes. […] A creative [player] is someone who starts making up notes and tunes from their own feelings. That's what I call creative playing." (1, A)

Through time, this can give rise to positive outcomes and changes in how the instrument is experienced:

> "A certain attachment [with the clarinet] has emerged. You have the feeling that it has become a bit 'my' clarinet, it has become a place of safety. Yes, a very strong bond did develop there. […] But [the clarinet] also feels like an extension, especially at those moments when you feel that you have to start blowing through the clarinet, that you really blow through it, that you no longer feel pressure in the body, then it really feels like an extension, and then you just forget that you are holding that instrument." (3, B)

> "After a while, that clarinet […] I'm not going to say that I have complete control over it, but […] it's not a strange object anymore. In the beginning that was really the case, then you look at it not even knowing how to put it together yourself." (2, B)

But what happens when holding the instrument for the very first times? A way to gain familiarity with it might be found in how the musical possibilities offered by the instrument can be explored in total freedom:

> "I always start by being a little creative with it, for my own pleasure, and then I'll try out some sounds that we have not learned yet, playing with my fingers, so that I get something audibly pleasant that makes me want to experiment more with it, before I force myself into an exercise." (2, A)

The constructive opportunities that emerge from such a creative freedom with the instrument (e.g., students work in dyads, one student makes a rope or stick move in a creative way, the other student plays a musical pattern while imitating the movement of the rope or stick) are expressed in further descriptions from the same participant reported in the final interview, where exploratory activity is associated with free movements:

> "I would not tend to stay in a chair. So, I would rather walk around until I had to stand still because, for example, I'm going to have to read a score or re-enact something and have a screen next to me or something. […] I do think that moving around feels rather natural and sitting or standing will feel rather unnatural." (2, B)

Engaging with the clarinet in a creative and active way, for example, by exploring music—movement associations while improvising, leads participant 3 to offer the following evocative description, where the instrument is described as "friend":

> "To a friend you can tell a lot of things. For example, negative emotions, you can tell them, and then they are channelled. The same with the clarinet. If you feel down, then you are also going to play more instinctively […], somewhat blue, or feed a little more negative emotions, you are going to put a darker sound in it. Then you actually feel like you are entrusting the clarinet with your emotion, and the clarinet is going to translate it. A bit like a friend does. It's going to translate it, reformulate it, and then you can start doing something with it." (3, B)

Note how, in this last quote, an intersubjective characterization of the musical instrument emerges even if the kind of activity

described was inherently solitary (i.e., playing the clarinet alone). In all, the statements reported here suggest that despite possible initial problems, there is an important tendency to establish a relationship with the instrument that, through movement and creative effort, develops in an effective fashion.

Knowing the Group

The intersubjective framing of the last statement brings the discussion to the social dimension of the course. In a way similar to how a relationship with the instrument is built through the course of the program, our participants revealed different attitudes toward each other, which radically shifted as the course develops.

> "In the beginning we were [just] four individuals, we did not know each other. But online a kind of connection emerged. It's very strange, but that's what happened." (1, B)

It is important to note how the quote stresses that a sense of social connectedness emerged *despite* the remote setting of the course. Likely, a different context would have facilitated the participants' cohesion and sense of togetherness. The same concern is voiced by another participant during the first interview:

> "There is no group dynamics, or very little. I think that, once you have the group dynamics […] you are going to [learn] faster, on whatever medium. But if you have not been able to create [adequate] group dynamics [due to] a physical distance—then for me […] it's harder." (2, A)

Interestingly, in the final interview, the same participant returns to the topic of group dynamics to discuss on how these have been eventually developed remotely:

> "I work in the social sector, so I work a lot with people, and I know that group dynamics is something you cannot build on your screen. But still I had the feeling that there was a harmony in the group, and that sometimes a joke could be made, and that there was spontaneity among each other. Nobody was like 'what kind of person is that'. But it was all about the music and playing together and trying it out together, without hesitation." (2, B)

In a similar vein, another participant comments:

> "[Even if] we never saw each other live, we managed to make a very pleasant connection. I also notice that at the beginning of the lesson we chat with each other, [and we ask, for instance] 'How was the week?'. [It is] always very pleasant [that] you can share some experiences. And very quickly we managed to make some jokes with each other during the lesson [too]. I was very positively surprised how fast that went to create that bond. That was a very pleasant feeling. And at the same time a very safe feeling." (3, B).

Although the remote setting may appear not so helpful at first, the group co-created a friendly and safe learning environment. It is therefore important to examine what kind of teaching dynamics helped such a positive outcome to be developed. One strategy the teacher adopted in the course was to use Zoom breakout rooms, and let students interact and play with each other already from the first lessons:

> "Especially when you go into 'breakout rooms', you are really actively engaged with each other, and then you see each other make mistakes, or give more difficult assignments. And that's a positive thing for me, because you see you are not the only one struggling with certain things." (2, A).

Not only can such an arrangement provide the student with more learning responsibilities (as the teacher was not there all the time); this can also help novel creative opportunities to be developed directly from the students' interaction (as illustrated in **Figure 3**). As the same participant put it:

> "The breakout rooms are definitely the most creative aspects, or moments [of the lesson] and I think, yes, every time you learn something new and you succeed, that's interesting in itself. Suddenly you know an extra note that you did not even know existed. And that in itself is interesting. Or you learn a blowing technique. I remember the moment when you learned that you have to use your tongue to change notes instead of making your breath stop. That's when you are like: "Ah yes, I actually have not thought that this would be even possible." So that in itself is such a moment that is grateful." (2, A)

Participants can thus "learn from each other" (3, B), activating and reinforcing social dynamics through musicking. As such, "you did not have to be afraid of the breakout rooms" (4, B) for the whole duration of the course. An example of this stems from a previously mentioned musical exercise, where learners had to come up with a sentence and then translate that into music. In a number of cases, students were paired and asked to engage in a "dialogue" where (i) they created novel sentences one after the other, (ii) discuss the content of these sentences such that this interaction could make sense semantically, and (iii) "translate" these sentences into a musical duet.

Until now, we have seen how the quotations associated with the category of "building musical connections" revealed how the online learning environment designed for the study can give rise to positive outcomes in terms of developing meaningful relationships with the instrument and the group. In both cases, it is arguably the creative, explorative activity that learners experience as they play and collaborate with others that makes this possible. In what follows we expand on these themes to focus on how physical movements and technical exercises contribute to the overall learning experience of the students.

Control and Creativity

Moving to Create

As mentioned earlier, physical movement is an essential aspect of how musical skills can be acquired and developed. The mastering

FIGURE 3 | In the breakout room, one student helps the other student by showing a particular fingering solution. Both participants are involved in exploring different fingering solutions.

of adequate (e.g., breathing) techniques, fingering styles, and posture, for instance, is certainly central to a musician's learning trajectory. And therefore, these elements are often seen as building blocks for novices. But while an initial focus on control and fine motility can be indeed beneficial in many ways, it is not always experienced positively by the students:

> "At the beginning […] there was more emphasis on control, but over time I noticed that I did not like that control. […] For example, when my clarinet started playing with a 'squeak' in the beginning, that did cause frustration. But I notice that the more frustration, the more this 'squeak' came in. So basically: the more control I wanted to have, the less good what I wanted to play was. So, at some point I just let it go, just started focusing more on a natural posture while blowing, and it improved a lot. I actually think it's about that less control to get more out of it." (3, B)

When asked to provide a further example, the same participant comments as follows:

> "Holding the clarinet forces the body into a certain position. You have to hold it, and the arms and the fingers are in a certain way. [The instrument] also has a certain weight, so it's going to direct the movement. For example, I move a little bit slower. So, on that level, there's also a certain 'physical respect' towards the instrument." (3, B)

Playing an instrument, in other words, involves dealing with associated physical constraints, which may limit our natural inclination to move. This leads to a number of challenges, to which each learner may respond differently. For such a reason, one of the main ideas behind the study was to stimulate more freedom through larger bodily movements (e.g., doing "step exercises"[6] while playing, or generating a new musical pattern while moving only certain parts of the body such as leg or an arm). As reported in the following quote, this can have a significant impact on how we engage with the instrument:

> "Through bodily movement…your breathing becomes different, and you also focus more on what you are doing. Movement in itself was never difficult for me." (1, B)

The key role of the body is thus evident at initial phases of the course, where learners were asked to imitate a rhythmical pattern (long–short–short) with a specific way of walking (slide–step–step) or moving the upper part of the body. An illustration of such an exercise is offered in **Figure 4**.

The positive outcomes emerging from such an exercise and more general comments about the role of movements are expressed in the following two quotes by the same participant:

> "I often notice that certain aspects you have to study, like rhythm, are much easier if you link something physical to it. Those steps are a sort of support for me, just like the 'slide, step, step' exercise. Then I know that if I follow that pattern or do it that way, then I have to keep going for that long. […] In that way, I also find that movement very useful, as a kind of, […] metronome. I think that is the best comparison, because the coupling between body and instrument comes out best that way, a kind of accompaniment." (3, A)

> "with the long notes, for example, I also notice that, when I move, I hold on to a note until I change movement. Specifically, for example, I play the do when I put my left foot, and then I play it until I put the right foot. This is then purely rhythmical. If I then speed up the movement, that also logically links to a much faster alternation [and] in the tonguing [technique]. […] And then I try to pay attention to the fact that it's not the clarinet that controls the body. So not the body following the clarinet, but the other way around, the clarinet following the body." (3, A)

This last point suggests that with less constrained movements, the sense of control felt when interacting with the instrument can be significantly impacted, even at the very beginning of one's musical journey. This also emerges when considering the emotional aspects that music-making activities often entail. In

[6]These were characterized as follows: (1) students perform a specific stepping pattern in a loop: right foot to the right, left foot joins, left foot to the left, and right foot and (2) the rhythm of a song (e.g., short-short-long) is translated in a stepping pattern (e.g., step-step-slide).

FIGURE 4 | Playing a musical pattern while using lateral movements of the upper body. The arrows show the direction of the movement.

the following quote, another participant refers to the "kinematic musical task" proposed by the teacher, which consisted in creating a short choreography based on *Laban motif notation*[7] (see Hutchinson Guest, 2007) that involved the creation of a new melody.

> "Sometimes I had the feeling, especially during the second exercise in which we had to compose something ourselves with movement and melody, that I could put my emotion, 'my thing' into it." (2, B)

Despite the challenges of not being able to move together in a "real" space, and not having a close guidance by the teacher (as it would be in a more formal context), the course offered a number of movement-based resources that learners could use to take responsibility for their own learning and improve their musicality. In what follows, we take a closer look on how this impacted the overall quality of their learning experience, and their motivation playing the clarinet.

Creative Potential

One of the aims of the musical course, we designed was to inspire students take more responsibilities for their own learning. In a sense, this involves helping participants discover their creative drive, enhancing meaningful interactions with the instrument and the group. These two aspects, as we have emphasized all along, are intrinsically linked with each other. An example of how this is experienced by students emerges from the following two quotes by the same participant after lesson 4 and lesson 12, respectively:

> "I do not really have the fantasy to start playing all kinds of things myself and to figure it out. I have that to a lesser degree, I notice that if you give me something like 'learn to play that', then I can do that perfectly well. But if you say to me 'create something yourself'. I cannot do that." (1, A)

> "You do creative things because you are challenged to work together and do things in that regard. […] So, the interaction with each other does make you be creative. You do get lured out of your comfort zone to do something." (1, B)

The bonds between participants that emerged in the course, it can be argued, played a key role in fostering creative thought and action despite the physical distance. However, it is also the experience of playing music in itself that contributes to musical and creative flourishing:

> "for me, learning to play the clarinet is a kind…that's a difficult…an enrichment anyway. You can connect a lot of things to it. For example, in my spare time I do a lot of research, I read a lot of things. And then you notice that I can connect certain stories or certain ideas to it, and that they come back." (3, A)

This capacity to make novel associations is often regarded a central aspect of creative cognition (see Benedek et al., 2012) and is indeed reported in the previous quote. Remarkably, this does not only involve connections between different domains of experience (e.g., reading stories and playing music, as in the last statement), but also speaks directly to how one can learn music.

> "One of the recurring thoughts is whether I'm playing it right, whether the sound is correct. Especially when I'm practicing, for example the scales, I often think about whether the sound is correct, whether I blow in the right way. On the other hand, suppose I start practicing a little looser and then play more with the clarinet, then those thoughts are less, and then I can afford to make a mistake or play it in a different way. Yes, in that case you can also

[7]Laban motif notation is a simpler version of Laban notation, consisting of a series of symbols that, when combined, express a single moment of movement.

> put a little emotion in there by just using a different sound or a mistake. It's very different though. If I'm really practicing, then I often look at—I would say it's almost normative—what is right or wrong. But when we do creative exercises, it's completely different." (3, B)

The issue of "control" discussed earlier makes again an appearance. When engaging in creative exercises, such as developing together new melodies one after the other (such that each one continued from where the last one finished), there appears to be less control overall, not only in terms of physical constraints but also regarding what musical aspects can be developed. For example, in the last statement, the participant mentions how mistakes could be thought of as musical opportunities and more emotional nuances could be used to explore such opportunities. Engaging in such creative discoveries, however, might be not enough to "feel" creative, as creativity is often associated with the mastery of certain mental or technical skills, which one can manipulate to achieve novel, valuable results. This is made explicit in the following quotes by two different participants:

> "You can be creative with a bike, but you cannot be creative with your bike if you cannot ride a bike properly." (2, B)

> "I cannot say of myself that I am creative […], because I think you can only be creative when you have a certain skill or mastery. […] And I think […] of music in itself as a very creative thing. If you try to explore that, I think you are being creative in some way, but separate from that mastery and so on. I find that very difficult, because […] I think that you actually have to master something before you can start being playful with it, and only then… It's kind of, a little bit anyway, an expert level." (4, B)

Yet, when asked to elaborate more on this, this last participant makes a further important point:

> "I have always considered creativity to be a bit of an expert-level [thing]. Whereas now I've noticed that music in itself can also be a creative method." (4, B)

By using the term "creative method," the participant arguably points to the capacity of music to enhance the creative potential of the individual, echoing previous statements concerning the "connections" one can come up with when learning music, even at the earliest phases.

DISCUSSION AND CONCLUSION

The present research explored the verbal descriptions and reflections of participants who enrolled to a group, online course based on creativity, movement, and collaboration. As such, this work complements other studies that focus on the transition between face-to-face and remote learning (e.g., Camlin and Lisboa, 2021; Ritchie and Sharpe, 2021), on online music lessons offered to more skilled participants (e.g., Johnson, 2017), and on forms of musical learning based on imitation and the reproduction of scores (Lisboa et al., 2005; Hanken, 2017). To achieve our objective, we asked four novices to participate in a 12-week, newly designed music course delivered remotely from the start and conducted two semi-structured interviews with each learner after 1 month and 3 months from the beginning of the course. A thematic analysis of the qualitative data gave rise to two main themes, that of "Building Musical Connections" and of "Control and Creativity," respectively.

Regarding the former category, two main codes were individuated: "Knowing the Instrument" and "Knowing the Group." As revealed by several statements reported during the first interviews, participants were perhaps not entirely sure if the online setting of the course, the main instrument, and the collaborative approach offered, would work for them. However, all participants were generally satisfied after the last interview and motivated to keep playing in the future. As such, the partnerships developed by each participant with group and instrument can be thought of as valuable tools that contribute to musical skill development.

When looking at the instrument in more detail, a main motive emerged in the interviews: participants were generally able to create a strong bond with the instrument after an initial period of adaptation. This aligns well with the literature suggesting how tools and musical instruments can become, in a sense, "incorporated" through experience and practice, being treated as if they were part of the musician's cognitive system (Nijs et al., 2013; Simoens and Tervaniemi, 2013; Rojas, 2015; Nijs, 2017). By acting "creatively" with it, new musical possibilities are arguably discovered directly through the musical instrument, without recurring to prior thought or conceptual preparation (see Borgo, 2005, 2007). There is thus a synergetic "dialogue" that can develop between instrument and musician—a possibility captured by one of the participants when s/he describes the clarinet as a "friend."

The description of how participants engaged with the group was equally fascinating, as it emphasizes the importance of creating a safe learning environment, despite the physical distance. This echoes existing work that shows how pedagogical settings based on mutual trust, open discussion, and collaboration between peers can provide an optimal frame for skills to be developed (e.g., Robinson and Kakela, 2006; Clapper, 2010), in both formal and informal musical contexts (see Lebler, 2008). Remarkably, the interviews revealed how participants embraced the ambiguity of "distant" social relationships to interact constructively through a process of progressive attunement with the musical instrument, which involved a creative framing. This was particularly evident when participants mentioned how the "breakout rooms" gave them more space for freedom and interaction, in turn providing them with more shared responsibilities for their own learning. Among others, the importance of shared responsibilities for musical development in novices has been recently emphasized in an empirical study by Schiavio et al. (2020b), where it was demonstrated that peer-learning techniques based on synchronization and turn-taking gave rise to more accurate musical outcomes when compared to imitation, highlighting the key role of collaborative contexts where both learners are given equal responsibilities in the concrete act of playing music.

A combination of factors involving creativity and collaboration emerged in several of the statements reported under the second main category, that of "Control and Creativity." Here, a number of verbal descriptions can be seen to explain how specifically musical and non-musical (e.g., walking) movements were creatively used by the group during the course. Let us begin with the first code of this category that is "Moving to Create." Quotes placed under this header highlight a tension between the physical constraints inherent to what playing musical instruments entail and the freedom of movements necessary to let creative ideas and action flow with ease. It should be noted that examining the reciprocal interplay between the opportunities offered by the physical (and the social) environment and the capacity to generate creative (e.g., musical, artistic, etc.) outputs a key theme in recent work on creative cognition and ecological dynamics (see, e.g., Kirsh, 2014; Malafouris, 2014; Orth et al., 2017; Kimmel and Rogler, 2018; Schiavio and Benedek, 2020). The qualitative insights reported in our study contribute to this line of work with a specific focus on music, not only emphasizing how moving freely while playing can facilitate certain musical activities (e.g., the rhythmic exercises with steps, moving along with a chord or stick, and improvising music while freely moving with the upper body), but also how it can help develop a more personal relationship with the clarinet, where emotional aspects can be effectively put into play in a creative fashion (see again Nijs, 2019).

This last insight brings us to the second code emerged under the present category: "creative potential." Here, participants described how their capacity to develop novel, surprising, and valuable associations of ideas and (musical) actions can be enhanced by the collaborative and movement-based dimensions of inherent to the course. While this remains to be further investigated, there is already a wealth of research that shows how walking can boost creative ideation (Oppezzo and Schwartz, 2014), and that recognizes the structural link between social interaction and creativity across a range of contexts in music and beyond (see, e.g., Sawyer and De Zutter, 2009; Burnard and Murphy, 2013; Glăveanu, 2014; van der Schyff et al., 2018; Verneert et al., 2021). Again, the multimodal connections between creative, social, and movement-based activities offered in the course are seen to positively shape the participants' learning trajectory, helping participants feel of themselves as more creative, as well as develop meaningful relationships with the group and the instrument itself, despite reasonable initial concerns.

In all, because our participants were generally positive[8] when describing their learning experience, the present exploratory study suggests that a cause of the learning issues reported in the recent literature in music education (e.g., when describing remote learning during the pandemic) might in fact be found in the *sudden shift* in pedagogical methods caused by the pandemic, rather than in remote education *per se*. This last insight aligns well with research that shows that music teachers may find the systematic use of technology for their didactics highly problematic when not adequately supported by their school, for example, through training sessions (see Gall, 2013; Schiavio et al., 2021a). Such an observation, as anticipated, is particularly relevant when considering the recent health emergency caused by the spread of SARS-CoV-2 around the globe, as a result of which many educational offers had to be radically transformed. For those pedagogical activities based on music, the shift was particularly difficult, given the key role of close interactions between students and teachers (Johnson and Merrick, 2020; de Bruin, 2021). As learning and doing music online present several challenges that have been addressed in many contributions (see, e.g., Baratè et al., 2020; Biasutti et al., 2021), gaining a richer insight into the lived experience of novices who start learning to play an instrument through this format can be particularly helpful to better individuate and face such challenges.

Several differences may arise when music lessons are offered remotely rather than in person, including the type of personal relationships that develop between group members (which lacks a more immediate dimension) and the absence of key musical and social aspects such as touch and gaze (which can be particularly useful when dealing with specific technical problems; see Antonini Philippe et al., 2020). Facilitating body movement, among others, could become a major obstacle for the teacher; the latter—without physical proximity and adequate training with technology—could struggle to find a way to promote the development of convincing motor solutions for the students. As such, the lack of "real" closeness can be a disadvantage for students as well, who might need more time to musically "attune" to the group and to the teacher.

Participants of our study nevertheless developed an important sense of togetherness as they were given various responsibilities and were invited to creatively explore different body configurations alone or together. As such, it is suggested that both remote and in-person modes of learning can be approached in a positive way, fostering synergies that involve a reciprocal interplay of creative, interactive, and bodily dimensions. We are not claiming that the style of teaching illustrated in this paper would work better than it would have in an in-person setting: Our participants did not have any previous experience with other learning approaches in music, which makes a direct comparison hardly accomplishable. That said, the positive outcomes of this study could be taken as an opportunity to reflect on the value of technology-enhanced pedagogies. Not only is this point particularly important amidst the times of global crisis we are currently experiencing, in which physical interaction is being increasingly replaced with virtual connections; it also points to the possibility that similar learning programs might be implemented when the global health emergency will be over. Indeed, we suggest that a remote setting can also facilitate social inclusion in contexts (i.e., marginalized communities) where attending musical lessons privately might be difficult.

Before concluding we wish to note that, as a qualitative study with a small sample size, the present research features one important limitation, that is, the lack of generalizability. But while our data cannot be used to test general hypotheses or theories, they can still provide a comprehensive window on the lived experience of musical beginners. And, as such,

[8]Notably, three out of the four participants continued to follow lessons in formal and informal lessons.

our findings may inspire novel pedagogical approaches in music that wish to offer novice learners a remote context where creativity, interaction, and freedom of movement can be fostered. Another limitation concerns the rather short period (3 months) of lesson, which may seem to hinder an assessment of instrumental training. We acknowledge the value of a more longitudinal approach (which could also illuminate on how specific motor configurations develop individually and in group), yet the goal of this study was not to *assess* musical training but rather to gain insights on how musical novices would experience their first musical course in a remote setting with a special focus on the role of creativity, interaction, and bodily movement. Moreover, the very first months of a novice's learning path are a particularly interesting period of investigation, as so many aspects of music-making come together, often leading to a focus on technical aspects at the expense of creativity and expressiveness. It should also be said that our participants were adults, so things could have gone differently in the case of younger students (even where the latter could feel more comfortable in a totally virtual environment).

Finally, it could be argued that our participants might be biased toward offering a positive evaluation of the course, because they were self-selected volunteers, and because teacher and interviewer were the same person. We acknowledge this possibility, being reminded by Seidman (1998, p.35) that "the teacher-researcher should seek to interview students in some other setting *with some other teacher who is using a similar method or curriculum*" because "a student can hardly be open to his or her teacher who has both so much power and so much invested in the situation." However, given the uniqueness of our pedagogical approach, such a teacher was not available. Also, Seidman's concerns seem to refer mainly to a teacher-centered context. A more student-centered approach, on the other hand, may foster an environment in which pupils feel safer to express their concerns, ideas, and opinions. This latter was the approach of the present study, whereby the teacher–researcher developed a familiarity and closeness with the participants uncommon in other types of research, allowing students to express their thoughts freely and critically during the lessons and the interviews. Indeed, the teacher-researcher has a privileged position characterized by "the vicarious experience of having been there" (Merriam, 1998, p. 238) and allowed "weaving together the successes, the failures, and the tensions involved with the innovative approach" (Luke, 2004).

To conclude, we believe the preliminary findings reported in this contribution may spur teachers and researchers to further explore and develop new learning paradigms in instrumental music teaching settings that more strongly cultivate the creative potential of groups and individual learners, that place considerable focus on free movement and expressivity from the very beginning, and that stimulate collaborative and peer-to-peer learning across different musical genres and personal styles. Among other things, a way to extend the present research might involve a focus on video data and quantitative approaches. In a partially similar way to existing interdisciplinary work (see, e.g., Bietti and Baker, 2018; Olivares and Cornejo, 2020), a detailed analysis of the video recordings of the lectures could help us gain more detailed information on how certain motor configurations develop over time, reflecting the growing interest in musical research for the study of the bodily and kinesthetic aspects of experience. A quantitative methodology guided by specific hypotheses could in fact integrate the qualitative findings reported in this paper, offering a privileged way to examine specific motor variables (such as breathing or fingering) fundamental for the acquisition of musical skills, further enriching our understanding of how novice musicians thrive from their first musical steps in a remote setting.

DATA AVAILABILITY STATEMENT

The anonymised 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. The patients/participants provided their written informed consent to participate in this study. 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

Designed the study: AS and LN. Collected the data: LN. Analysed the data: AS and LN. Wrote the first draft: AS. Edited the manuscript: AS and LN. Both authors have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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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.2022.899381/full#supplementary-material

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Learning to play a musical instrument in the middle school is associated with superior audiovisual working memory and fluid intelligence: A cross-sectional behavioral study

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Music training, in all its forms, is known to have an impact on behavior both in childhood and even in aging. In the delicate life period of transition from childhood to adulthood, music training might have a special role for behavioral and cognitive maturation. Among the several kinds of music training programs implemented in the educational communities, we focused on instrumental training incorporated in the public middle school curriculum in Italy that includes both individual, group and collective (orchestral) lessons several times a week. At three middle schools, we tested 285 preadolescent children (aged 10–14 years) with a test and questionnaire battery including adaptive tests for visuo-spatial working memory skills (with the Jack and Jill test), fluid intelligence (with a matrix reasoning test) and music-related perceptual and memory abilities (with listening tests). Of these children, 163 belonged to a music curriculum within the school and 122 to a standard curriculum. Significant differences between students of the music and standard curricula were found in both perceptual and cognitive domains, even when controlling for pre-existing individual differences in musical sophistication. The music children attending the third and last grade of middle school had better performance and showed the largest advantage compared to the control group on both audiovisual working memory and fluid intelligence. Furthermore, some gender differences were found for several tests and across groups in favor of females. The present results indicate that

learning to play a musical instrument as part of the middle school curriculum represents a resource for preadolescent education. Even though the current evidence is not sufficient to establish the causality of the found effects, it can still guide future research evaluation with longitudinal data.

KEYWORDS

music training, cognitive development, audiovisual working memory, musical abilities, music education

Introduction

In recent years, several studies with continuous variables (e.g., duration of music training) have been carried out exhibiting the relationship between music training and overall cognitive ability both in childhood and in adulthood, making this area one of the most investigated within the field of music psychology (Schellenberg, 2006; Wetter et al., 2009; Degé et al., 2011; Corrigall et al., 2013; Swaminathan et al., 2017). Previous studies focusing on children (Schellenberg, 2004, 2006, 2011a) confirmed the hypothesis of a positive correlation of intelligence with the duration of musical courses, while reporting a long-term association between formal exposure to music in childhood and both IQ and academic performance.

Some studies showed a stronger relation of cognitive abilities with music lessons than with other leisure activities: in an intervention trial, participants allocated to music lessons showed greater increases in full-scale IQ points than students assigned to theater education or to a passive control group (Schellenberg, 2004). In a longitudinal study by Degé et al. (2011) with preschoolers, participants who took part in the phonological skills program or the music program significantly improved their phonological awareness, but this improvement was not seen in the sports group. Moreover, in some studies music training is associated with improvements in cognitive skills (Schlaug et al., 2005; Sachs et al., 2017; Guo et al., 2022). It is know that individuals with more music training have a significant advantage in tasks that require perceiving and discriminating between pitches, rhythms, and melodies (Wallentin et al., 2010; Law and Zentner, 2012; Zarate et al., 2012; Ireland et al., 2018). This means that a substantial correlation exists between music training and the cognitive abilities known as "near abilities," which are promoted in music lessons; on the contrary, the concept of "far abilities" implies the transfer of the learner's knowledge and skills from the taught context to another dissimilar context.

Correlational research revealed that individual differences in music lesson duration were associated with various "far" intellectual domains (Schellenberg, 2006). Music training involves procedural memory and long-term memory and, as it requires hours of practice, it includes the integration of auditory and visual information in a temporal framework; a study by Bugos and Mostafa (2011) showed a positive correlation between music training and information processing speed in the visual and auditory domains in adolescents with years of active music training compared to non-musicians. Further analyses on the relationship between music and cognitive abilities confirmed that children who receive music training have better performances in visuo-spatial abilities, language processing, verbal memory and reading ability (Jaschke et al., 2018; Linnavalli et al., 2018; James et al., 2020). In another study by Swaminathan and Schellenberg (2020), musical ability predicted language ability. Also, it has been found that learning to play an instrument as a child may predict academic performance and IQ in adulthood (Okada and Slevc, 2018).

Finding associations between music training and mental abilities like linguistic aptitude, visuo-spatial thinking, fluid reasoning and processing speed is fascinating and poses challenging issues concerning the underlying causes and developmental mechanisms. However, although there are favorable correlations between music training and cognitive skills, most of the relevant evidence is based on correlational studies, i.e., observational data, excluding causal inferences or only making it possible under certain conditions (Silas et al., 2022). Consequently, the very idea of non-musical benefits of music training is still questioned and debated in the scientific community.

According to some authors, the cause of improvements in cognitive abilities cannot be attributed solely to music training since transfer between very far abilities is, in human cognition, a rare effect (Gordon et al., 2015; Sala and Gobet, 2017, 2020). Moreover, most research on the relationship between learning music and improving cognitive ability is correlational, thus looking at whether continuous variables increase or decrease together. Hence, inference of causal effects from correlational studies can be confounded by pre-existing individual differences in social background, cognitive ability, personality, and genetic repertoire (Schellenberg, 2019; Vincenzi et al., 2022). Further issues, such as small sample size and no random assignment, together with the lack of an active control group, preclude the possibility of clearly determining causation between music

training and non-musical abilities (Tierney and Kraus, 2013; McPherson, 2016; Schellenberg, 2020a).

In the study by Swaminathan and Schellenberg (2020), the link between music and language appeared to arise primarily from pre-existing factors and not from formal training in music. Moreover, literature showing brain structural differences between musicians and non-musicians has not yet ultimately established whether such differences result from pre-existing traits, musical training, or an interaction between the two (Norton et al., 2005; Vollmann et al., 2014; Olszewska et al., 2021). Hence, these findings impede one to make any definite inferences of causality in relation to cognitive transfer of music training. However, compelling proof of a causal link between musical experience and cognitive abilities comes from longitudinal experimental investigations.

The mentioned study by Degé et al. (2011), together with a study by Roden et al. (2014b) where results showed better performance in processing speed tasks in a group of children who followed music training for 1 year compared to children who followed a science training, are examples of longitudinal studies with active control groups. Even longitudinal studies with random assignment obtained enhanced reading skills and phonological awareness in musicians compared with controls (Cogo-Moreira et al., 2013; Slater et al., 2014; Rautenberg, 2015); this latter type of studies is actually the most effective way to address the issues regarding correlational studies (Tierney and Kraus, 2013). This also applies to the mentioned correlational literature investigating the relationship between music training and intelligence, unable to provide firm evidence on the effects of music training. Although, more recent studies on this topic suggest that the link between music training and IQ has an inverse causal relationship: children with higher IQ are rather more inclined to take music lessons than children with lower IQ (Schellenberg, 2019, 2020b; Kragness et al., 2021).

To achieve an "intelligent", goal-oriented behavior (Arffa, 2007), individuals must be able to control their attention, inhibit their impulses, automatic responses and emotions, focus, maintain and protect attention from distraction, generate information and manipulate it in memory making it possible for us to engage in complex cognitive tasks, and adapt readily to changing circumstances. All these abilities correspond to the psychological concept of executive functions (EF; Arffa, 2007). In some studies, IQ has been found to be associated with executive functions although this remains a controversial topic (Friedman et al., 2006; Garcia-Molina et al., 2010; Ardila, 2018). Authors found some overlap between IQ and EFs. Specifically, EF refers to a group of skills that are often subdivided into the components of cognitive flexibility, working memory (WM) and inhibitory control (Stuss, 2011; Diamond, 2013; Marzocchi et al., 2020). The cognitive flexibility component comprises fluency, the ability to relinquish inhibition and generate information from mind and set shifting, also known as task switching, the ability to quickly shift between two activities or quickly switch response methods within a task. WM, according to the original definition by Baddeley and Hitch (1974), includes the ability to temporarily hold information in mind (maintenance) and manipulate it (updating), which relies on several interconnected operations: flexibility, mental manipulation and inhibition of distractors including visuo-spatial skills (Baddeley, 1986, 2000). Finally, inhibitory control is the suppression of inputs and behavioral reactions that are unrelated to the aim. Current developmental classifications distinguish between the ability to suppress interference from distracting stimuli (attentional inhibition) and the ability to block a preeminent motor response (response inhibition) (Tiego et al., 2018).

Each component of EF is known to mature at a distinct age and to develop at its own rate during childhood and adolescence; cognitive flexibility prolongs its development into young adulthood and, together with its subcomponents (set shifting and task switching), is the last to develop. This applies also to WM and inhibitory control which become distinct cognitive functions only after 9–10 years of age, although the basilar characteristics of both first appear about 6 months of age (Mata et al., 2017; Camos and Barrouillet, 2018; Tiego et al., 2018). The prolonged development of WM throughout adolescence is linked to brain changes, notably the prefrontal cortex's maturation (Ferguson et al., 2021). Such rapid changes lead to an imbalance between the cognitive control system, relying on prefrontal brain structures and supporting the decision-making process through impulse inhibition, and the socioemotional system, relying on ventral striatum and orbitofrontal cortex (Donati et al., 2014; Meisel et al., 2019). This makes adolescents prone to risky behavioral decisions, and therefore it is important at this stage to possess a developed self-control. Being able to intentionally suppress or control behavioral reactions incompatible with one's goals, is a sign of good self-regulation (Hofmann et al., 2012). As seen, inhibitory control and WM are two related but separate constructs; also, WM is supported by the same neural networks as cognitive flexibility which in turn relies on mental processes analogous to fluid intelligence (Stevens et al., 2002; Lambek and Shevlin, 2011; Barbey et al., 2014).

Fluid intelligence has been conceptualized as a discrete factor of general intelligence related to problem-solving and in contrast to crystallized intelligence which comes through learning (Cattell, 1963; Kent, 2017). Spearman's (1927) theory hypothesized the presence of a universal factor that influences all cognitive processes called general intelligence (g); thus, g and lower-order skills like fluid intelligence are also correlated with auditory discrimination skills, since they share general and specialized genetic factors (Mosing et al., 2014; Silvia et al., 2016).

Notably, WM and fluid intelligence are closely associated functions and complementary measures of cognitive processes supporting complex cognition (Unsworth et al., 2014). WM capacity, allowing humans to flexibly create task-relevant

connections between disparate bits of knowledge, hence, represents a key cognitive process underlying fluid intelligence together with focus of attention (Shipstead et al., 2016; Gray et al., 2017). Moreover, both fluid intelligence and WM are crucial for an adequate healthy development. On one hand, fluid intelligence allows for handling new problems without having prior knowledge of the task, and it is predictive of outcomes like educational success; also, it was found to be strongly associated with logical problem-solving and social adaptation (Huepe et al., 2011; Fuhrmann et al., 2020). On the other hand, disorders in WM functional maturation are linked to the emergence of neurodevelopmental disorders (Andre et al., 2016). The importance of a good cognitive and executive functioning in preadolescence and adolescence is, therefore, unquestioned; indeed, from childhood on, self-regulation is an important predictor of academic achievement and mental health (Woodward et al., 2017).

Due to the relatively gradual maturity of EFs, their course of development may be influenced by early activities through a variety of programs (Blair et al., 2008) including music training. Some of the most striking examples in the literature highlight the positive effect of music training on both neural and behavioral development: previous studies have shown that extra-curricular music training helps improve EF in children (Putkinen et al., 2015; Sachs et al., 2017; Shen et al., 2019; Frischen et al., 2021). Also, event-related potential and neuroimaging studies found evidence for improved EFs in musically trained children and adolescents (Zuk et al., 2014; Moreno et al., 2015; Kausel et al., 2020; Putkinen et al., 2021; Saarikivi, 2022) in addition to a more efficient use of neural systems supporting those functions (Putkinen and Saarikivi, 2018). Furthermore, in a longitudinal study of children from underprivileged backgrounds, those who took music lessons after school exhibited an enhanced ability to delay gratification compared to their counterparts who took sports or no after-school program; the music group also improved from 2 to 3 years on a test of response inhibition (Hennessy et al., 2019). In another study, Okada and Slevc (2018) found that actively participating in a music course requires the ability to consistently manipulate, remove and add information. In two recent experiments carried out by Chen et al. (2022), the level of music training was found to be positively correlated with response inhibition and WM abilities, implying that music training is linked to improved EF abilities in childhood. These studies assume that the intensity and length of practice are related to the degree of structural and functional adaptation in the brain (Habibi et al., 2018).

Some other studies focusing on the effects of musical education in childhood assume that music lessons can improve EFs, hence, boosting general cognitive advantages (Schellenberg and Peretz, 2008; Degé et al., 2011; Schellenberg and Winner, 2011; Holochwost et al., 2017). However, it remains unclear whether EFs play a role in the link between music lessons and general cognitive performance. In some cases, for example, the association between music training and IQ appears to be completely mediated by EFs while, in other cases, music training is correlated with IQ but not with EFs, except for WM (Swaminathan and Schellenberg, 2016). The effects on cognitive development may be influenced by the onset of music lessons tied to specific developmental stages and by a number of other relevant variables such as motivation, reward and contextual social factors.

In the specific case of WM, retention, processing and integration of complicated pitch and time sequences are all required in music training; consequently, music training and WM are clearly able to activate analogous mechanisms (Yurgil et al., 2020). When playing an instrument, WM integrates sound events, retrieves data from memory systems, connects sounds to meaning and memories, and aids in the development of emotional responses (Burunat et al., 2018; Criscuolo et al., 2019). The involvement of a WM network in musical tasks has been reported in several studies with higher brain activation in musicians than in non-musicians (Schulze et al., 2011b; Schulze and Koelsch, 2012; Burunat et al., 2014). Moreover, several positive effects on WM were found when comparing musicians and non-musicians. In previous studies, musicians outperformed non-musicians on *n*-back tasks showing that music training leads to improvements in WM tasks (Pallesen et al., 2010; Oechslin et al., 2013; Slevc et al., 2016; Ding et al., 2018). More recently, in Criscuolo et al. (2019) adult musicians showed higher general intelligence, verbal intelligence, WM and attention skills than non-musicians, while amateur musicians scored in between.

Despite this evidence, the findings of some studies of music training and WM in children and preadolescents are mixed. In a longitudinal study by Saarikivi et al. (2019), the results suggest that music training, particularly in late childhood, is significantly linked with improved WM capacity and maintenance but not with improved WM updating. Furthermore, some cross-sectional studies showed that musicians have an edge in auditory WM but not in visual WM (Strait et al., 2012). By contrast, in another study, Sachs et al. (2017) did not find any effect of music training on WM, although they did identify changes in neural activity in brain areas involved with cognitive functions between children who had received music training and those who had not (Sachs et al., 2017).

However, in a recent meta-analysis Lorenzen and Brattico (2020) provided a synthesized estimate of the effect of music training on a combined measure of short-term memory and WM in children, demonstrating that music training can increase these abilities. In another study by Bergman Nutley et al. (2014), the favorable effects of music practice on WM development, even controlling for parental education and other leisure activities, provide evidence for the significance of practice for WM growth during childhood and adolescence. Finally, in a study by Kausel et al. (2020), across attention

conditions, preadolescent musicians performed better on bimodal (auditory/visual) attention tasks adapted by adding the memory retrieval task and showed, at the same time, more activity in fronto-parietal control network areas than controls.

Working memory is frequently studied separately for each modality, such as for visual and auditory WM. Auditory WM is the process of recalling sounds in mind for short periods of time when the sounds are no longer present in the environment; particularly, the expression "musical WM" specifically refers to the temporary storage and manipulation of musical inputs, like notations or musical sounds, useful for the completion of musical tasks (Silas et al., 2022). Auditory WM was also found to have a specific relationship with music sophistication (Lin et al., 2021; Lad et al., 2022; Silas et al., 2022), a multifaceted construct applicable to the general population since it focuses on multiple aspects of an individual's musicality (improvisation, having a strong sense of pitch and rhythm, musical comprehension, appreciation, judgment, and communication abilities) which do not necessarily require mastering an instrument (Ollen, 2006; Müllensiefen et al., 2014; Zhang et al., 2020; Porflitt and Rosas, 2022). While several studies clearly indicate advantages of musicians in auditory WM (Schulze et al., 2011b; Kraus et al., 2012; Zuk et al., 2014; Slater and Kraus, 2016; Slevc et al., 2016; Alain et al., 2018; Guo et al., 2018; Nie et al., 2021), the evidence is controversial for visual WM.

The WM visuo-spatial sketchpad consists of two subsystems: a temporary visual store ("visual cache") for visual shape and color, and a temporary spatial store ("inner scribe") for movement sequences and planning (Logie, 1986, 2011). In a study by Hansen et al. (2013), significant effects were found in verbal WM but not in the visuo-spatial domain. These results converge with a more recent study involving adult participants where Talamini et al. (2017) found that musicians' memory advantage is large for musical stimuli, medium for verbal stimuli (digits and words) and small for visual and/or spatial stimuli. Nevertheless, a particular relation has been found between music training and visuo-spatial sequence learning in the study by Anaya et al. (2017), showing that musicians may exhibit this domain enhanced due to fundamental differences in their visual-spatial abilities because of their extensive training and involvement in musical activities: encoding and recognition of visuo-temporal patterns is a common process during instrumental playing; think of reading a score or following the hands while playing (Janata and Grafton, 2003; Proverbio and Orlandi, 2016; Proverbio and Bellini, 2018). Also, a convergent finding by Rodrigues et al. (2014) suggests that musicians may score better on the visual memory test due to their enhanced sensorimotor connection. A further study conducted with children by Roden et al. (2014a) suggest an enhanced visual memory for the musicians, although without finding significant effect in those tests addressing the visuo-spatial sketchpad. In an additional longitudinal study with children, participants belonging to the music group exhibited significant improvements in the post-test compared to the sport group participants in visuo-spatial WM; however, no significant group x time interactions were found (Frischen et al., 2019).

As seen, previous research has been inconsistent on whether musical aptitude affects performance on complex non-musical tasks, such as tests of WM and intelligence, especially in preadolescence; thus, more investigation is needed on the topic. In the present study, we chose to focus on the two interrelated cognitive constructs of WM and fluid intelligence because they are central for the development of self-regulation abilities during preadolescence, preparing for adolescence and adulthood. Preadolescence is a period characterized by specific evolutionary tasks and milestones necessary for development, and the inattention to needs in this age range can have consequences for the functioning of adolescents and adults (Moore and Halle, 2001; Moore and Theokas, 2008; Fasano et al., 2019a). Hence, preadolescence can be thought of as a pivotal stage to understand the development of WM and its role together with fluid intelligence in academic achievement and psychosocial adaptation and, thus, a sensitive period for prevention.

Instrumental education in music middle schools

In the educational communities, various forms of music training exist, and initial evidence suggests that even the type of training might affect transfer outcomes, with formal instrumental music training being more efficient than less structured programs (James et al., 2020). Hence, the complexity of musical development as well as the type of music training received need to be taken into account (Ilari et al., 2016). The present study focuses on a music training program carried out in Italian music middle schools, whose impact has only been little examined. Musical middle schools can be considered one of the largest and most original investments of the Italian public school, allowing tens of thousands of students to study a musical instrument for free within the curricular study pathway. The program was born in 1975 in some Italian middle schools following the traditional didactic model of the Conservatory until they became regulated starting from the academic year 2000/01. Characteristic elements of the regulation process were:

1) Emancipation from the traditional Conservatory teaching and the expansion of the range of possible activities: from individual lessons to group lessons, to the practice of ensemble music, to increasingly original forms of learning musical notation.
2) A strong link with curricular music education and with the didactic and educational programming of schools.
3) The ordinary and extended use of organizational and didactic autonomy for all schools.

4) The presence in schools of teachers having a Conservatory Master's degree and specialized in the arrangement/composition of pieces suitable for students in that age group.

In musical middle schools it is possible for students to be enrolled in the standard curriculum as well: in fact, students enrolled in the music curriculum and in the standard curriculum attend their courses within the same school building. Both groups of students receive the same number and type of lessons in the morning; in the afternoon, only students enrolled in the music curriculum attend the instrument lessons two or three times a week. In some cases, separate course sections for students of the musical curriculum on one side and standard curriculum on the other side are set up within the same school building; otherwise, students of the music and standard curriculum are classmates. The morning lessons' contents comply with the directives active throughout the national territory of the Italian Ministry of Education for lower secondary schools and include Italian, English and second community language, History, Geography, Mathematics, Science, Music, Art, Physical Education and Technology. Recently, the teaching of Citizenship and Constitution was added to these disciplines.[1] In addition to the standard curriculum, numerous extra projects are offered, within the PON (National Operational Plan of the Italian Ministry of Education, funded by the European Social Fund and the European Regional Development Fund)[2] to all students during the school year for creating an additional high quality, effective and fair education and training system. PON projects range from courses for strengthening basic school subjects to foreign language courses, computer labs, sport and artistic programs. One PON learning module lasts 30 h and, if necessary, can be repeated several times. Furthermore, these kinds of activities are also carried out during the summer months thanks to the "Summer Plan" of the Italian Ministry of Public Education.

Admission to the musical curriculum at the first middle school grade takes place through music aptitude tests at the beginning of the school year. Tests are regulated by law and consist of several steps: rhythmic and melodic abilities are evaluated through imitation tests where the candidate has to reproduce some musical phrases proposed by the teacher. Then, a pitch recognition test is followed by a first approach to the instruments (see footnote 1). After having tried several musical instruments, the candidate is asked to prioritize them to avoid the assignment of an instrument that is not particularly appreciated. Each student is assigned a numerical score by the examining board; it is necessary to obtain a minimum score in order to be admitted to the musical curriculum. At the end of the aptitude tests, a ranking of the admitted students is drawn up. Music middle schools curriculum, regulated by law by the Italian Ministry of Public Education, includes 2 h per week in the afternoon for 1st grade students and 3 h per week for 2nd and 3rd grade students. Classes are held in the afternoon and are organized as follows: 1 h of individual instrument class and/or in small groups; 1 h of collective class of music theory, music reading and group music; 1 h of group music class (orchestra and instrumental ensemble). Concerts are also performed during the school year.

Thus far, only one behavioral longitudinal study (Carioti et al., 2019) has been conducted on the peculiar kind of music instrument training offered at the Italian music middle schools, namely at the Negri-Calasanzio Middle School of Milan, involving a sample of 128 pre-adolescents: 72 students belonged to the music curriculum (30 with previous music experience and 42 without), and 56 belonged to the standard curriculum (44 with prior music experience and 12 without). Group differences in both musical and auditory cognitive skills were found, as well as in language processing and general cognitive abilities. Moreover, the music children showed superiority of memory, visuo-spatial, numerical and reading skills than the non-music children. However, no significant curriculum-by-time interactions were found. The authors, hence, concluded that pre-existing group differences might have a strong role in the observed behavioral findings; however, the study does not exclude that the school environment may bring benefits, and this needs to be investigated in future studies.

Altogether, we believe that the music middle school is a relevant context for investigating transfer effects of music training for several reasons: First, it offers the possibility of investigating music training carried out as a curricular, and thus mandatory, publicly-funded activity, while so far research has focused on extracurricular music activities conducted on a voluntary (typically self-financed) basis. If, on the one hand, extra-curricular activities have an impact on intrinsic motivational engagement in music and academic achievement (Pitts, 2007; Metsäpelto and Pulkkinen, 2012; Guo et al., 2022), on the other hand, including the instrumental training in the school curriculum may mean an increase of accuracy when studying and of the number of hours spent in music practice, which, in turn, may likely affect other skills in a different way, as well as provide an initial strong extrinsic motivation due to the evaluation of the instrumental course as one of the curricular subjects. Moreover, curricular training can reach students with various socio-economic backgrounds since materials and musical instruments are often given on loan for use to less well-off children.

Furthermore, studying music middle schools allows us to investigate the effects of this peculiar music training on the preadolescent population, and also how the peculiar environment and the daily opportunities to carry out music-related activities, together with group activities and other leisure

1 www.miur.gov.it

2 https://ec.europa.eu/

activities, can contribute to balance the evolutionary trajectories and to foster a healthy development up to adolescence. Indeed, while several researchers consider primary school as an optimal environment for using music training as an aid to cognitive maturation, middle school targets the preadolescence phase in which music increases in importance, and musical identities start forming.

The present study

This study is part of the MiddleMusic project, which was set up with the aim of collecting observational data on cognitive, emotional and performative skills, as well as on the sense of self-efficacy and general quality of life. Apart from the specific interest in musical middle schools, a particular focus of this project is on the preadolescent period and on the importance of self-regulation at this stage of development. Thus, this study aims to test the effects of middle school music training on two crucial cognitive constructs related to self-regulation, namely WM and fluid intelligence in preadolescence.

Three schools from three very different metropolitan areas participated. One of them was located in the city center, while the remaining two were located in suburban municipalities. According to the latest data provided by Istat (Italian National Institute of Statistics)[3] for the year 2020 and similarly to previous years, an important gap can be found in the Apulian province of Bari between the city center and most of the municipalities in terms of per capita income and economic vulnerability. Hence, differently from the previous study by Carioti et al. (2019) focusing on a single school, the social contexts are very different according to the location, and therefore the socio-cultural level of the participants is extremely varied. Some studies in the past already focused on the effect on academic achievement and on the increase of cognitive abilities in musically-trained children at risk or with socio-cultural disadvantage: a 3-year longitudinal study by Rauscher and Hinton (2011) was conducted to determine whether music lessons could improve mathematics test and visuo-spatial test scores of economically disadvantaged elementary school children. Children at risk as well as middle-class children were assigned to music lessons and compared to control groups (computer lessons or no lessons). The results showed better performance by the musically-trained children only at the end of the third year of the study in those participants who had started music training before the age of 7. Furthermore, two longitudinal studies by Slater et al. (2014) demonstrate how music training can provide auditory and cognitive enrichment, helping children in critical developmental phase to improve their literacy skills and proceed with their academic progress. Also, a few recent investigations focused on collective music training, such as El Sistema offered for children coming from under-privileged areas (Alemán et al., 2017; Fasano et al., 2019b, in press) and showed a significant improvement of inhibitory control in the music group that was not found in the control group. Moreover, those children who did not follow any intense music program had a significant increase of hyperactivity-impulsivity from the pre- to the post-test, while the music group did not show a significant difference (Fasano et al., 2019b). However, more studies are required to account for the diversity of music training programs to scientifically inform future music education policies.

In the current study, we chose to focus on visuo-spatial and auditory WM. We did not test inhibitory control, although EFs often share correlates, and WM and inhibition in particular are closely related; indeed, inhibition tends to cohere more with WM measures than with measures of other types of inhibition (Diamond, 2013). The visuo-spatial aspect is crucial for the proper functioning of different cognitive skills and consequently for academic achievement, especially in the case of students with attention problems and ADHD (Gropper and Tannock, 2009; Giofrè et al., 2013, 2018; Mawjee et al., 2015). The Jack and Jill WM test is aimed specifically to measure the component of the visuo-spatial sketchpad in WM. It demonstrated strong correlations with other well-known tests of WM (Backward Digit Span, Memory Updating Figural, Corsi Block-tapping test), spatial tasks (Paper Folding, Shape Rotation, Mechanical Reasoning, Pattern Assembly), and a non-verbal intelligence test (Raven's Progressive Matrices) (Tsigeman et al., 2022). This correlation is important as these tests are among the most used so far in the studies of WM and music (Talamini et al., 2017; Lorenzen and Brattico, 2020). Moreover, in this MiddleMusic project we used performance tests that were both used to measure music perception skills and musical sophistication (along with extensive questionnaires), but also served to assess auditory WM skills (Mas-Herrero et al., 2013, 2021; Müllensiefen et al., 2014). Hence, in addition to visuo-spatial skills we aimed to test auditory WM to provide a complete picture of the individual abilities that allow preadolescent children to explore multimodal world environments, in line with the increasing interest of researchers in multimodal cognition (Setti et al., 2021, 2022; Xie et al., 2021). The second scope of the study was to identify training-related changes in fluid intelligence, as assessed with a test based on Raven's Progressive Matrices, currently one of the most accurate tests to evaluate both the ability to infer abstract relations and the ability to handle a broad range of problem-solving tasks in a dynamic way, which are the distinctive features of the g factor (Jensen, 1998; Holyoak, 2012; Martinez, 2013). In fact, the tests of fluid intelligence, which include creative problem-solving, are often the best ways to evaluate g (Carroll, 1993).

Moreover, we decided to investigate the gender variable. Examining gender variations in cognitive processes has garnered increasing attention in recent publications; particularly, the

3 https://www.istat.it/

idea that each gender processes information using distinct cognitive strategies seems to be widely spread. According to prior literature, women would be inclined to elaborate information material in more depth, whereas males are more likely to be motivated by schemas or overarching information themes (Guillem and Mograss, 2005; Seinstra et al., 2015). In addition, females have been found to outperform males in word recalling, language and memory tests (Kaushanskaya et al., 2013; Loprinzi and Frith, 2018; Theofilidis et al., 2020) while males generally showed better performance in spatial abilities, especially in mental rotation (Levine et al., 2016; Lauer et al., 2019). However, the results are not always clear-cut, and they are often more related to the socio-cultural context and to the type of task (Wai et al., 2010; Nazareth et al., 2013; Miller and Halpern, 2014). Mostly, it was shown that the promotion or inhibition of cognitive abilities, such as spatial or verbal abilities, is highly mediated by gender-role. Boys and girls are encouraged by parents to engage in either stereotypically masculine or feminine activities appropriate to their gender, as "masculine" typed activities promote the development of spatial abilities while "feminine" typed activities pursuits instead strengthen of reading and language abilities (Reilly and Neumann, 2013). Despite all the evidence on gender differences in cognitive abilities, the relationship between EF performance in musicians compared to non-musicians and potential gender disparities have not yet been systematically studied (but see Jansen et al., 2022). Hence, it is pivotal to determine whether gender, especially in preadolescent age, can be a primary factor in the performance of cognitive tests.

The present study has a quasi-experimental research design, where cross-sectional analyses have been carried out. Moreover, the MiddleMusic project is still ongoing, and longitudinal data will be collected from the same children over the coming years. From the literature on the topic, it can be deduced that higher levels of musical ability are favorable for cognition performance, and according to previous studies musical ability can explain part of some cognitive performance factors, such as WM and fluid intelligence (Silvia et al., 2016; Slevc et al., 2016; Baker et al., 2018). As suggested by correlational evidence, we expected a replication of the association between following a music training program within the school curriculum and the performance on tests of cognitive and musical abilities (possibly due to pre-existing differences and selection). We also expected older students to perform better on the cognitive and musical tests (due to maturation). Moreover, we expected to find a stronger growth in abilities for the music group than for the control group across age groups (due to the effects of music training). Overall, we expected to find differences in favor of musicians beyond all the possible confounders and covariates. Finally, considering the literature on gender differences, we expected to find significantly better performance in females due to the developmental differences.

Materials and methods

Ethics

The present study is part of a larger project ("MiddleMusic") which involves a longitudinal analysis with the same middle schools over an extended time period and involves parents through the administration of three questionnaires in paper format. In addition to the sample of children analyzed for the present study, samples of adult participants were included in the MiddleMusic project with the aim of carrying out the Italian validation of some instruments. The research protocol has been approved by the Ethics Committee of the Department of Education, Psychology and Communication of the University of Bari "Aldo Moro" (reference: ET-21-15).

Participants

The sample includes 324 preadolescents (range 10–14 years; mean age = 12.3 SD = 0.94) selected from 21 classes of three music-focused middle schools in the Bari area (Apulia, Italy): De Amicis-Dizonno (Triggiano), Alighieri-Tanzi (Mola di Bari), and Massari-Galilei (Bari). Children (47.2% females and 52.8% males) belonged either to the musical curriculum ("musicians" N = 194) or to the standard curriculum (non-musicians N = 130).

The musicians were compared with their schoolmates or classmates enrolled in the standard curriculum. This was a necessary choice since in this kind of community-based studies choosing whether a child should participate in the music curriculum or the conventional curriculum at school is neither logistically possible nor ethically acceptable. For practical reasons especially due to COVID-19, we were unable to collect more specific information on prior musical expertise and general background of participants through preliminary interviews as in the case of the study conducted by Carioti et al. (2019). Instead, we administered extensive questionnaires (Gold-MSI, detailed below) in order to obtain information on their level of expertise, start age and amount of music training. Moreover, we aimed to evaluate the children's musical background at the start of the study in order to determine the impact of music training on audiovisual WM and fluid intelligence.

The music training program of the music curriculum consists of 2 h of general musical lessons per week; the standard curriculum does not include additional afternoon lessons. For this reason, standard curriculum students tend to have more free time and have more chances to attend the extra above-mentioned PON projects within their own schools. In any case, the spending of free time should be investigated more in depth, as no data in this respect are available in the present study. Such projects were also running

during the measurement periods and addressed also to the classes involved in the study. For example, within the "Summer Plan" 2022, among the projects presented by the schools, the most popular themes were the following: strengthening of functional alphabetic competence (19%) learning modules to enhance language skills (17%), strengthening of "STEM" subjects - Science, Technology, Engineering and Mathematical Subjects (14%), Digital Strengthening (10%), Physical Education (10%) art theater creative writing (9%), cultural awareness and expression (9%), music and singing (5%). And, moreover, in the general plan creative and artisanal workshops, education for active citizenship and education for legality and human rights projects are foreseen (see text footnote 1).

For example, some of the activities carried out in the last year at the three participating schools consisted in: entertaining logical puzzles (gamification), digital competence modules, "Edugreen" workshops on eco-sustainability, modules for the strengthening of English and French languages, creative writing and finally, multi-disciplinary group artistic workshops.[4]

Data were collected for the most part in December 2021; only a small group attending 2nd and 3rd years of middle school was tested in January 2022.

Tests and questionnaires

The MiddleMusic project shares several objectives with the LongGold project: LongGold investigates and follows groups of secondary school students for several years in order to demonstrate how longitudinal research may give a solid empirical foundation for understanding the origins and impacts of musical engagement (Müllensiefen and Harrison, 2020). Students are assessed once a year and complete a test battery of musical and non-musical tasks as well as questionnaires asking about music and other free-time activities, self-concepts, personal strengths and difficulties, personality and other person-related aspects. The battery runs in a standard internet browser, and pupils are tested in their classroom. LongGold researchers use school computers or can supply tablets and headphones to perform the test sessions, depending on the school facilities.[5]

One of the main differences between the present study and the study by Carioti et al. (2019) as well as other studies is our use of fairly entertaining and motivating ability and performance tests to keep motivation high: in fact, tasks such as the Digit Span task often employed in this type of studies can be perceived as boring and repeating to children, and this could negatively affect the performance. All cognitive and performance tests use an adaptive procedure which homes in on the participant's individual ability level as quickly as possible and therefore saves a lot of testing time. The adaptive testing methods and underlying statistical theory of the musical ability tests employed in this study are explained in Harrison et al. (2017), Harrison and Müllensiefen (2018), and Larrouy-Maestri et al. (2019). The method of computerized adaptive testing (CAT) involves selecting test items using an algorithm based on the test-taker's previous replies. The goal of item selection is often to maximize the amount of information each item conveys regarding the test-taker's actual aptitude. This gives a considerable advantage in improving the testing efficiency and the test reliability, as adaptive testing aims to give the most informative items possible at each testing point.

To administer the tests, we employed the psychTestR online testing framework (Harrison, 2020). Several adaptive ability tests have been developed in this framework, including the melody discrimination test (MDT; Harrison et al., 2017), the beat perception test (BAT; Harrison and Müllensiefen, 2018), the mistuning perception test (MPT; Larrouy-Maestri et al., 2019), the visuospatial WM test (JAJ; Tsigeman et al., 2022), and the rhythmic ability test (RAT; MacGregor et al., 2022). In this study we used a selection of tests and questionnaires as follows, summarized also in **Table 1**. To measure cognitive abilities the Jack and Jill and the Matrix Reasoning were used.

The Jack&Jill WM test (JAJ) measures visuo-spatial WM capacity employing a dual task paradigm (Tsigeman et al., 2022). The task is adaptive and based on an explanatory item response theory (IRT) model. The final IRT scores of the test show a bell-shaped distribution that is centered around 0. Negative scores indicate a performance worse than the average of the calibration sample, and positive scores indicate a better than average performance. The test is implemented in the open-source R package JAJ.[6] The test length on the LongGold project was set to eight trials. In the present study, the participants completed a total of 7 trials for the JAJ since in the original study the authors found that reliability and validity for this test are acceptable after 7 or 8 trials (5–6 mins), with diminishing gains from more trials (Tsigeman et al., 2022).

Many of the classic tests used for WM require keeping the information while working on a second task, which can cause interference, and the Jack and Jill test is also based on this dual-task paradigm. The JAJ task presents participants with pictures of a young female on the left ("Jill") and a young male on the right ("Jack") of the screen on a white background. Before the task, the participant is instructed on the procedures through a tutorial. The task is divided into trials of different lengths increasing over time, totaling 14 trials in one testing session.

While Jack rotates about his axis on each stimulus presentation and can grasp a ball in either of his right or left hand, Jill always remains in the same position while clutching a blue ball in her right hand. Additionally, Jack's ball moves, randomly taking one of the six indicated spots on the screen

4 https://www.istruzione.it/pon/index.html

5 https://longgold.org/

6 https://github.com/klausfrieler/JAJ

(orange dots). Participants must complete two tasks for each stimulus presentation: (1) determining whether Jack is holding the ball in the same hand as Jill, and (2) memorizing the location of the ball at that moment. Participants are required to click on the designated spots in the proper order at the conclusion of each trial in order to recall the order of the ball positions.

Correct answers are represented by cursor positions. Responses from participants are evaluated as correct (1) or wrong (0) depending on whether the entirety of a trial can be successfully repeated. The duration of the sequence of ball placements that a participant can recall serves as an indicator of their visuo-spatial WM span. Because the JAJ task needs participants to alternate between memory encoding (memorizing the position of the ball) and mental rotation with a subsequent choice on visual input, which adds additional cognitive strain, it can be classified as a complex span task.

Matrix Reasoning (MIQ) is a test that contains stimuli that are similar to those used in Raven's Progressive Matrices (Condon and Revelle, 2014; Chan and Kosinski, 2015). The stimuli are 3 × 3 arrays of geometric shapes with one of the nine shapes missing. Participants are instructed to identify which of the six geometric shapes presented as response choices will best complete the stimuli. In each round the stimulus disappears after 120 s, leaving only the response options visible for the participant.

The Computerized Adaptive Beat Alignment Test (CA-BAT) is a test that probes a listener's beat perception ability using the beat alignment paradigm where the listener tries to detect misalignment between a metronome and a musical extract (Harrison and Müllensiefen, 2018). This paradigm comprises a series of two alternative forced choice trials. Each task presents the participant with two versions of a music track, both overlaid on a metronome-like beep track. In one version, the target beep track is exactly in time with the locations of the musical beats. In the other version, the beep track is "off" from the main musical beat. The participant's task is to identify whether the track is "on" or "off" the beat. The CA-BAT is an adaptive test. Therefore, the item selection adapts to the candidate's previous responses. Typically, the goal is to maximize the amount of information each subsequent item provides about the candidate's true skill level, which in practice means that poor performers receive easier items and better performers receive more difficult items.

Melody Discrimination Test (MDT) is an adaptive test characterized by a three-alternative forced-choice (3-AFC) melodic discrimination paradigm (Harrison et al., 2017). In the 3-AFC paradigm, each melody version is compared with every other version, producing three similarity comparisons in total; in addition, item difficulty is determined by manipulating the melody's length. The participant performs a decision-making process to determine which melody was the odd-one-out, on the basis of these similarity judgments. In each trial, the participant is presented with three versions of the same melody. Two of these versions have the same interval structure and are called lures, but one version has exactly one altered note and is called odd. These three versions can occur in any order, and the participant's job is to identify which version is the odd one. Two of these melody pairs must be different, and one must be the same. The participant's task is therefore to identify the most similar pair, and then the odd-one-out must be the melody not contained within this pair. The duration of the test may vary according to the specific needs of the research; in the case of our study, the test consisted of 18 items.

Mistuning Perception Test (MPT) is a test that uses a two-alternative forced choice (2-AFC) paradigm in which each trial comprises two versions of the same musical extract, one "in tune" and the other "out of tune" (Larrouy-Maestri et al., 2019). The stimulus material consists of short excerpts (6–12 s in length) from pop music performances (obtained from MedleyDB; Bittner et al., 2017) for which the vocal track was pitch-shifted relative to the instrumental tracks. Each musical extract has a vocalist singing the main melodic line and an instrumental accompaniment. Out-of-tune extracts are produced by adding a constant pitch shift to the vocal line. The listener's task is then to identify which of the pair was the out-of-tune version.

Rhythm Ability Test (RAT) is an adaptive test in which participants have to select the correct image that corresponds to the rhythm heard (MacGregor et al., 2022). The rhythms are made up of high-pitched and low-pitched sounds. High-pitched and low-pitched sounds are represented in each picture with

TABLE 1 LongGold tests employed in the MiddleMusic project.

Area	Test	Acronym	References
IQ	Matrix reasoning	MIQ	Condon and Revelle, 2014; Chan and Kosinski, 2015
Visuo-spatial WM	Jack&Jill Working Memory Test	JAJ	Tsigeman et al., 2022
Music abilities	Computerized Adaptive Beat Alignment Test	CA-BAT	Harrison and Müllensiefen, 2018
	Melody Discrimination Test	MDT	Harrison et al., 2017
	Mistuning Perception Test	MPT	Larrouy-Maestri et al., 2019
	Emotion Discrimination Test	EDT	MacGregor and Müllensiefen, 2019
	Rhythm Ability Test	RAT	MacGregor et al., 2022
Music Sophistication	Goldsmiths Musical Sophistication Index	Gold-MSI	Müllensiefen et al., 2014

two rows of squares of two different colors placed at the top row (to indicate high-pitched sounds) and at the bottom row (to indicate low-pitched sounds). The tasks are presented according to a progressive increasing difficulty, and the stimuli are made up of 4, 8, and 16 sounds (quarter, eights, sixteenths notes).

Emotion Discrimination Test (EDT) is an adaptive test and uses a two-alternative forced choice (2-AFC) format: two played or sung fragments of the same melody are presented for each task (MacGregor and Müllensiefen, 2019). The participant's task is to identify which of the two fragments corresponds to the expression of a specific emotion (anger, happiness, sadness, and tenderness). Excerpts differ between trials in terms of musical features such as length, instrument, melody, target emotion and comparison emotion, and item difficulty is assessed with regard to the contribution of these features. The key features of angry excerpts are high amplitude, fast tempo and greater roughness, happy excerpts are similar to angry excerpts though without high roughness, sad excerpts exhibit slow tempos and low amplitude, and tender excerpts have similar acoustic properties as those conveying sadness.

In addition to the cognitive and music perception tests, the pre-adolescent participants were asked to complete a demographic questionnaire and the Gold-MSI, a 39-item self-report scale that comprises five subscales (Active Musical Engagement, Perceptual Abilities, Music Training, Singing Abilities, and Emotional Engagement with Music) and one general factor (General Musical Sophistication) (Müllensiefen et al., 2014).

The Active Engagement factor includes a variety of active musical engagement behaviors, including the conscious devoting of time and money to musical activities; the Perceptual Abilities factor represents the self-assessment of various musical abilities, most of which are related to music listening skills; the music training factor concerns one's level of self-assessed musicianship, as well as the amount of music training and practice; the Singing Abilities factor reflects different skills and activities related to singing; the Emotions factor covers different and mainly active behaviors related to emotional responses to music; and finally, the General Musical Sophistication factor incorporates aspects from all above mentioned five sub-scales.

Initially developed for use with adults, the factor structure and internal reliability of the Gold-MSI have been replicated and validated for the use with secondary school pupils in a large German sample of 11–19-year-olds (Schaal et al., 2014; Fiedler and Müllensiefen, 2015). All the perceptive test instructions were translated into Italian from English. The Gold-MSI was translated with the method of the back translation (similar to the method described in Lin et al., 2021): Two parallel translations were carried out and the two versions of the same test, translated from English to Italian and from Italian to English, were secondly compared with a native speaker.

TABLE 2 Sample descriptives.

		N	Mean age	SD	Gender	
					F	*M*
1st Grade						
Group	M	56	11.3	0.31	22	34
	NM	51	11.3	0.29	24	27
2nd Grade						
Group	M	50	12.3	0.30	29	21
	NM	30	12.2	0.37	12	18
3rd Grade						
Group	M	57	13.3	0.35	26	31
	NM	41	13.4	0.38	23	18

M, musicians; NM, non-musicians.

Procedures

The data collection took place in the schools' IT rooms, and the whole process was guided by the experimenters. The tests were administered during class hours for a total duration of 2 h after prior agreements with principals and teachers and after having received informed consent signed by parents. The tests were administered on a specific online platform implemented by the LongGold group which can be accessed through a link (a demo version of the LongGold tests can be found here: https://longgold.org/tests/). In addition, unique numerical identification codes were created for each participant. The battery of tests was split into two parts and administered in two sessions on two different days to avoid cognitive overload and not to compromise the performance. The order of tasks was balanced by type and required level of cognitive load; the cognitive tasks were placed at the very beginning of the battery, the perceptual tests and questionnaires were presented alternately to keep the participant's attention high.

The JAJ test was administered within the second session. Due to the non-attendance at school of a group of students on the second day session, the participants in the JAJ test appear to be fewer in number than the participants who completed the remaining tests. Of the children invited and who consented to participate, 29 were not at school due to COVID reasons on the second day of measurement, and 10 more missed to complete only the first part of the battery. For this reason, the final sample obtained includes 285 participants instead of 324 (47.7% females and 52.3% males) belonging to a music class ($N = 163$) or a class standard ($N = 122$).

As reported in **Table 2**, the sample of students involved was equally distributed among the three grades; in each group the age of the participants ranged between 10 and 14 years. In the original sample, 14 participants had learning disabilities or impairments, but they were not excluded from the present analysis as they presented mild cognitive disabilities. In the

final sample, only 10 of them remained (six musicians and four non-musicians) and their scores appeared not to be dissimilar to those obtained by the rest of the participants. None of the participants reported a salient hearing impairment, and no differences were found in the scores of the only participant who declared to have an increased hearing sensitivity than normal. Finally, some data were missing for the Rhythm Ability Test ($n = 1$), the Mistuning Perception Test ($n = 3$) and the Start Age sub-scale of the Gold-MSI ($n = 27$) from non-musicians only.

Data analyses

Statistical analyses were performed using the Jamovi software (version 2.2, 2021, retrieved from https://www.jamovi.org/; R Core Team, 2021). As a first step, an independent sample *t*-test was performed to detect whether there were significant differences in general music sophistication in the 1st grade. Subsequently, a series of two-factor ANOVAs were performed to verify the two main basic hypotheses and to detect whether there were significant differences in cognitive and musical skills for age and group. Therefore, two-factor ANOVAs were performed using the two independent variables Grade (1/2/3) and Group (Musicians/Non-musicians) on the following dependent variables:

1. Working Memory (JAJ: Jack&Jill Test);
2. IQ (MIQ: Matrix Reasoning Test);
3. Beat Perception (BAT: Beat Alignment Perception Test);
4. Melody Discrimination (MDT: Melodic Discrimination Test);
5. Mistuning Perception (MPT: Mistuning Discrimination Test);
6. Emotion Discrimination (EDT: Emotion Discrimination Test);
7. Rhythmic Ability (RAT: Rhythm Ability Test).

Subsequently, gender was also included as a further independent variable in the analyses. For the same variables, a series of ANCOVAs were performed treating the Gold-MSI General Index score as a covariate to account for probable pre-existing differences, and also due to lack of subjects' random assignment. Moreover, general musical sophistication was found to correlate with self-reported music training (Müllensiefen et al., 2014). As the students of the musical curriculum are chosen through aptitude tests based on imitation and recognition of rhythm, melody and pitch, we aimed to statistically control for pre-existing individual differences in musicality to better see the effect of music training, similarly to other studies where some Gold-MSI subscales were used as covariates (Kang and Williamson, 2012; Farrugia et al., 2015; Ma et al., 2021; Wallmark et al., 2021; Krause et al., 2022).

It is important to note that the Gold-MSI has a hierarchical factor structure, and the General value is the mean of an assorted set of items across all the other subscales. In the Gold-MSI original study by Müllensiefen et al. (2014), 18 items were drawn from all five Gold-MSI subscales to index musical sophistication in general, with a clear preponderance of items from the Musical Training and the Singing Abilities subscales. In addition, for removing outliers we applied a filter in the analysis of MIQ scores that was based on the estimated amount of measurement error, rejecting all observations with a standard error of the mean (SEM) value < 1.5 with the aim to eliminate performance scores which were estimated in the presence of a high amount of measurement error, thereby eliminating nine more participant's scores from the dataset. For the JAJ no outliers were found.

TABLE 3 Jack&Jill (JAJ) and matrix reasoning (MIQ) descriptives for grades and groups and gender.

	Grade	Group	Gender	*N*	Mean	SD
JAJ	1	M	Female	22	−0.18621	0.950
			Male	32	−0.09296	0.912
		NM	Female	24	−0.29614	0.879
			Male	27	−0.32285	0.675
	2	M	Female	26	0.00176	0.828
			Male	21	0.18652	0.864
		NM	Female	12	−0.07302	0.684
			Male	18	0.13442	0.669
	3	M	Female	25	0.46949	0.714
			Male	29	0.04914	0.939
		NM	Female	22	−0.28995	0.827
			Male	18	−0.09424	0.853
MIQ	1	M	Female	22	−2.32072	0.767
			Male	32	−1.84395	0.936
		NM	Female	24	−2.08777	0.982
			Male	27	−2.48786	0.686
	2	M	Female	26	−1.87805	0.675
			Male	21	−1.65372	0.974
		NM	Female	12	−2.16634	0.914
			Male	18	−2.00237	0.799
	3	M	Female	25	−1.62141	0.895
			Male	29	−1.61453	0.887
		NM	Female	22	−2.08135	1.010
			Male	18	−2.10286	1.042

M, musicians; NM, non-musicians.

Results

The scores of the adaptive tests were given on a z-scale and had a population mean around 0 and ranged from −4 to 4. JAJ and MIQ score ranges, mean and standard deviations for each grade and group are summarized in **Table 3**, likewise the SEM ranges for both JAJ and MIQ.

TABLE 4 Descriptive statistics for all the perceptive tests.

	Grade	Grade	Gender	*N*	Mean	SD
CA-BAT	1	M	Female	22	−0.8484	1.062
			Male	32	−1.3194	1.149
		NM	Female	24	−1.5169	1.365
			Male	27	−1.6951	1.418
	2	M	Female	26	−0.4379	0.827
			Male	21	−0.6774	0.999
		NM	Female	12	−0.9597	1.005
			Male	18	−0.9679	1.339
	3	M	Female	25	−0.5237	1.164
			Male	29	−1.0052	1.336
		NM	Female	22	−1.0502	1.068
			Male	18	−1.4549	1.555
MDT	1	M	Female	22	−1.0957	1.104
			Male	32	−1.3840	0.917
		NM	Female	24	−1.6999	1.095
			Male	27	−1.4922	1.132
	2	M	Female	26	−0.9481	0.898
			Male	21	−1.0231	1.104
		NM	Female	12	−1.6880	0.762
			Male	18	−1.1849	1.111
	3	M	Female	25	−0.5490	1.069
			Male	29	−0.7132	1.050
		NM	Female	22	−1.2212	0.985
			Male	18	−1.5660	1.054
MPT	1	M	Female	22	−0.6690	1.056
			Male	32	−0.9477	1.045
		NM	Female	22	−1.1373	1.351
			Male	26	−1.6432	1.310
	2	M	Female	26	−0.2969	1.067
			Male	21	−0.7156	1.095
		NM	Female	12	−1.1736	1.182
			Male	18	−0.5925	1.188
	3	M	Female	25	−0.0897	0.775
			Male	29	−0.6441	1.132
		NM	Female	22	−0.2583	1.106
			Male	18	−1.2586	0.854
EDT	1	M	Female	22	0.5932	1.117
			Male	32	0.5068	0.859
		NM	Female	24	0.4786	0.999
			Male	27	0.1615	1.051
	2	M	Female	26	0.6833	0.948
			Male	21	0.8154	1.051
		NM	Female	12	0.9135	1.033
			Male	18	0.5330	1.013
	3	M	Female	25	1.1620	0.781
			Male	29	0.5642	0.997
		NM	Female	22	0.8740	0.961
			Male	18	0.4510	0.971
RAT	1	M	Female	22	−0.6754	0.923
			Male	32	−0.6418	0.949
		NM	Female	24	−1.0240	0.779
			Male	26	−1.1966	0.790
	2	M	Female	26	−0.7967	0.823
			Male	21	−0.3189	0.937
		NM	Female	12	−1.0394	0.811
			Male	18	−0.6794	0.850
	3	M	Female	25	−0.1251	0.757
			Male	29	−0.4099	0.910
		NM	Female	22	−0.9258	0.808
			Male	18	−0.8501	0.859

(1) M, musicians; NM, non-musicians.
(2) JAJ, Jack&Jill Working Memory Test; MIQ, matrix reasoning; CA-BAT, Computerized Adaptive Beat Alignment Test; MDT, Melody Discrimination Test; MPT, Mistuning Perception Test; EDT, Emotion Discrimination Test; RAT, Rhythm Ability Test.

Overall, JAJ scores ranged [−1.80, 2.83] with a mean of 0.016 (SD = 0.89) while MIQ scores ranged [−3.59, 1.71] with a mean of −1.87 (SD = 0.93). For the JAJ, the lowest ability value (−1.89) would correspond to the ability of remembering not more than one position consistently (Tsigeman et al., 2022). Considering this, in the present study 47.4% of the participants obtained a score below zero for the JAJ: of them, 48.1% are musicians and 51.8 non-musicians. Moreover, the 21.7% of participants who obtained scores below 0 attend the 1st grade. Regarding gender, no significant differences were found.

A comparison of estimated marginal means showed the following: For the music group 1st Grade MIQ scores ranged [−2.31, −1.82] while for the 1st Grade non-musicians scores ranged [−2.58, −2.08]; 3rd Grades musicians scores ranged [−1.83, −1.34] and 3rd Grade non-musicians scores ranged [−2.42, −1.85]. For JAJ, 1st Grade musicians scores ranged [−0.35, 0.10] and 1st Grade non-musicians scores ranged [−0.58, −0.10]; 3rd Grade musicians scores ranged [0.06, 0.51] while 3rd Grade non-musicians scores ranged [−0.50, 0.03].

Comparing the estimated marginal means for the perceptive tests showed similar results. Descriptive statistics for all the perceptual tests can be also found in Table 4: BAT (M = −1; SD = 1.23); MDT (M = −1.14; SD = 1.08); MPT (M = −0.7; SD = 1.15); EDT (M = 0.6; SD = 0.9) RAT (M = 0.6; SD = 0.9). For all the three grades, higher mean scores can be always found for the musicians compared to non-musicians, and overall, both groups tend to improve their scores in 3rd grade compared to 1st.

Table 5 reports descriptive statistics for the GOLD-MSI. Musicians show better scores than non-musicians in all sub-scales except for Starting Age; however, the data missing from 27 non-musicians may have affected the results. Another exception was found in the sub-scale Emotion for the 2nd Grade, where

TABLE 5 Gold-MSI descriptives for all subscales.

	Grade	Group	*N*	Missing	Mean	SD
GMSI	1	M	56	0	4.21	0.791
		NM	51	0	3.59	0.752
	2	M	50	0	4.40	0.858
		NM	30	0	3.89	0.918
	3	M	57	0	4.35	0.761
		NM	41	0	3.52	0.844
GMS active engagement	1	M	56	0	4.43	0.966
		NM	51	0	3.89	0.970
	2	M	50	0	4.71	1.012
		NM	30	0	4.62	1.130
	3	M	57	0	4.50	1.011
		NM	41	0	4.00	0.909
GMS music training	1	M	56	0	3.82	0.931
		NM	51	0	3.17	1.292
	2	M	50	0	4.25	0.898
		NM	30	0	3.25	1.203
	3	M	57	0	4.25	0.833
		NM	41	0	3.20	1.120
GMS emotions	1	M	56	0	4.57	0.957
		NM	51	0	4.36	1.122
	2	M	50	0	5.14	0.994
		NM	30	0	5.14	1.205
	3	M	57	0	5.09	1.047
		NM	41	0	4.80	0.979
GMS perceptual abilities	1	M	56	0	4.41	0.849
		NM	51	0	4.08	0.789
	2	M	50	0	4.81	0.919
		NM	30	0	4.43	0.776
	3	M	57	0	4.73	0.708
		NM	41	0	4.31	0.790
GMS singing abilities	1	M	56	0	4.71	1.081
		NM	51	0	4.27	1.014
	2	M	50	0	4.67	0.991
		NM	30	0	4.42	1.011
	3	M	57	0	4.52	0.763
		NM	41	0	3.89	1.071
GMS instrument	1	M	56	0	7.02	5.629
		NM	51	0	6.45	7.739
	2	M	50	0	7.54	5.736
		NM	30	0	5.77	6.135
	3	M	57	0	7.44	5.720
		NM	41	0	5.17	6.025
GMS start age	1	M	56	0	7.70	2.207
		NM	40	11	8.63	1.877
	2	M	50	0	7.42	1.939
		NM	25	5	7.36	2.447
	3	M	57	0	7.77	1.899
		NM	30	11	8.47	1.737

(1) M, musicians; NM, non-musicians.
(2) The number of participants is lower than the sample number as a filter was applied to SEM values <1.5 which removed the score of nine participants.

musicians (M = 5.14; SD = 0.99) and non-musicians (M = 5.14; SD = 1.20) have the same mean scores.

As we aimed to test whether there are pre-existing differences in musical sophistication and expertise between the two groups when they enter middle school, we decided to perform a t-test as the first step. The results of the independent sample t-test indeed showed a significant difference between the groups of participants enrolled in the 1st grade of middle school (Table 6).

The 56 1st grade musicians (M = 4.28; SD = 0.765) compared to the 51 participants in the control group (M = 3.69; SD = 0.712) demonstrated better scores: $t(105) = 4.11$; $p < 0.001$; $d = 0.795$. Welch's test results also suggest a significant difference between the two groups: $t(105) = 4.12$; $p < 0.001$. Also, Mann-Whitney test reported similar results: as the p value obtained from the Mann-Whitney U test is significant ($U = 777$, $p < 0.001$), we conclude that the general level of musical sophistication of the two groups is significantly different. Moreover, the general Gold-MSI score was found to be distributed normally, as verified by the Shapiro-Wilk test ($p = 0.648$).

The subsequent series of 7 two-factor ANOVAs showed a significant difference for both of the cognitive tests, namely JAJ and MIQ, with higher scores for musicians than non-musicians (JAJ: df = 1; $F = 6.101$; $p = 0.025$; $\eta p^2 = 0.018$; MIQ: df = 1; $F = 8.462$; $p = 0.004$; $\eta p^2 = 0.030$). The analysis also showed a robust difference between the groups for both JAJ and MIQ especially in 3rd grade. This and the results between groups and across age for all the remaining perceptive tests are summarized in Figure 1. Significantly better performances of musicians were found on the BAT, MDT, and MPT. Significant differences were also found between year groups on the same cognitive and perceptive tests; moreover, an additional significant difference between groups was found for the RAT and between year groups for the EDT. Based on these ANOVA models, *post hoc* multiple comparisons using Bonferroni correction revealed significant differences between groups for all the tests except for EDT. Significant differences for grades were also found for all the tests except for JAJ and EDT. Significant differences for grades x group interaction were found throughout all the variables except for EDT.

As significant differences were found in the starting t-test for the General Music Sophistication Index in 1st grade, a series

TABLE 6 Independent samples *t*-test for 1st grade groups using general music sophistication as a dependent variable.

						95% confidence interval			
	Statistic	df	*p*	Difference in means	SE difference	Lower	Upper		Effect size
Student's *t*	4.11	105	<0.001	0.588	0.143	0.304	0.873	Cohen's *d*	0.795
Welch's *t*	4.12	105	<0.001	0.588	0.143	0.305	0.872	Cohen's *d*	0.796
Mann-Whitney *U*	777		<0.001	0.667		0.333	0.933	Rank biserial correlation	0.456

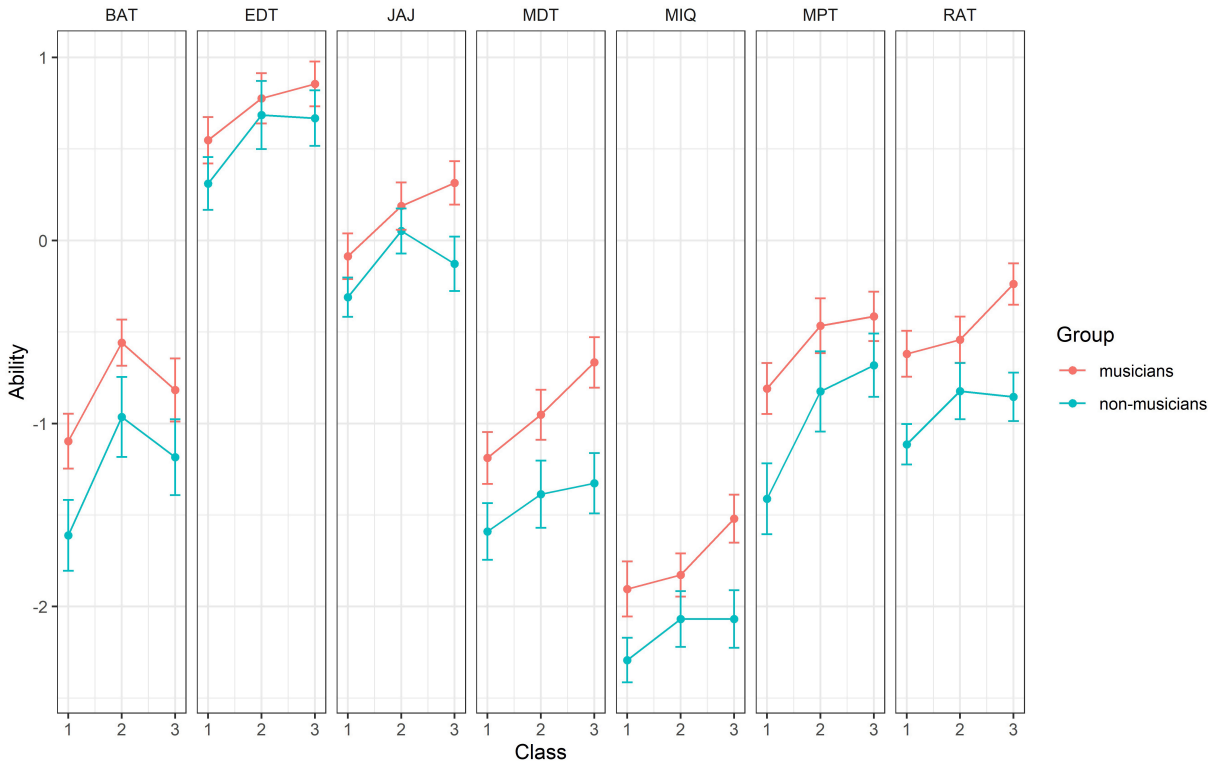

FIGURE 1
Mean ability values for the seven performance tests by grade and quasi-experimental group. Error bars indicate standard error of mean. BAT, Beat Alignment Test; EDT, Emotion Discrimination Test; JAJ, Jack&Jill Working Memory Test; MDT, Melody Discrimination Test; MIQ, matrix reasoning; MPT, Mistuning Perception Test; RAT, Rhythm Ability Test.

of seven ANCOVAs were also employed treating the GOLD-MSI General Index score as a covariate. Significant differences between musicians and non-musicians remained significant both for JAJ (df = 1; F = 6.008; p = 0.015; ηp^2 = 0.022) and MIQ (df = 1; F = 9.735; p = 0.002; ηp^2 = 0.035) and as well as for year groups. Regarding the perceptive tests, the results for BAT and MPT barely changed after controlling for GMSI and they remained significant for the music groups. For the MDT results remained significant for both groups and years, while for the RAT no changes were found. Gender was also added as a variable, and the results are summarized in Table 7. Significant differences were found for EDT and MPT in favor of females. Predicted abilities showing the predictions of the final model with gender as covariate are summarized in Figure 2.

Finally, *post hoc* multiple comparisons using Bonferroni correction based on the ANCOVA models showed significant differences between groups for all the tests except for EDT (Table 8); across age, significant differences were also found for all the tests but not for JAJ and EDT. Several significant interaction effects grades x groups were found except for EDT. In both *post hoc* analysis significant interaction effects were mostly found for comparisons between 1st Grade non-musicians and 2nd/3rd Grades musicians. The only exception was found for MDT where significant grades x groups interactions

TABLE 7 ANCOVAs results for gender after Bonferroni correction and controlling for general music sophistication.

Measure	Test	df	*t*	*p*	Pbonferroni
Visuo-spatial WM	JAJ	263	−0.18	0.857	0.857
Fluid Intelligence	MIQ	263	−0.47	0.637	0.637
Beat perception	CA-BAT	263	1.81	0.071	0.071
Melody Discrimination	MDT	263	0.11	0.908	0.908
Mistuning Perception	MPT	260	2.27	**0.024***	**0.024***
Emotion Discrimination	EDT	264	2.29	**0.023***	**0.023***
Rhythm Ability	RAT	262	−0.93	0.353	0.353

JAJ, Jack&Jill Working Memory Test; MIQ, matrix reasoning; CA-BAT, Computerized Adaptive Beat Alignment Test; MDT, Melody Discrimination Test; MPT, Mistuning Perception Test; EDT, Emotion Discrimination Test; RAT, Rhythm Ability Test.
Bold values represent the significant values.

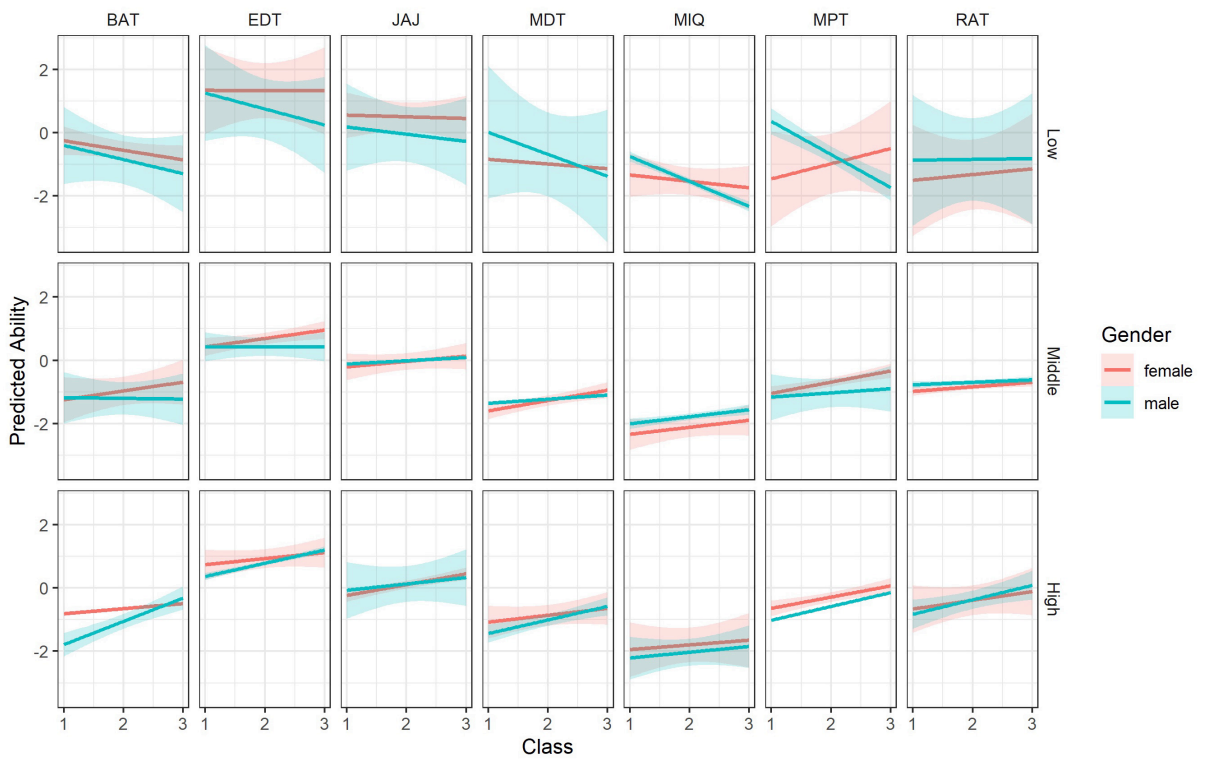

FIGURE 2
Predicted ability values for the seven performance tests by class (X-axis) and gender (red = females, blue = males) for the three levels of General Music Sophistication. BAT, Beat Alignment Test; EDT, Emotion Discrimination Test; JAJ, Jack&Jill Working Memory Test; MDT, Melody Discrimination Test; MIQ, Matrix Reasoning; MPT, Mistuning Perception Test; RAT, Rhythm Ability Test.

were found between 2nd Grade non-musicians - 3rd Grade musicians and 3rd Grade musicians - 3rd Grade non-musicians.

Discussion

The present study was carried out with the aim of evaluating the effects of music training on audiovisual WM and fluid intelligence in preadolescence. In particular, the focus was on instrumental training carried out in musical middle schools. For this purpose, a series of cognitive and perceptual tests were employed to check whether there is any difference between the two groups of musicians and non-musicians and over the years. Fluid intelligence, visuo-spatial WM, beat perception, melodic discrimination, mistuning perception, rhythmic ability, emotional discrimination and general music sophistication were assessed.

First of all, from analyzing the descriptive data for the JAJ test we found a lower percentage of below-zero results for the musicians, which seems significant considering that the participants belonging to the experimental group outnumber the participants of the control group. Furthermore, differences between the two groups in music perceptual tests could be traced back to pre-existing dissimilarities. In fact, a significant difference emerged in general music sophistication between the musical and non-musical group in the 1st grade, probably due to the fact that children in the musical middle schools are selected through aptitude tests to be enrolled in the music curriculum, and therefore the general musical abilities appear to be more enhanced in the musical group from the beginning.

Taken together, the results allow us to reject the null hypotheses, which predicts the absence of significant differences between the musical and non-musical group and over the

TABLE 8 ANCOVA's *post hoc* comparison (Bonferroni correction) for grade, group and grade × group interaction.

Measure	Test	df	*t*	*p*	$p_{bonferroni}$
Visuo-spatial WM	JAJ				
Grade		–	–	–	–
Group		263	2.78	0.012*	0.012*
Grade × Group Grade 1, NM - Grade 3, M		263	−3.71	<0.001*	0.004*
Fluid intelligence	MIQ				
Grade 1–3		263	−263	0.009*	0.027*
Group		263	3.32	0.001*	0.001*
Grade × Group Grade 1, NM - Grade 2, M		263	−3.18	0.002*	0.024*
Grade 1, NM - Grade 3, M		263	−4.10	<0.001*	<0.001*
Beat perception	CA-BAT				
Grade 1–2		263	−2.97	0.003*	0.010*
Group		263	2.19	0.029*	0.029*
Grade × Group Grade 1, NM - Grade 2, M		263	−3.80	<0.001*	0.003*
Grade 1, NM - Grade 3, M		263	−3.12	0.002*	0.030*
Melody discrimination	MDT				
Grade 1–3		263	−2.71	0.007*	0.021*
Group		263	3.55	<0.001*	<0.001*
Grade × Group Grade 1, NM - Grade 3, M		263	−4.37	<0.001*	<0.001*
Grade 1, M - Grade 3, NM		263	−2.98	0.003*	0.047*
Grade 2, NM - Grade 3, M		263	−3.25	0.001*	0.019*
Grade 3, M - Grade 3, NM		263	3.16	0.002*	0.026*
Mistuning Perception	MPT				
xgGrade 1–3		260	−3.31	0.001*	0.003*
Group		260	2.15	0.032*	0.032*
Grade × Group Grade 1, NM - Grade 2, M		260	−3.00	0.003*	0.044*
Grade 1, NM - Grade 3, M		260	−3.74	<0.001**	0.003*
Emotion discrimination	EDT				
Grade		–	–	–	–
Group		–	–	–	–
Grade*Group		–	–	–	–
Rhythm Ability	RAT				
Grade 1–3		262	−2.47	0.014*	0.043*
Group		262	3.57	<0.001*	<0.001*
Grade × Group Grade 1, NM - Grade 3, M		262	−4.45	<0.001*	<0.001*

(1) M, musicians; NM, nonmusicians.
(2) Comparisons are based on estimated marginal means.
(3) Only significant effects obtained after Bonferroni correction were included in the table.
(4) Df value is lower as a filter was applied to SEM values < 1.5 which removed the score of 9 participants; for MPT and RAT some participants are missing.
(5) JAJ, Jack&Jill Working Memory Test; MIQ, matrix reasoning; CA-BAT, Computerized Adaptive Beat Alignment Test; MDT, Melody Discrimination Test; MPT, Mistuning Perception Test; EDT, Emotion Discrimination Test; RAT, Rhythm Ability Test.
*represent the significant values.

years; in fact, significant results in musicians and for years, with a considerable variance between groups, were found. We would state that at least two of the three alternative hypotheses of the present study can be accepted: in one of them, we predicted the association between music training and superior audiovisual WM and fluid intelligence and, actually, the group of musicians showed a better performance compared to non-musicians in both domains. The present results converge with prior studies where music training was associated with superior cognitive abilities (Schellenberg, 2006, 2011b; Degé et al., 2011; Slevc et al., 2016; Baker et al., 2018; Meyer et al., 2020; Porflitt and Rosas, 2022).

In line with the first hypothesis, results also showed a significantly better performance by musicians in most of the perceptual tests. Since the music perceptual LongGold tests contain memory retention among the cognitive processes evaluated, similar results in these tests suggest that music training is associated with auditory memory, although, as already mentioned, this may possibly be due to pre-existing differences and selection. In fact, in previous studies, connections with potentially pre-existing auditory cognitive abilities that may help to explain the discrepancies between musicians and non-musicians were discussed (Mankel and Bidelman, 2018; Bidelman and Mankel, 2019). Note that significant differences remained even after controlling for general music sophistication for all the perceptive tests except for EDT, suggesting a convergence with the studies that found correlations between music training and auditory WM due to the near transfer effect (Kraus et al., 2012; Zuk et al., 2014; Slater and Kraus, 2016; Slevc et al., 2016; Alain et al., 2018; Nie et al., 2021).

Furthermore, the second alternative hypothesis that predicted a better performance from older groups due to maturation can partially be accepted; having found clear differences between the means of the three age groups suggests a maturation effect. However, the relative measurement error for the younger age group provides some uncertainty around these results. The high measurement error might be due to some younger students not obtaining a very good understanding of the task, but this can be verified with subsequent longitudinal data. Something similar was found for the perceptive tests: the tendency to improve the performance over the years seems to be an effect of the general maturation. These results converge with those of Rauscher and Hinton (2011) where children showed improvements in the third year of study, although in that case it was a longitudinal analysis unlike the present study. Here, an exception is represented by JAJ and EDT. For the MIQ results, on the other hand, growth is rather gradual over the years.

In the specific case of gender, previous studies suggested that boys may experience a window of increased sensitivity to risk-taking throughout adolescence that is broader in magnitude and longer in duration than females (Bennett et al., 2005; Shulman et al., 2015). This could be due to a difference in maturation between the two genders that would lead girls to show a better self-control and, by consequence, a better academic achievement (Matthews et al., 2009; Duckworth et al., 2019). Particularly, for WM a slight tendency in favor of females was found as well because of the existence of gender-specific strategies produced by different neurodevelopment trajectories, more specifically by hemispheric differences in the neural substrate. In fact, females tend to perform more accurately at the cost of longer reaction times (Grissom and Reyes, 2019). Although, in the specific domain of visuo-spatial WM, males seem to have an advantage (Voyer et al., 2017). In spite of this evidence suggesting differences between genders in cognitive maturation, no significant differences were found for the visuo-spatial WM nor for intelligence. However, significant results were found for MPT and EDT. In addition, the latter results clearly indicate a higher emotional maturation of females at this stage of development.

Finally, for the third and last hypothesis the question is more controversial: comparing the estimated marginal means after controlling for music sophistication showed a difference from the start between groups, both for MIQ and JAJ as well as the perceptive tests, and also a difference between 1st and 3rd grades consistently with a better performance by the group of musicians. Moreover, after Bonferroni correction some significant interaction effects were found for grades and groups. However, this would be not a definite proof yet of the positive effects of music training. Certainly, the starting difference between groups is clear-cut, so the contribution of other different factors to these results cannot be excluded, as the developmental trajectories of musical experience may be influenced by individual variations in musical ability, personality and cognitive capacity as well as environmental factors, such as socioeconomic background (Vincenzi et al., 2022). However, it can certainly result in a concrete hypothesis for further studies where further information may be provided by exploring these variables.

Similarly to the study carried out by Carioti et al. (2019), in the present study we aimed to demonstrate how the positive association between music training and better performance in visuo-spatial WM and fluid intelligence increase with increasing years of training, despite individual differences and other variables. In addition, we found improvements in auditory memory. But differently from the Carioti study, the present study is a cross-sectional analysis across the different ages and the three grades of students of the Italian musical middle schools that would serve as a hypothesis for future longitudinal analyses. Another difference and a strength of our study lies in having tested a larger sample size, recruited in three different schools located in three different parts of Bari's metropolitan area and characterized by different social contexts. Moreover, a further difference to the Carioti study consists in a clearer distinction in terms of musical experience between the groups within the sample to reduce the risk of spuriousness due to the presence of music-skilled subjects in the control group.

In sum, the contributions of the present study certainly allow to add evidence to previous studies where music training had been correlated to better performance in visuo-spatial and auditory WM (Pallesen et al., 2010; George and Coch, 2011; Schulze et al., 2011a; Suárez et al., 2016; Anaya et al., 2017). As regards the specific domain of visuo-spatial WM, our results highlight the connection between instrumental training and implicit sequence learning. Similarly, to the study by Anaya et al. (2017), we found better performance by the group of musicians in the JAJ; in their study, participants were shown a sequence of black squares that were individually illuminated to form a sequence, and they were asked to reproduce it. The sequence was scored as correct if the participant was able to reproduce the entire sequence without error. In our study, one of the two tasks of the JAJ concerns precisely remembering increasingly long sequences of ball positions according to Jack's rotation. Therefore, the JAJ task deals with memory encoding, which is one of the critical processes, together with storage and retrieval, involved in sequential memory (Liang et al., 2020), so, it is plausible find a better performance in musicians engaged in formal music training with this type of task.

It is certain that playing an instrument requires a lot of discipline, effort and patience. It requires also rote work and many hours of practicing and involving procedural memory and sequence processing. Sequences generally seem to be learned implicitly, in which case there is no relationship with WM. On the contrary, sequence learning tasks show WM differences if the learning is explicit or purposeful, as WM actively learns to direct attentional focus and cognitive control (Janacsek and Nemeth, 2013). It therefore seems conceivable that music training, together with other influencing factors, is able to affect sequence learning. Our findings seem to match the findings by Pau et al. (2013), who discovered a relationship between musicians' functional brain alterations and memorizing visual sequences; however, such outcome may be a reflection of music students' background in combination with their formal education, activities and years spent playing an instrument that are not present here.

Furthermore, we found a wider gap in 3rd grade scores in favor of musicians compared to the remaining school grades, but no Grade × Group interaction was found except for melody discrimination. Thus, it is not an inferential result and further studies are needed in order to enrich the literature on the possible effects of reiterated music training. Swaminathan et al. (2017) showed that music abilities, rather than the amount of music training, predicted far transfer effects in a sample of adults. This finding supports the idea that the correlation between far transfer effects and engagement in music is mediated by the level of music skills rather than the duration.

On the other hand, Criscuolo et al. (2019) showed significant positive relationships between WM and the duration of musical practice, even after controlling for intelligence and background variables, such as personality traits. It may be that the extent of the training influences the persistence of the effect after termination of the training. According to these studies it may be assumed that music training would be able to prepare a basis for a range of skills and thus promote cognitive development (Miendlarzewska and Trost, 2014). In addition, music training over time can be made progressively more challenging, and this is a unique strength to consider in future research when advocating for music training as a cognitive growth intervention (Cooper, 2020).

Overall, the contributions of this study concern the use of new instruments suitable for preadolescents to assess these domains for the first time with Italian children; the exploration of a new environment of study together with curricular instrumental training and the providing of new evidence to preadolescents, cognitive abilities and music training literature (Schellenberg, 2011a; Corrigall et al., 2013; Bergman Nutley et al., 2014; Putkinen et al., 2015; Carioti et al., 2019). Finally, our study provided new evidence for gender differences regarding the improvement of auditory skills in favor of females, with a particularly strong effect for the musical emotion recognition task.

In sum, music middle schools can be considered a resource for preadolescent education, a delicate stage of development in which it is necessary to offer the child the possibility of an overall maturation and to carry out group activities for a good transition to adulthood. Hence, in this sense, music middle schools certainly constitute an excellent public and free resource for the community. Even if the present results are not sufficient to direct research on WM and cognitive characteristics related to auditory stimulation and middle schools' music training toward solid evidence, the promising lines of this study may be considered surely encouraging.

Limitations and future research

Despite the contributions to the field, the present study is subject to several limitations. First of all, the cross-sectional setting does not allow to comment strongly on the influence of music training, since without longitudinal data it is not possible to establish a true cause and effect relationship; in fact, longitudinal experimental investigations are the most reliable proof that reading and musical experience are causally related ability (Tierney and Kraus, 2013).

Thus, the present study could be considered a cross-sectional examination of variations in musical ability and visuo-spatial WM comparing people with and without music training in three distinct age groups. However, cross-sectional studies can estimate prevalence of outcome of interest and are useful for the generation of hypotheses (Levin, 2006). Furthermore, as previously mentioned, the MiddleMusic project which this study is part of is still under progress and, throughout the following years, longitudinal data from the same children will be gathered.

Ideally, measurements should be conducted before training, immediately following training, and after training to see if any training-related advantages persists. Moreover, the control group should be active to leave out the possibility that trained children are performing better than control children merely because they are getting a treatment that the other group is not (Tierney and Kraus, 2013). In this regard, another important limitation of this study consists in the lack of an active control group together with the pre-existing differences between the two groups, as other factors such as receiving teachers' increased attention, more interaction with peers or more time spent at school may influence results; although, it might be logistically challenging to find an active control training program that matches music training in the same level of intensity and enthusiasm. Additionally, even if several extra-curricular projects addressed to all students are put on throughout the school year, the specific activities of our sample were not investigated. As regards pre-existing differences, they may determine the desire or ability that led some of the children to study music and, by consequence, the differences between groups; in this regard, the initial choice of school curriculum alone seems not to be sufficient to isolate the influence of other potential factors. In fact, a future musician may decide to enroll in an educational program with intensive music training due to his predispositions, making it difficult to determine whether the cognitive advantage seen in musically trained children is a genuine effect of the training, whether it is a specific one, or whether it is a spurious effect. According to the latter approach, Schellenberg's argument that music training is better suited for analyzing pre-existing differences in brain and cognitive development than plasticity brought on by training would be confirmed (Schellenberg, 2011a).

The risk of the high impact of pre-existing differences on differences between groups occurs especially when children are not randomly allocated to either a music training group or a control group. Since the current study is quasi-experimental research, random assignment is another crucial topic to deepen. According to Barrett et al. (2013), it can be difficult to conduct a study on the effects of music training with randomization. As a result, there is frequently a compromise between the ecological validity of musical education and the degree to which study designs can satisfy these requirements. The results of such investigations will be challenging to adapt to actual music learning environments, but using the experimenter's training programs can enable more rigorously controlled trials (Barrett et al., 2013). On the other hand, researchers might increase the relevance of their findings to educators at the expense of certain study design restrictions by looking at current programs that have been shown effective in teaching adults and children musical abilities (Fasano et al., 2020). The method used to establish group equivalency is crucial when proper randomization is not realistically feasible.

Also, due to lack of a second-level interaction, here and in the previous study by Carioti et al. (2019) it might be concluded that 1 year of intensive music training alone is not sufficient to strongly affect cognitive maturation. However, cognitive and emotional abilities and mutual acceptance among children can be further benefited, regardless of the relatively advanced stage of children's emotional maturation, although further research is required on the topic. Hence, overall, our findings allow us to join the chorus of other researchers in suggesting that primary school could be exploited as a privileged environment and should include music training as a significant tool to aid cognitive maturation (Rauscher and Hinton, 2011; Hallam, 2015; Altenmüller, 2016; Carioti et al., 2019; Peretz, 2019; Kraus and White-Schwoch, 2020). In fact, starting music training in primary school and persevering with it also during pre-adolescence might more likely produce significant results on cognitive maturation.

These findings stand upon neural basis; as already mentioned, increasing neuroscientific research demonstrates its positive effects on brain development. For example, musical expertise is associated with the efficiency of a right-lateralized frontoparietal network activated by the EF tasks, meaning that musically trained children are able to engage neural resources that are inaccessible to untrained children, perhaps because of earlier maturation, stronger task engagement, or the use of different cognitive strategies (Putkinen and Saarikivi, 2018).

Again, the question is if these effects are the product of intensive music training rather than of other factors, such as pre-existing differences or biological traits of musicality. The anatomical evidence reveals that musicians have specific brain areas that appear different compared to the starting age of music training; (e.g., a study with functional magnetic resonance imaging identified the left superior temporal gyrus as the region that is linked with music training, in terms of cumulative practice hours (Ellis et al., 2013). Diffusion tensor imaging studies, on the other hand, show greater structural connectivity in other areas (Schlaug, 2015; Møller et al., 2021; Criscuolo et al., 2022). A further longitudinal study with pre-adolescents showed an improvement in some perceptual and cognitive abilities after a 6-month individual instrumental training carried out at a public music school and also a neuroplastic change of the frontotemporal networks of brain connectivity, measured with neuroimaging techniques (Cantou et al., 2018; Brattico, 2019; Fasano et al., 2020). Then, according to these studies, it is reasonable to assume that music training can induce brain changes not attributable to pre-existing differences or biological traits.

Recent research has also shown that the child's agreeableness and the parents' openness to new experiences are the best indicators of how music lessons would affect the youngster (Corrigall and Schellenberg, 2015). In this respect, individual

variables, such as personality or socioeconomic status that could affect outcomes, are important to explore in further studies; as these factors have not been analyzed in the present study, this correlation should be verified by evaluating the personality types of the parents and the children. Mostly, to contrast the limitations of this study, more longitudinal and random assigned trials on pre-adolescent musicians are needed when feasible. In addition, the presence of the active control condition is prominent and, importantly, both experimental and active control groups should be tested for far transfer (Bigand and Tillmann, 2022). This would allow to make equal and fair comparisons and to have a clearer view on the possible causal effects of music training; therefore, it is essential to move in this direction for future research.

Data availability statement

The dataset analyzed for this study can be found in the Zenodo digital repository at doi: 10.5281/zenodo.6958523.

Ethics statement

The studies involving human participants were reviewed and approved the Ethics Committee, Department of Education, Psychology, Communication University of Bari "Aldo Moro", Italy. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

ML: design, coordination, recruitment, data acquisition, data management, data analysis and interpretation, and manuscript writing. EB: conceptualization, design, recruitment, data analysis and interpretation, and manuscript revision. DM: design, data management, data analysis and interpretation, and manuscript revision. KF: design, data management, figures preparation, and manuscript revision. BM: data acquisition, data interpretation, and manuscript revision. PV: design, funding, and manuscript revision. RC: design and manuscript revision. All authors contributed to the study and to the final revision of the 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.

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Being and becoming instrumental musicians and teachers: A post-qualitative exploration

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In trying to understand the complex interplay between effective learning and personal experience in instrumental music education we look to our own histories of becoming instrumental performers trained in conservatoires. We seek a collective fusion of horizons of possibility to explore the relationships of musicians, both learners and teachers, with each other and their environments. We adopt the post-qualitative turn, as it offers space and place for simmering curiosities, introspections, evaluations, and yearnings. As pondering individuals, we question how we were pulled and prodded through the acquisition of instrumental expertise. We are a trumpeter and a clarinetist; we are performers. We are also music educators who both re-enact and resist what was given to us as gospel. We hope to find within our thick and layered experiences, understandings of the better teacher we hope to become. We look beyond our "training" to our becoming both musicians and pedagogues, a work that remains in progress. We offer this pathway to our students—how can we/they become the better music educator?

KEYWORDS

post-qualitative, music education, music teaching, pedagogy, instrumental music education

Introduction

In music education, the instrumental one-to-one lesson is a "site of negotiated interactions, and behaviors of awareness and focus, frustrations, disappointments and epiphanies" (de Bruin, 2018a, p. 2). This is a relational and temporal space of physical modeling, dialogic scaffolding and coaching that is unfolded in a sequence of preplanning, action-reaction, and post-performance evaluations. In this, practice and performance coalesce in the cascading moment-to-moment interactions between teacher and student that may reveal evolving understandings of self and other (Bruner, 1996; Folkestad, 2006; Galenson, 2006).

We draw on recollections of learning incidents using Barad's (2007) concept of "agental realism" (p. 132) that address how human nature and experience is agentic. It is through acts, and how those actions have consequences, of boundary riding between maintenance, stasis and change, that the "openness and amorphousness of post-qualitative inquiry" provides (Gerrard et al., 2017, p. 384). St. Pierre (2017, p. 2) describes post-qualitative enquiry as "both provocation and challenge," that "asks

that we push forward the intensive, barely intelligible variation in living that shocks us and asks us to be worthy of it" (p. 5). We respond to calls for post-qualitative "inquirers to articulate an overt ethical orientation toward change, one animated by the work of standing at one's post, mapping the contemporary terrain, arranging newly productive relations, and generating different effects" (Kuntz, 2020, pp. 1–2). This allows and exhorts us to ponder, question and investigate our creative and experiential stance toward places and practices known, and to that which we wish to make better from this knowingness. As a consequence, we inhabit our post-qualitative perspective educationally, ethically, and empathically. Using our understood experiences maps what was and still is, urging us toward new ways of becoming for ourselves, but also for other music educators who come within our sphere.

Instrumental music learning has previously been delved into and sifted through various knowings, most noticeably socio-cultural perspectives that inform understandings of individual, interpersonal, and collective learning (Rogoff, 2003; Wertsch, 2008). Teacher work is emotional, somatic, and personal (O'Connor, 2008). It is shaped by often uninspected held perceptions, beliefs, and assumptions about teaching that are formed by professional, educational, and personal experiences across a lifetime (Bukor, 2011). Teachers teach and student-teacher relationships may evolve and endure, building inclusive ecologies that engage others in expanding relational arrays. Sometimes relationships dissolve and perish. Relationships may be characterized by continuities and interruptions, built shared histories, interactions and changing understandings. All these elements impact the reciprocities of instrumental teaching and learning which are lived through the body (de Bruin, 2018b). Our teachers told us that our instrument becomes a part of us that is mobile, animate, and responsive. Merleau-Ponty (1945/2012), p. 213) gave primacy to the body through which we perceive, discover and know. Sheets-Johnstone (2020) extended this primacy to the moving body which is doing what is needed. The embodied instrument-learning self can be a site of multiple ways of engaging, including growth, resistance, and subterfuge.

We, a trumpet player and a clarinet player offer curated reminiscences of our music learning experiences to capture the spontaneous somatic "to and fro" of play, teacher action, reaction and response. We approach this from a post-qualitative stance that "nurses bubbling curiosities and yearnings which it aspires to explore and negotiate in an unprecedented manner" (Singh et al., 2021, p. 2). We embrace the entanglements of self (the auto of autoethnography) as subject, as subjective reviewer and as post-qualitative collaborators "with each intra-action, the manifold of entangled relations is reconfigured" (Barad, 2007, pp. 393–394). In creating these vignettes, we critically reflect on our beliefs, assumptions, personal experiences, educational understandings, and knowledges which have impacted on our practices as musicians and teachers. We consider personal reflection and reaction, considering all these factors as we engage with a discursive practice. In this, the words we choose capture emotions and their embodiment, becoming themselves part of our negotiated reality (Zembylas, 2005). As perceiving people, we each hold a "historical thickness" (Merleau-Ponty, 1945/2012, p. 248). Through self-reflection we investigate and focus our "analytic attention to an array of material-discursive forces through which bodies realise their capacities to act, connect, move (or become stuck, fixed, rigid)" (Fullagar and Taylor, 2021, p. 38). We hope to find within our thick and layered experiences, understandings of the better teacher we hope to become. What we find are things that could have been better, moments we have held onto for decades that colored how we grew as music learners.

Initially as learners, then teachers, then researchers, teacher educators and academics in music education, we have lived the entanglement of becoming throughout our careers, and we continue to do so. We disconnect ourselves through the ontology of the nature of our reality progressing through these prisms of profound learning events in our lives. Through short, curated vignettes that offer snapshots of past instrumental learning, we unfurl our processual philosophy of becoming through these events in our lives, each of us providing reflection, re-reflection and meaning-making through each other's perspectives through these incidents. Our conversation flows between story-teller and critical friend, engaging with our reminiscences so as to create an assemblage of understandings, questioning of our attachments, and an introspective yet reflexive realism as a guide to inquiry that provides portentous narratives for music teachers of the future. One recounted memory draws forth resonant cascades from both the teller and the hearer. Although taking different paths, we find that we share small outrages, frustrations, and triumphs. What follows are a shared gathering of curated memories connected by bi-constructed understandings of events and slowly burning realizations, epiphanies that lead to aspirational journeys to becoming better/best. We begin with our first moments and memories of instrumental learning.

First moments in music-learning

> *I brought my first attempt at writing music, shortly after beginning to learn the trumpet—a carefully scribed rendition of "Mack the Knife" that I heard off the radio, and that my father played repeatedly on his piano accordion, until I had it. Lesson time at school came, and I eagerly showed the teacher my creation—"What is this? That's not how you write it, that's all wrong" (Leon).*

Returning to that day, I (Leon) had offered my teacher the product of my cherished music-making with my father. I recall my teacher's response as being an affront, a shock to my senses as I balanced my internal feelings of effort, collaboration,

pride, and accomplishment, with the denigrating negativity felt from the teacher's comment. I feel the anguish then as now, as my shared father and son creativity was smashed and ridiculed. I now sense the passionate teacher not wanting his student to stray, to "play the exercises over and over" and "maintain a steady tone." I sense two worlds disconnected, yet each seeking to assist to develop learning and a love of music-making with others. I feel a relational disjunction between the teachers' words chosen, and what he may have intended to say or correct; a leap back into the realms of empathy, insightfulness, and intuitive guidance rather than bombastic humiliating directive.

The need to be right and to be in charge drives many teachers. We share stories between ourselves that repeatedly speak of rigidity and control, of feeling powerless in the relationship. Our teachers knew they were the rule for right learning and playing. As their students we transgressed their imaginings of us, thus our cognitive and somatic musicking (Small, 1998) was wrong and they were right. We had to be fitted into the mold of "student" not fellow musicker. We were not required to think for ourselves, just comply with the unspoken pattern held in our teachers' heads, a pattern often beyond our ability to grasp.

First experiences with a new teacher

> *I was first in the state for the clarinet exams. I changed teachers, moving to the best teacher at the university. He wrote the book on scales (literally). He discovered that I couldn't play scales without the book before me. Every week he set more and more scales. Every week I practiced but couldn't commit to memory. He would take the book away and they would fade from my memory both in my mind and under my fingers. I could play Mozart, but I couldn't memorise scales. I tried to make myself but the harder I tried, the more elusive, they became. My inability seemed to be a personal challenge to him. He stopped me playing pieces until I could play the scales. Eventually my mother rang him and said, she is about to give up the clarinet. Finally, after a year, we stopped trying to make me do what I apparently couldn't. With reflection, I can play scales if they make musical sense to me. I like scale passages. I just cannot remember them in what to me is non-musical isolation. The book of scales nearly broke me (Jane).*

This battle between teacher and student situated both of us in crenelated bastions. Teacher unable to back down and student unable and unwilling to do what he demanded. He was Teacher (with a capital T), an unassailable expert who knew more than me and to whom I (Jane) must make obeisance. I was student (no capital S) who must be shaped to fit the mold. After a year we reached breaking point. One of us would break or we could negotiate a different way of being.

Shared memories and understandings

We began with our first wonderments—what is the better music educator that we would be? There is an implicit criticism in our retrospection. We both remember repeated mantras, "get it under your fingers" (as if the body was a separate thing to be controlled), we were taught to "start at page one and keep going," we were faced with technical studies to be played "10 times without a mistake and then do it 10 times again, faster," and we were exhorted to "think creatively" but given no steps to follow, just the threat of critique. Instrumental music learning exists in a complex ecological web that begins within the body (we are repeatedly told "the instrument is an extension of your body"), and advances to the relational—those we musick with in every sense (Small, 1998). This constant and iterative experience of the merging of musician and musical instrument becomes an enabling attunement "of the extended body to the musical environment [that] enables the musician to freely and expressively communicate [their] artistic intentions on the basis of the corporeal articulation of the moving sonic forms" (Nijs et al., 2009).

We construct and curate our vignettes to reflect the patterns of activity that were emblematic of what occurred during both formal and informal learning episodes. Written vignettes capture remembered crystallized images (or short videos in our minds) usually of a short duration, that are representative of typical events (Miles and Hubermann, 1994). Our curated vignettes are often vivid or even heightened reflections of the "sights and sounds" of typical occurrences (Erickson, 1986). In these, we perceive entrenched pedagogical approaches which we critique through the receptiveness and responsiveness of the post-qualitative (Gerrard et al., 2017).

In this study we seek to trouble "visibility and hold up blind spots as productive sites toward the risk of a new relationality" (Berlant in Davis and Sarlin, 2008, p. 642). This approach to research values "identifying and explicating the connections that enable understandings always to be more expansive than the identities or events they are seeking to explain" (Bhambra, 2014, p. 156). In negotiating between experience, critique, and reflection, we act responsively in the moment, our movement of thought embracing the dualities of the singular and collective, past, and present. We continue our becomings to reflect on our own teachers and our own learning.

Becoming our own teachers

Over time, as learners moving from apprentice to journeyman, we took matters into our own hands, pacifying and to some degree deceiving teachers to give ourselves space to become better. It would

have been preferable that we could do this with our teachers, not despite them. Jane offers a memory of resistance:

> *Why is it that a new teacher finds fault with the old teacher's influence and goes "back to basics" to replace technique? I could play quite well. Nobody noticed my odd tonguing until when asked, I explained. Shock! Horror! It is all wrong. We must go back and start again—long slow notes with deliberate, different, awkward feeling tonguing. Eventually my playing was deemed acceptable. Funny thing was, I never changed, I just pretended to because 10 years' technique could not be undone and personally, it served me well. I could see no need to change. (Jane).*

I (Jane) recount the all too familiar trope of stripped back and rebuilt technique—so many musicians have told me similar stories—possibly a reflection of the first idea that the teacher knows what is correct and nothing else will do. But in this story is also my growing ego and confidence—I chose not to do what I could not (rather like the scales) but this time, it was not an external battle of wills, rather a play of subterfuge. My technique remained; as did my non-acquiescent self. I note my growing confidence in believing that I knew what worked for me. I must have been annoying to teach to someone who thought they knew better.

Leon too found teachers unhelpful:

> *One year I had three different teachers in the one year, each with their own peculiarity to describing breathing. . ."breathe through your diaphragm, it's here below your lungs" (remonstrating furiously), "take in air like you are yawwwwwning–cold air in hot air out, come on, breathe!" "breathe to the bottom of your toes. . . all the way down. . ." A year of uninspired analogies led me no closer to breathing "correctly" which I discovered for myself some years later (Leon).*

I (Leon) questioned what I was doing all the time, rarely being "at one" with playing music but intent on directing attention to the physical sensations that I was meant to be feeling if I was doing "it" correctly. Sensations from the top of my body, and then the very opposite as I strived to iterate the "right" way of doing things. I placated a procession of teachers, leaving lessons all the more confused by their highly colorful yet clouded metaphorical descriptions of breathing. Actually, playing music with better musicians, listening to their sound (rather than their words) and watching their body provided the insights I needed to facilitate my own embodied sensating of an effective approach to improving.

Shared reflections

A post-structural critique allows us to "dig deeply . . . and make the intelligible appear against a background of emptiness . . . to make a truly unavoidable challenge of the question: What can be played?" (Foucault, 1997/1981, pp. 139–140). It allows us to interrogate what may be taken for granted and offer a better and more enlightened path to teacher fulfillment. Our questioning of what is, or what becomes good teaching is transacted through our crystallized memories and critical reflections about our experiences. We relish the conversation, savoring the moments of camaraderie and sympathy, but then wondering what we learnt (or did not learn). These provide weights and measures as to what may be best in terms of the musical occurrences and the intra-active knowingness between teacher and student. In critiquing these, we maintain a "civil disobedience" derived from our constituted experience (Rajchman, 1985, p. 6). Oscillating between remembered incidents, our reactions then and now, we attempt to free ourselves, and in so doing find freer and more thoughtful teaching pedagogy, approaches, and philosophy for teaching.

St. Pierre (2014) makes the point that much post-structural qualitative work resides in theories posited that are then attached to descriptions and treatments of unique and idiosyncratic voices. We have taken heed of this by applying both an interpretivist and analytical voice to each of our captured memories. The overriding supposition we carry throughout our curated memories and surrounding writing is that of intent, reception, and "better"—by better we imply in the teaching and learning of music, that which is done with passion, care, empathy, and enthusiasm. We have become our own litmus test of better. We easily find stories of hurdles and interruptions. It is telling that we find ourselves working to recall the best. Having found them we try to imagine future selves as best (or at least better).

Ultimately, we found other teachers—sometimes others who did not even know they were teaching us and ourselves. It was not always our single teacher but sometimes it could be a host of teachers who both taught us (knowingly or not) technique and how to be.

Becoming journeymen

Gradually we moved inside the walls of professional playing, often encountering both gate keepers and guides along the way. Leon captured an experience of the dualism of becoming insider while still feeling outsider,

> *"You must always watch the conductor"! said our ex-military bandsmen director in a stern but calm manner. The*

> *award-winning symphonic wind was going through its paces, preparing for triumph at the forthcoming Bands Festival. We rehearsed as darts and flashes of collective and soloistic brilliance flashed about. A sudden pause—a missed cue by an overzealous young musician (not me). . . "I've killed a man for less than that" muttered the army colleague sitting beside me in the trumpet section (Leon).*

We rehearsed, and then we rehearsed again, polishing the remaining jagged bits until they were silky and gleaming. All 60 of us, attuned, willing each other to get it right as our conductor sternly waved his hands around. We were just happy to be there, reveling in the sounds we made, the individual moments of brilliance but also the collective, collaborative sense of community. The comment jarred and reverberated within me as I (Leon) tried to make sense of it—the gravity implied that was intended to shock and agitate for compliance and agreeance but also a disconnect between its implied military sentiment and the situated learning environment we were actually working in. I felt a detachment between the leaders, the gatekeepers of this community, and how we were meant to act and feel within the community. At the same time, I felt that by being allowed to hear this comment about someone else, I had been accepted.

Sometimes this progression to insider is afforded by a mentor who lights the way. Jane describes encountering just one such:

> *I was dragooned into playing clarinet in the pit band for the university review in second year of my music degree. I was an expert sight-reader who, with enough "dots" could play most things. In the band led by my friend Ben (an expert jazz saxophonist and not his real name) there were no dots, just "lead sheets" and I was adrift. Ben first wrote in the notes of the chords and said, "use these on the strong beats and play around between." This was a lifeline to which I clung, but we never struck out from the shore. After the show, the band hung around jamming. I longed to join but didn't know how. Ben said, "when you hear a note no-one else is playing, that is your note." Finally, I heard that Cheshire cat of a note, grinning at me and I grabbed it. I found the next note and the next. Without Ben's lead, I would never have begun (Jane).*

Ben opened the door for me (Jane)—he was my guide and teacher who offered no correction, no one way of being, but rather he gave me stepping-stones to a beginning, a way into a community of musickers I wanted to join. His were the casual words of a best teacher that I have held close.

We continue to share memories between ourselves. As we each moved from apprentice to journeyman, we began teaching others—a familiar pathway for many instrumental musicians. We began to observe ourselves and others, thinking, if I were teaching, I would do things differently, I would attend to the person before me, not to the stereotype held in the mind unseeing. Leon spoke of this:

> *The trumpet teacher compiled a 30-minute routine that all students had to do daily without variation, developing tone, endurance, and volume. Whilst an initially satisfying task, enhanced by a brotherhood of others within the trumpet stable, most found it gruelling and ultimately stultifying. It left me wondering how I could more mindfully organise my practice fulfilling my goals that supplemented my aspirations, and not my teachers. The next teacher was a past student which ensured the same thing—achieving a rolling stasis of established rote routine. When by myself, I studied method and technique books looking for something more. Gradually, I found a trove of texts that enlightened me; offered other ways of learning, and of considering the challenges faced by others (Leon).*

I (Leon) recall religiously attending to practice but feeling unrewarded and unimproved by the process. I gathered as many different books as I could thinking about the range of technical problems students could possibly have, and ways to approach providing development and strengthening of technique. I saw the failings of an unchanging, prescribed approach and considered a lens of understanding that took a personalized and differentiated way of helping a student. I became adamant that this was a quality needed for impactful and sustained teaching and guidance of a student. I was transitioning to teacher while still evolving as a musician.

Ultimately, we both become our own best teacher; we do for others what we needed others to do for us. The sudden revelation that meant something to the musician in the making was so rare that it sits enshrined in our sense of evolving self. That best teacher of ourself becomes the model for the better teacher of others. We teach what we would have liked. Leon recounted another experience,

> *Performing overseas, I met with a trumpeter-educator. We shared our performing experiences, tastes, as well as experiences in education. He realised I was a qualified teacher who could actually play, and that liked teaching. He implored me to consider what my calling in life was- which area could I make the biggest impact. For the first time I contemplated teaching as a career (Leon).*

This was a serendipitous moment in my life (Leon) when the "fallback" of being a teacher to supplement my professional performance collided with the beginnings of identity work as placing my efforts, desires, and aspirations into teaching others. In this moment, a teacher can be a fellow traveler who offered a lesson that I was ready to accept; temporality—there are times we can hear things and other times we can't. My heart and mind were ready to hear that message and it set a train of events that was to drive me to establishing music departments, teaching hundreds, and eventually being a teacher in initial teacher education.

Hindsight and realization

There becomes a point where we are more than students and when our teachers become more that our teachers. The scales once weighted unequally begin to balance. Those who were our teachers become colleagues and fellow musickers—we have moved to be with them on the inside looking out. We see before us the students we once were. We seek to afford them what we wanted for ourselves. We acknowledge that there are things that must be taught. There are masterworks to conquer, technical exercises to attain, and skills to acquire, perfect and then take further. We learn from self and others, we set our own routines, we meet our own expectations and sometimes we fail. We make music by ourselves and with others. We form connections social and musical that are stable and fluid. We explore other musicks, consolidating and expanding what we know ourselves capable of being. The instrument has become us, no longer an "extension," it is us. We are part of an ecological web of musicking and we traverse these rhizomatic connections predictably and surprisingly.

An ecological perspective recognizes the intricate connectivities and contexts where-in and when-in instrumental musical-social networks may evolve and grow as "music is in essence a social medium predominantly experienced in social, interactive and mediated settings" (De Bruyn, 2012, p. 17). We have interrogated distilled moments of social and musical interactions that promote, inspire, motivate, reward, and afford meaning from experiences that at times in our musical upbringing did quite the opposite. Turning backwards to our student selves, and then forwards to our current stance of teacher and teacher educator, we acknowledge successes as learners derived from senses of satisfaction and equilibrium through immersive and entrancing experiences with our learning environments, whether because of teachers, or in spite of them.

Such empirical research on music education forefronts self-regulation, motivation, self-efficacy, and similar constructs as significant ways of understanding music education (Perry et al., 2018). These atomistic understandings discount the interpersonal and relational aspects inherent in teaching and learning events that promote enjoyment, engagement, and enduring curiosity in learning music. We believe that there are attributes to which we aspire in our quest to be the better teacher in every sphere of our engagement. We utilize experience and wisdom gained from teaching. We realize that the actual experience of music is not necessarily driven solely by structural objectives or propositional-representational orders of mental activity that allow them to be schematized. Rather, "it is the holistic experience, the shifting relationships, and affective-emotional contours that we attend to" that mark the teaching experience for us (Schiavio and van der Schyff, 2016, p. 371).

We seek what we would have liked to find as we were pulled, prodded, pushed, shattered, reconstructed, and rearranged on our quest to acquire expertise as performer and hopefully musician. We wanted to be seen, to be heard and to be respected. Although this is not what we always found, we did find moments that fueled our journey. We now think ourselves no longer apprentices, sometimes still journeymen, and we hope to create our masterworks in the ways that we foster and inculcate the next generation of learners. We think ourselves better teachers but never anticipate becoming best. Becoming is a constant turn, a rhizomatic exploration of possibilities, and pursuit of what we might be (Deleuze and Guattari, 2004).

Trying to capture what we hope to become

The better teacher is many things that we circle round, hovering with hope that this is what we as students encounter and critiquing ourselves that these attributes are what we become. We have recounted things that repelled and drove the apprentice from the chosen path, sometimes demanding that students forge their own paths in abeyance of their teacher. We share attributes that we wish to be as learners and teachers, acknowledging the musical and dialogic space that is built as we learn our craft. We offer these attributes in no particular order, as we shift between them constantly in our practice. Teachers are not just the holders and gatekeepers of required knowledge, they should have the skills and wherewithal to bestow this knowledge in impactful ways (Ardelt, 2004).

A good teacher is respectful of each student's qualities and needs, and that these will evolve over time. Teachers should have the capacity to grasp the essence of a student's personal learning trajectory (whether articulated or enacted) and enter into it with understanding and respect. A good teacher acknowledges learning about the student through multiple means and is able to come to "know well who the student is in front of them today and in so doing create what the student might achieve in the future" (de Bruin, 2021, p. 11). We acknowledge the temporality of learning episodes and opportunities—both student and teacher change, and assumptions should not be made. A good teacher gives respect for progress made and work accomplished, seeing both process and product as valuable learning opportunities. They understand the learning journey of each student and how it may be different across a bevy of students. They celebrate both small and large moments of musicking.

A good teacher doesn't make comparisons between their students (particularly not aloud) as they realize such comparisons gain no traction and may actually harm student sense of capacity and self-worth. The good teacher can recognize and interpret learning in diverse ways and differentiate ways of learning, and of demonstrating this through process and performance. A good teacher is not an autocrat or a tyrant

who makes you cry by the end of the lesson. They don't prod or pull their students to fit their procrustean frame of technique. Good teachers are not just adept at how knowledge and skill is transmitted, but in the "qualifying senses of sustained affinity and confluence between teacher and student that promotes effective and more enriching learning" (de Bruin, 2021, p. 4). A good teacher listens and entrains positive and supportive feelings and connection. They can promote spoken, embodied and musical respondings to discoveries, epiphanies, and joy. A good teacher sees and senses student growing awareness; perceptions, discernments, and doesn't just emphasize skill and knowledge but also growth and maturity (Halstead, 2004).

A good teacher listens with their eyes, observing embodied learning. Through embodied interactions, the better teacher offers space for the "refinement of musical expression, instrumental techniques, or other concurring factors" (Schiavio and Høffding, 2015, p. 18). A good teacher builds and utilizes an array of intra- and inter-personal strategies that enhance learning opportunities (Pedder et al., 2005). These strategies are based on experience but have been sharpened and attuned to become acts of wisdom. A good teacher is "comfortable in the situated emergence of thought and action as a phenomenon nurtured and encouraged between teacher and student" (de Bruin, 2021, p. 4).

A good teacher guides empathically becoming a companion, a fellow-musicker, and guide from apprentice to journeyman to master. An empathic teacher is aware of seeing and hearing through the senses of another; they can recognize this need, position, and evaluate their thinking and actions in responding for the now, as well as to make better the possibilities and feelings toward improved learning. A good teacher has the capacity to understand through observation and interaction, thinking in and of/upon actions that promote a developing functional relationship. They utilize a reciprocity that invites an empathic "knowing each other's minds" (Bruner, 1996, p. 12) and ways of musicking. This functionality is built upon social and collaborative foundations that are not just musical (Dillon, 2009).

A good teacher creates a dynamic space that feeds the dyadic teacher-student relationship. They understand that "the interpersonal relationship acts as a conduit through which the teacher identifies and personalizes processes involved in a task to make them visible, understood and achievable" (de Bruin, 2021, p. 12). Teaching is more than just passing information, skill, and know-how, it is the in the moment calibration, an improvisatory feat of finding calm communion and confluence between at times very different people. Sennett suggests that "we frequently don't understand what's passing in the heart and minds of people with whom we have to work" (Sennett, 2012, p. 274). Teaching within the one to one music lesson offers an exciting, exhilarating environment where these marvelous qualities can come together to produce even more wonderous music. The music lesson will always be a site that nurses bubbling curiosities and yearnings, explorations and negotiations by both teacher and learner.

A good teacher allows agency by nurturing ability and aspiration, guiding the learner from apprentice to journeyman to aspired master. Better teachers have the capacity for dialogue and multiple perspectives to a solution. They provide a learning space and place that allows students to feel safe to engage in being who they are as nascent and evolving musickers and they permit themselves the same possibility and freedom. It should be possible for teachers to act and talk in ways that provide spaces to foster and support increasing independence in their students, even in the constrained traditions of the nineteenth century conservatoire where teacher is master and student is indentured apprentice (Gaunt, 2010), and deviations from established guidelines are rarely tolerated (Moore, 1992).

The journey to aspirational best

The journey is a series of turns, often around corners of uncertainty that open new ways of being and becoming. It never ends and we return to where we began, hoping that we have captured the complexities of becoming the better teacher. Through our own histories of learning, then teaching, we realize that as teachers we try to be what we sought but rarely found. We shape our praxis as educators in trying to match the ideal best that we can never quite grasp. We know we are better. We are responsive, empathic, generous, allowing agency, and individuality (at least that is what we hope we are). We constantly seek to imbue this in all modes of our engagements in teaching and learning spaces, allowing curiosities and explorations (we would never announce something to be baldly wrong), we hope we never seek to control and break, rather we provide space and provocation for reflection and growth.

As pondering individuals, we question how we both were dragged and pummeled through the acquisition of instrumental expertise. We extend this to encompass our evolution as teachers and then teachers of others. We draw on Kuby and Christ (2019) as we consider the "entanglement of us. We are not I as teachers; we are we already-always entangled with our students and the non-human materials. . . we are entangled in/as/becoming us" (p. 967). We are no longer solely a trumpeter and a clarinetist. We are performers and we are teachers who select from what we were given, and craft our practice shaped by embodied being, feeling and thinking. As we began, we continue, remaining works in progress—becoming is not finite but lasts a lifetime. We aspire that our becoming had taken us to better—we will never achieve "best." We hope that this is what we ultimately give our students, the notion of the aspirational best music

educator and that the realization that this will always be just out of reach.

Data availability statement

The datasets presented in this article are the result of distilled essences and reflection of the authors' learning journeys. Queries should be directed to the corresponding author.

Author contributions

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

Conflict of interest

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

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Toward a meaningful technology for instrumental music education: Teachers' voice

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In musical instrument training, researchers have gradually started exploring the potential of interactive technologies supporting learning processes and teaching methods. Although numerous technological tools have been proposed to enhance instrument learning and teaching, these methods rarely find their way into daily practice and teaching routines. In this study, we report data from an online survey study administered to violin and drum kit teachers. Results reveal distinct learning profiles of novice violin and drum kit students and exhibit a variety of teaching approaches toward adults and children. Furthermore, they provide more insight into teachers' opinions on the use of virtual reality (VR) and smart wearable technologies in early instrumental training, as well as their attitudes regarding technology design. Overall, our findings highlight the importance of involving teachers in the initial stages of technology design to facilitate technology acceptance and adoption, prevent potential mismatches between requirements regarding technological functionality and actual user needs, and promote musical growth and skill acquisition.

KEYWORDS

music education, musical instrument training, technology, learning, virtual reality, wearable device, teaching approach, technology acceptance

Introduction

Learning to play a musical instrument consists of an intensive process entailing skill acquisition as well as instrumental, technical, conceptual and artistic development (Ericsson, 1997, 2003). Over years of practice, learners develop goal-oriented and self-regulatory practice strategies (Platz et al., 2014; Hallam et al., 2018) to master precise spatiotemporal control of limb coordination (Schoonderwaldt and Demoucron, 2009;

Mutio et al., 2017) and acquire the freedom to express themselves musically (Ericsson, 1997, 2003). It requires a substantial amount of self-determination, discipline and motivation from students to stay engaged in music practice in the long term (Upitis et al., 2017; Colwell et al., 2018). Nevertheless, learning to play an instrument is rarely a solitary endeavor, as it is embedded in dynamic social networks/contexts where interactions with teachers, caregivers and peers have the power to shape one's teaching and learning experience (Creech and Hallam, 2011, 2017; Nielsen and Johansen, 2021; Zdzinski, 2021).

Therefore, during music training, students usually follow regular one-to-one classes with a qualified teacher, followed by periods of self-study (Creech and Gaunt, 2012; Gaunt et al., 2021). During these courses, teachers tend to adapt their teaching strategies according to specific aspects of the student's profile (e.g., age, years of experience, cognitive and motor abilities), learning goals (e.g., learning a tune, specific sound effect and technique) or the studio environment (Bauer, 2020; Schiavio et al., 2020). These strategies are often based on a master-apprentice model (Folkestad, 2006; Calvert, 2014; Schiavio et al., 2020). Despite key achievements (e.g., high music performance standards, rich repertoire and extensive instructional material), this educational approach is also prone to critique in the light of recent pedagogical insights. Studies have shown that the master-apprentice model is often characterized by a teacher-centered approach with a focus on technique in order to support reproductive imitation, corrected mainly by verbal feedback, aural modeling and physical guidance (see McPherson and Welch, 2012; Daniel and Parkes, 2015). A potentially problematic aspect of such conventional ways of teaching is their proneness to ambiguous interpretation and delayed feedback (Welch et al., 2005; Hoppe et al., 2006; Howard et al., 2007). Welch et al. (2005) describe the traditional instrumental or singing lesson as a process where the teacher produces a prototypical performance, which is followed by the student's attempt to replicate the performance. Subsequently, the teacher evaluates the student's performance, after which he/she tries to improve his/her performance based on the provided feedback. A potential pitfall of this procedure is identified by Welch et al. (2005), Howard et al. (2007), referring to a dual misinterpretation of information. For instance, on the one hand, by describing musical gestures through speech, a teacher might fail to accurately describe the student's performance, while on the other, the student, who subsequently aims to translate the administered verbal and visual feedback into an adapted performance, may fail to correctly interpret the teacher's cues (Welch et al., 2005; Howard et al., 2007). Indeed, verbal instruction, physical guidance and movement imitation provide at best a rough approximation of the target movement and may easily lead to misinterpretation (Grindlay, 2008; van der Linden et al., 2010), especially when we also consider that every teacher uses his/her idiosyncratic pedagogic vocabulary while teaching (Howard et al., 2007). Another drawback of this way of working is delayed feedback, as the evaluation of the performance is often provided *a posteriori* (Welch, 1985; Welch et al., 1989). As a result, the critical learning period is mainly distributed over two points in time, i.e., the *post hoc* feedback stage and the performative response (Hoppe et al., 2006).

An increasingly popular way to deal with such issues involves the use of digital monitoring applications, using sensing technologies such as *motion capture* (e.g., Volta and Volpe, 2019; D'Amato et al., 2020), *optical sensors* (e.g., Pardue, 2017; Provenzale et al., 2021), *infrared depth camera* (e.g., Vamvakousis et al., 2018) and *audio information retrieval techniques* (e.g., Schoonderwaldt and Demoucron, 2009; Perez Carrillo and Wanderley, 2012). These digital monitoring applications instantly process players' movement patterns and provide them with immediate feedback on, for instance, errors regarding posture, sound quality, melody or rhythm (Blanco et al., 2021; Bobbe et al., 2021). Indeed, the advent of such technologies inspired a growing belief in the potential of technological tools to enhance teaching and learning quality and spur further educational developments (Savage, 2007). New technologies are assumed to help overcome the above-mentioned limitations of the traditional master-apprentice approach (Grindlay, 2008; van der Linden et al., 2009). For example, wearables (i.e., any kind of electronic device designed to be worn on the user's body) may complement, or even supersede, the appraisal of the teacher by providing more objective, and thus less ambiguous, feedback in real-time (vs. *a posteriori*) based on the quantification of sound and movement (Blanco et al., 2021). Examples of such applications are, for instance: *MusicJacket*, a wearable system that tracks the movements of the player and provides vibrotactile feedback whenever he/she deviates from a target trajectory (van der Linden et al., 2011); *Haptic Guidance System apparatus* (HAGUS), which targets the ideal rendition of wrist movements while drumming (Grindlay, 2008); *HapTune*, a system for string instruments providing vibrotactile feedback to support pitch note playing (Yoo and Choi, 2017); and *POSTRUM*, a wearable system for trumpet players applying real-time haptic feedback to improve posture (Dalgleish and Spencer, 2014).

One of the most recent technological developments regarding music training is the introduction of Virtual Reality (VR). For instance, *Virtual Reality Exposure Training for Musicians* is a VR application developed to tackle performance anxiety (Bissonnette et al., 2015), while *DrumBeats VR* (Eissens and VRROOM Ultimate VR Experiences BV, 2019), *Garage Drummer VR* (Blazing Tree Studio, 2016) and *Paradiddle* (Tanirgan, 2017) are commercially available drumming apps, simulating different drum kit setups and environments, and supporting the transfer of newly acquired skills to a real drum kit.

Notwithstanding the potential of such applications, so far, they rarely seem to find their way into daily study practices

and didactic strategies (Bobbe et al., 2021). This adoption gap has been associated with several factors. According to Mroziak and Bowman (2016), teachers are often not trained to use these technologies. This lack of training and experience with regard to technology use was especially noticeable during the lockdown prompted by the COVID-19 pandemic, which forced music instrument tutors to teach remotely and adjust their typical training strategies to entirely new contexts (Calderón-Garrido et al., 2019; De Bruin, 2021; Onderdijk et al., 2021; Schiavio et al., 2021). Bauer (2014) argues that it is not sufficient to show teachers how technology works, rather, they should be made aware of the affordances these technologies might have for their further teaching careers. Therefore, he proposed the *Technological, Pedagogical and Content Knowledge framework* (TPACK) that considers how technological, pedagogical and content knowledge dynamically interact, creating a knowledge intersection (Bauer, 2014; Hilton, 2016). Together with another methodological tool, the *Substitution Augmentation Modification Redefinition* (SAMR) model, TPACK might allow educators to discover how to optimally integrate technology in the studio in order to improve instruction (Puentedura, 2013; Hilton, 2016).

Another potential argument for the adoption gap refers to the general dominance of technology-driven approaches, rather than those steered by pedagogical considerations (Revelle, 2013; Leman and Nijs, 2017; Bobbe et al., 2021). For instance, the aforementioned commercially available VR applications for the drum kit generally lack physical rebound, a critical feature for mastering highly accurate motor patterns (West, 2021). As a consequence, students could pick up erroneous movement patterns when using such apps. Arguably, the overall inadequacy to sufficiently meet pedagogical requirements could be related to the fact that end-user involvement commonly only occurs at the later stages of the technology development cycle (van der Linden et al., 2011; Bobbe et al., 2021). Moreover, social dynamics of the learning and teaching context are often not considered.

Research on motivation and dropout prevention in music education suggests that parental support as well as the relationship between the teacher, caregivers and child are pivotal to engage students in regular and long-term music practice (Davidson et al., 1996; Zdzinski, 2021). For instance, assistance and positive reinforcement from teachers and caregivers have been shown to boost students' engagement with their instruments and to significantly impact learning outcomes (Creech and Hallam, 2011, Goodway et al., 2019; Zdzinski, 2021). Nevertheless, many of the educational applications for novice students (who may be minors or adults) are developed to be used during a self-study period, even though the students do not have appropriate schemata to evaluate their progress and assess their errors (McPherson and Renwick, 2001; Hallam et al., 2012). At the same time, applications providing feedback during a self-study period might hinder the development of students' self-efficacy–a powerful factor for predicting long-term engagement in music training–as students might rely too extensively on the monitoring functions of the device (Upitis et al., 2017; Krause and Davidson, 2018). Moreover, many of these educational applications implement visual feedback (Welch et al., 2005; Blanco et al., 2021). Callaghan et al. (2004), Wilson et al. (2005) suggest that visual feedback is often hard to interpret for novices, possibly due to an overabundance of provided information. Hence, the tutor's guidance is key, especially for novice students, as it reinforces learning strategy advancements, supporting developments in aural, cognitive, motor, technical and musical communication and performing skills (Creech, 2012). Furthermore, previous work on technology adoption suggests that especially teachers' assessments of the usefulness of the technology, their attitudes toward its use and their technological self-efficacy directly impact their overall willingness to employ the tool, while perceived ease of use, technological complexity and facilitating conditions are shown to generate more indirect effects (Teo, 2009; Teo and Bahçekapili, 2012). Considering the above, it is rather surprising that teachers are often not fully involved from the earliest stages of technology development.

In our view, to achieve successful technology adoption, a participatory design should be implemented, encompassing intense interaction between developers and educators from the very beginning of product development. This idea is in line with the concept of user-centered design, where, rather than the functionalities of the technology itself, the needs of its prospective users are taken as a starting point (Revelle, 2013; Bobbe et al., 2021). In instrumental music training, such requirements may involve awareness of developmental needs, abilities and challenges of students in various age groups; an understanding of training strategies, needs and challenges of teachers; as well as an understanding of the interaction dynamics between students, caregivers and teachers. Hence, this study aims to obtain a more elaborate understanding of music teachers' attitudes toward technology adaptation, potentially fueling further developments in technology design and implementation for music training.

This study is part of a larger project, CONnected through ROBotS (CONBOTS), which focuses on the development of an innovative modular robotic platform facilitating musical instrument training. By implementing bi-directional haptic communication between two users (human-human or human-robot) and AR/VR-based applications, the platform aims to improve the efficiency of the training in order to enhance sensorimotor skill acquisition of novice violin and drum kit students. As this bears upon the core of musical instrument teaching and learning, we aim to position teachers at the very center of the discourse. Using an online survey administered to violin and drum kit teachers, we examined the profiles of violin and drum kit students and teachers. We collected teachers' descriptions of typical learning challenges encountered while training novice students. We also examined their opinions

toward the use of technology in the studio and ideas regarding technology design. Overall, by exploring key aspects of music training as well as physical and cognitive features of user profiles, suggestions are provided for developers and other stakeholders on how to more optimally meet the needs of the foreseen end-users of technological tools and applications for musical instrument training. An improved understanding of these matters could support the prevention of potential mismatches between requirements regarding technological functionality and actual user needs. Moreover, it could facilitate technology acceptance and adoption as well as promote students' skill acquisition and musical growth.

Materials and methods

Survey design

The design of survey items was based on exploratory interviews with two violin teachers, two drum kit teachers and two technology developers, which were further revised by experts in music education, musicology and technology development. The survey (see **Supplementary material**) included multiple-choice questions, open-ended questions and Likert scales. It also included a written description of the terms "VR technology" and "wearable devices for postural support." We used a mixed-methods approach in order to investigate learning profiles of novice violin and drum kit students, teachers' descriptions of typical learning challenges encountered while teaching novice students, and their opinions toward the use of technology in the studio. The survey consisted of the following sections and content:

General information: demographics; overall teaching experience.

Violin/drum kit teaching experience: beginner students' profiles; differences between adult and child beginners; teaching materials and first lesson scenarios; use of wearables/postural support; attitudes toward postural support devices; suggestions for teaching device design.

Virtual reality experience: previous VR experience; current VR knowledge; views on the application of VR in music education.

Data collection

Data were collected using an online survey administered in Microsoft Forms and distributed from 26 November 2020 until 5 January 2021. Violin and drum kit teachers from different countries were recruited using purposive sampling (Williamon et al., 2021), in order to capture a diverse cross-section of teaching methods, music education systems, and to compensate for potential gender imbalances. Teaching strategies between violin and drum kit tutors might vary substantially as the violin is predominantly associated with a more classical music repertoire, whereas the drum kit is commonly associated with more modern and improvised music, involving specific styles such as jazz, pop and rock (Zhu et al., 2004; Brennan, 2021). Moreover, violin pedagogy started to be systematized and well documented from the eighteenth century onwards (see Mozart, 1756; Baillot and Kreutzer, 1802; Spohr, 1832; Auer, 1921), whereas drum kit training is largely excluded as a requirement in the collegiate percussion studio (Pickering, 2020; Smith and Davis, 2022). Also, music education systems are found to vary substantially between countries in terms of the intensity of weekly individual instrument and ensemble lessons (Hofstede, 1983, 2011). Furthermore, regardless of musical style, significantly more females were shown to play the violin, while drummers were more often of the male gender (Harrison and O'Neill, 2000; Suki, 2011; Wrape et al., 2016).

Teachers were recruited through a range of online channels, such as mailing lists, music school websites and targeted social media. Participation was voluntary and respondents were informed about the goal of the survey in the preface of the questionnaire. All responses were anonymous, participants could not be identified from the material and all procedures were approved by the ethical committee of the authors' institution. Only one submission per participant was allowed. Respondents were able to fill out the survey in Dutch, Polish or English and were informed that it would take approximately 20 mins to complete. Only fully completed surveys were considered and no financial compensation was provided. In total, $N = 73$ valid responses were recorded.

Data analysis

Data were preprocessed using Microsoft Excel. Dutch and Polish responses were translated to English. R version 4.0.2 (R Core Team, 2020) for data analysis. All functions used were part of the base R environment. Descriptive analysis of violin and drum teachers' profiles as well as thematic analysis of open questions were performed (Braun and Clarke, 2012). The latter was performed by two researchers and was based on four predefined themes derived from existing knowledge and literature, i.e., (1) *differences between adult and child students*, (2) *challenges encountered while tutoring child novice students*, (3) *challenges encountered while tutoring adult novice students*, and (4) *teachers' attitudes toward the use of wearable devices and VR in music training.* The thematic analysis was performed as follows: one researcher analyzed and categorized the answers of the violin teachers while the other analyzed and categorized the responses of the drum kit teachers. Subsequently, researchers switched roles. The process was repeated until no further themes and categories could be interpreted from the data. As a result, a new theme emerged, i.e., (5) *differences in communication and*

TABLE 1 Teachers' demographics.

	Total $N = 73$ (100%)	Drum kit teachers $n = 32$ (43.8%)	Violin teachers $n = 41$ (56.2%)
Survey filled in . . . language			
Dutch	48 (65.8%)	22 (68.8%)	26 (63.4%)
English	11 (15.1%)	6 (18.8%)	5 (12.2%)
Polish	14 (19.2%)	4 (12.5%)	10 (24.4%)
Age			
18–25	2 (2.7%)	2 (6.3%)	–
26–35	16 (21.9%)	7 (21.9%)	9 (22%)
46–55	16 (21.9%)	5 (15.6%)	11 (26.8%)
36–45	24 (32.9%)	12 (37.5%)	12 (29.3%)
55<	15 (20.6%)	6 (18.8%)	9 (22%)
Hours of weekly tutoring			
5>	4 (5.5%)	1 (3.1%)	3 (7.3%)
5–9	6 (8.2%)	5 (15.6%)	1 (2.4%)
10–14	11 (15.1%)	5 (15.6%)	6 (14.6%)
15–19	17 (23.3%)	8 (25%)	9 (22%)
20<	35 (48%)	13 (40.6%)	22 (53.7%)
Years of experience			
0–3	2 (2.7%)	2 (6.3%)	–
4–7	8 (11%)	4 (12.5%)	4 (9.8%)
8–10	6 (8.2%)	4 (12.5%)	2 (4.9%)
11–20	26 (35.6%)	11 (34.4%)	15 (36.6%)
21–30	21 (28.8%)	8 (25%)	13 (31.7%)
31–40	10 (13.7%)	3 (9.4%)	7 (17.1%)
Student age categories			
Children			
Yes	70 (95.9%)	29 (90.6%)	41 (100%)
No	3 (4.1%)	3 (9.4%)	–
Adults			
Yes	46 (63%)	22 (68.8%)	24 (58.5%)
No	27 (37%)	10 (31.3%)	17 (41.5%)
VR use			
Yes	15 (20.6%)	8 (25%)	7 (17.1%)
No	58 (79.5%)	24 (75%)	34 (82.9%)

learning strategies between adults and children, in addition to the four predefined themes.

Results

Demographics

In total, $N = 73$ valid responses were recorded of which 43.8% ($n = 32$) of all respondents taught drum kit and 56.2% ($n = 41$) the violin. The majority filled out the survey in Dutch (65.8%, $n = 48$), 19.2% ($n = 14$) in Polish and 15.1% in English ($n = 11$). Forty-five percent ($n = 33$) were female, 52.1% ($n = 38$) were male and 2.7% ($n = 2$) preferred not to disclose. The gender distribution strongly differed between violinists and drummers (see **Table 1**), reflecting previously reported gender imbalances regarding instrument selection (Harrison and O'Neill, 2000; Suki, 2011; Wrape et al., 2016). See **Table 1** for a detailed overview.

Student profiles

Cognitive and motor differences between children and adults

The teachers in this study observed differences between novice adults and children, mainly regarding cognitive (e.g., conceptual understanding and awareness) and motor abilities (e.g., movement automation).

According to 31.3% ($n = 10$) of drum kit teachers and 29.3% ($n = 12$) of violin teachers, adults grasp concepts and objectives quicker than children. The data highlighted that, when compared to children, teachers find explaining lesson content to adults easier, as adults tend to have more musical experience and cognitive capacity. Moreover, 28.1% ($n = 9$) of drum kit teachers indicated that adults are generally more focused and display a higher understanding of the importance of working on instrumental technique. Respondents D28[1] and V43 reported that children need more guidance during the teaching process as they tend to forget the instructions more easily and are often not all too concerned with technical aspects:

> "The start is faster with an adult because he/she follows the instructions better. The child responds better to examples and repetition. A child needs more constant guidance in this regard." (D28)

> "Children repeat much more without analyzing how to do it, adults look for a scheme of action, try to control a lot with their minds. Children remember the melody with their fingers, adults remember it by recalling the notes." (V43)

Of all respondents, 12.3% ($n = 9$) stated that adults have higher self-awareness and can work more autonomously on technique than children. However, as respondent V63 noted, adults ask a lot of questions and commonly better understand how things need to be done, but at the same time are often hindered by this understanding:

1 Quotes of teachers are indicated with the letter "D" for drum kit teachers, and "V" for violin teachers, followed by the corresponding identification number from the dataset, e.g., D28 and V43.

> "[. . .] An adult can usually understand better how it has to be done, but strangely enough is often hindered by this. For example, placing a second finger high or low, learning vibrato (first large sliding movement)." (V63)

In regard to motor skill acquisition, 26% (n = 19) of teachers stated that adult novices often tend to overthink and overanalyze their movements, whereas children imitate them more immediately/intuitively and as a result tend to move more naturally:

> "Child: will do the movement much more naturally, because they work more intuitively. Adult: wants to have control over what he/she does and will try to think more about motor skills. As a result, the movements are sometimes less natural and stiffer." (D29)

> "[. . .] The adult pupil understands better what the motor movement should be but often cannot work it out properly immediately. A child thinks less about what he/she is doing but is flexible in executing motor movements." (V60)

The fact that *"the adult understands things sometimes 'too' quickly and therefore cannot follow with his motor skills"* (D68) might produce feelings of frustration and make the adult discontinue the practice:

> "Adult students get frustrated faster and will give up." (D09)

> "An adult is more likely to panic if something does not work from the first time, performance anxiety is [also] much more evident [than with children]. They also give up more quickly than children. Children try and do. If they fail, they can become nervous or annoyed but they try again and if they succeed, they forget their frustration immediately." (D24)

> "Playing the violin requires a lot of automation of movements. Because adults do understand, but the processes are not yet automated, they will feel more frustrated regarding the result after a few years." (V65)

Even though children appear to assimilate conceptual instructions slower than adults, it could be that some young students attain better motor control more quickly than adults. As this violin teacher mentioned:

> "As adults can analyze better (error analysis) they will make faster progress in the first lessons than a small child. [. . .] Playing the violin requires a lot of automation of movements. [. . .] Automation [with adult people] is also less efficient than with young people, which means that after a few years there is a turning point where children progress faster than adults." (V65)

Furthermore, 39.7% (n = 29) of teachers reported adults to be less flexible and have stiffer joints than children, whereas 20.6% (n = 15) identified that children adopt correct posture and motor skills more swiftly than adults, e.g.:

> "Children generally improve motor skills faster [than adults]. You need to give more time to an adult to master the motor skills. [. . .]" (D31)

Three respondents reported somewhat different observations. Respondents D26 and D12, for example, were more nuanced in their answers and indicated that efficient motor skill acquisition is connected to the student's level of attention and deliberate practice rather than to age.

> "If children pick it up correctly, they can automatize it quicker/faster." (D26)

> "Motor aspects depend little on age (unless younger than six and older than . . . it depends on the health state). However, it is more the intention/regularity that is decisive. For instance, the drumstick grip in young people is more 'natural' than in adult learners. Grip improvement depends on the 'specific attention' during practice but is certainly achievable for all age groups [. . .]." (D12)

Encountered challenges: Child novices

Thematic analyses of the second theme, *challenges encountered by teachers while teaching child beginner students,* suggest that violin and drum kit teachers experience similar problems while teaching young novices. The four main challenges that arose were: (1) acquisition of correct posture (mentioned fourteen times), (2) lack of concentration (mentioned twelve times), (3) lack of regular and correct practice at home (mentioned twelve times), and (4) difficulty to understand music notation and rhythmic values (mentioned seven times). To tackle these challenges, teachers proposed different solutions. For instance, for the acquisition of correct posture, they recommended general developmental exercises together with asserting the importance and potential long-term negative effects of neglecting postural recommendations. To compensate for lack of concentration, some provide more variable exercises, reward students with stickers/practice cards or try to increase parental involvement. Moreover, 19.5% (n

= 8) of violin teachers and 12.5% (n = 4) of drum kit teachers emphasized the importance of parental support in the learning process:

> "Help from the home environment is important for young children. Hence, the parent comes to class. If the parent guides the child properly, I experience little problems. [. . .]" (V52)

> "A child does not always manage to perform exercises correctly. Adjustment is done gradually. [. . .] It helps when parents join the lesson and can then guide the child during the practice at home." (D28)

Two violin participants explicitly indicated that contact with the parents could also entail some challenges:

> "The main problem among young novices is the lack of proper exercise at home, which is most often a flaw of the parents who do not want to cooperate with the teacher and believe that the child will do it by him/herself. [. . .]" (V41)

Besides the aforementioned challenges, some teachers touched upon more specific issues. For instance, drum kit teachers referred to the absence of ensemble experience (mentioned three times) as a challenge for young novices. Violin teachers pointed out that young novices tend to have underdeveloped motor control and weaker muscles (mentioned nine times), besides struggling with intonation (mentioned three times). For an overview of all challenges and possible solutions, see **Table 2**.

Encountered challenges: Adult novices

Thematic analyses of the third theme, i.e., *challenges encountered by teachers while teaching adult beginner students,* revealed four main challenges encountered by violin and drum kit teachers while teaching adult beginners: (1) acquisition of motor skills and coordination, and lack of mobility of the joints (mentioned eighteen times); (2) impatience (mentioned twelve times); (3) lack of regular practice at home (mentioned eight times); and (4) tendency to overanalyze instruction (mentioned eight times). In addition, violin teachers also reported on students' experienced feelings of tension (mentioned six times).

Teachers recommended various solutions to overcome these challenges. For instance, they proposed to perform exercises promoting limb coordination and independence or to use backing tracks to overcome the first challenge. To deal with impatience, they advised tailoring the repertoire to the individual's motor capabilities, facilitating maximum playing pleasure and avoiding further tension. To reduce students' tendencies to overanalyze exercises and movement execution, teachers advocate using conversation in order to calm the students down or try to redirect their focus. For an overview of all disclosed challenges and potential solutions, see **Table 2**.

Communication and teaching strategies

This theme emerged from the teachers' accounts of the other themes. To secure optimal knowledge transfer, both drum kit and violin teachers seem to, consciously and systematically, adjust their communication strategies according to the age of the students, with the aim to secure optimal knowledge transfer:

> "I sell/wrap the technique differently: the same techniques are taught, but other types of exercises, methods, . . . are used. For instance, commencing coordination exercises: I make them more playful for young novices [compared to adults], with games and pre- and post-performance exercises. With adults, I will start with notes much faster than with children." (D27)

When teaching adults, verbal instructions seem to prevail. Respondents adopt specialist terminology, for instance using particular muscle and joint names, and often describe movement sequences in detail. When tutoring children, however, they mainly use metaphors and analogies with daily activities:

> "Adult: I can refer to the joints and muscles they should use. Where they certainly should not feel/cause tension. Child: I use more simple ideas like 'hit with a hammer,' 'big and small movement,' 'bounce the basketball.'" (D29)

> "A beginner, child or adult, needs steps, but with a child, you have to allocate more time per step and explain the steps more metaphorically, while with adults you can use more 'standard' language." (V64)

When teaching children, shorter verbal explanations are employed, and performance is guided using movement demonstrations, physical cues and games:

> "With children, you are more likely to hold an arm or hand to guide the movement; with adults you are more likely to explain what to do using words." (V54)

> "With an adult student, you can illustrate the technique and provide some explanation about it. For a child, the explanation is shorter, and the focus is more on the different steps that are necessary to be able to execute a certain movement. [. . .]" (D60)

Teachers also tend to "*limit the explanation to one movement and then practice it playfully*" (V61) for children, whereas for adults they "*can usually give several points of attention as they are cognitively more developed.*" (D15). Respondent D32 remarked that the same resources could be employed for adult and child novices:

> "With an adult, you can describe a movement and have intermediate steps performed. With a child, you try to start

TABLE 2 Teachers' reported challenges and solutions.

Challenges (mentioned . . . times)	Suggested solutions	Illustrative quotes
Adult novices		
Acquisition of motor skills, coordination, and lack of joint mobility (18)	• Provide a variety of exercises for limb coordination and independence as well as stretching exercises without the use of an instrument, mostly to loosen the grip • Encourage students to do sports and use backing tracks • Adjust the repertoire to the motor possibilities of the student so that maximum playing pleasure is achieved and further tension avoided	'[...] Adults are stiff, it is difficult to adjust the developed bones and muscles to an unusual posture that you need for a violin." (V41) "Coordination can often be poor, also trying to run before they can walk. Engaging material and backing tracks straight away." (D05)
Impatience (12)	• Offer students musical content in a different form, for example, watching videos of violinists, listening to, and discussing music. This way students are engaged with the violin and motivated to keep on practicing until the technique is sufficiently mastered • Select enjoyable and varied exercises that are musically interesting and engaging, and on the student's current level of motor skill • Incorporate relaxation exercises	"[. . .] Adults are easily frustrated when something doesn't work as well as they thought it would. Here, the emphasis is also on being calm and relaxed. The same relaxation exercises can help." (V60) "Adults are more likely to come to class with a clear goal. [. . .] To achieve this, a lot of technique and coordination exercises are often required, which at first sight have nothing to do with these pieces. That is why adults can often focus too hard on a specific goal without wanting to work gradually toward it." (D22)
Lack of regular practice at home (8)	• Draw/make a training schedule • Select enjoyable and varied exercises that are musically interesting and engaging, and on the student's current level of motor skill	"Technical problems resulting from aging and lack of individual work. Percussion is often treated by them as a relaxing activity, occurring once a week." (D01) "I think that needing to practice a lot can be frustrating for fully formed adults, who aren't spending much of their days 'practicing' anything anymore. So, motivating adult students to keep practicing is sometimes hard when they want to be able to simply 'get it.'" (V46)
Tendency to overanalyze (8)	• Encourage students not too overanalyze every movement through conversation • Redirect focus of a student away from movement, e.g., making the student execute repetitive movements with different types of music • Ask students to just watch, listen and imitate	"Adults want to understand and grasp a lot at the same time, while the first building blocks require a lot of time to absorb the motor skills. Practicing the first movements very repetitively with different types of music/exercises/assignments is great for adults, in order to make them think less and do more instead." (D29) "Questioning or analyzing aspects of violin playing too deeply sometimes stands in the way of acquiring new skills. [. . .]" (V48)
Adult novices: violin only		
Being tense (6)	• Offer relaxation exercises, for example exercises from the book 'Basics' by S. Fisher	"You can get rid of tension through relaxation exercises without an instrument, by making them aware of incorrect postures, by talking to them (also about other things than the instrument lesson), by explaining what happens if they show a certain tension in certain muscles and how they can counteract that." (V59) "This is usually about 'relaxing while you play'. This can be particularly difficult in the beginning. Learning to use the bow in a relaxed manner is very difficult. There are a lot of exercises for this in the book 'Basics' by S. Fisher." (V54)
Young novices		
Acquisition of correct posture (14)	• Consistently explain and demonstrate correct stick grip and posture • Make a video of a student so that he/she can self-evaluate and see his/her mistake • Use general developmental exercises together with explaining its importance and potential long-term negative effects of incorrect posture	"[.] Poor posture–I use again general developmental exercises, but also explain to children about the spine and possible long-term effects of neglecting the correct posture." (V36) "Learning correct posture and fixing posture/body position, as well as stick grip." (D02)
Lack of concentration (12)	• Provide highly variable exercises during the lesson • Clarify that jokes are allowed, but that learning how to play an instrument also entails systematic practice and determination/persistence Introduce sufficient short breaks • Alternate between exercises • Insert game elements • React to students' input, i.e., provide immediate responses to their questions, let them talk about their day	"Lack of concentration, lack of individual work at home. The solution could be a high variability in exercises and lessons, not to focus on only one issue during the entire lesson. [.]" (Drum teacher, P01) "The challenges have to do with concentration and learning to be aware of the relevance of a good posture. Fortunately, you can tackle a lot physically, by dancing and singing, and walking and jumping." (V50)

(Continued)

TABLE 2 (Continued)

Challenges (mentioned . . . times)	Suggested solutions	Illustrative quotes
Lack of regular and correct practice at home (12)	• Motivate students by selecting customized material/music for each individual student • Involve parents in the practice of students, e.g., invite them to attend lessons, recall remarks and point out mistakes • Grade the length of the workload at home • Reward students with stickers or practice card • Organize regular class concerts of up to 15 mins	"The biggest 'problem' is that children more frequently come to class unprepared. They also do not like to do the same exercise week after week, but sometimes this cannot be done differently, for instance when the child did not practice. The task of the teacher is then to give a so-called different exercise that ultimately serves the same purpose, without the child realizing/feeling that he is stack with the same 'issue."' (D22) "[Challenge with] self-control in young children while practicing at home. Solution: parents' help (parents attend violin lessons), recalling the teacher's remarks and pointing out mistakes." (V33)
Understanding music notation and rhythmic values (7)	• Use counting games • Simplify concepts using metaphors • Play before and after the child with references to music scores • Play along with the student • Let the student play with recordings Focus on recognizability and enjoyment principles	"Music notation is often too abstract. Therefore, showing how to play before and after child's turn with reference to score [helps]." (D13) "The very beginning of solfeǏge often goes slow. They often play more advanced pieces on their instrument than what they already know from solfeǏge. It is thus more listening and playing after the teacher than reading, so more intuitive, which has advantages and disadvantages. Enjoyability, recognizability and ability to play along with the teacher and/or recordings is more crucial than for adults." (V48)
Young novices: drum kit		
Keeping up steady tempo (3)	• Use backing tracks • Accompany student on another instrument • Make a child count out loud, as this leads to a better feeling of the pulse	"[. . .] Tempo stability is also a major problem. Solution: making the child count out loud leads to a better metronome feeling." (D31) "Some children don't feel a pulse. Solution: a lot of clapping with the music and counting out loud." (D26)
No experience in playing with the group (3)	• Use backing tracks • Accompany student on another instrument	"Knowing where you are musically, without having much experience in band practice, or other musical frames of mind, is always a problem. This could be solved with backing tracks that are song specific." (D07) "Not knowing how something should sound creates a disadvantage. Solution: lots of pre-playing and listening to the recordings can help with this" (D31)
Young novices: violin		
Underdeveloped motor control and weak muscle (9)	• Use developmental and targeted exercises to improve motor control and strengthen muscles (mainly focusing on strengthening fingers, hands and shoulder girdle) • Demonstrate slow and steady exercises without bow or violin to control specific parts of the body, e.g., demonstrate enlarged arm movements • Use games such as tapping macrobeats by foot and clapping microbeats, while singing or playing a song	"Muscle Isolation – Exercises to control specific body parts. Weak muscles – general developmental and targeted exercises (mainly strengthening fingers, hands and shoulder girdle). Poor posture – I use again general developmental exercises, but also explain to children the functioning of the spine and possible long-term effects of neglecting the correct posture." (V36) "Underdeveloped motor control – slow and steady approach necessary. Basic physical movements, for example larger arm movements, which are refined over time. [. . .]" (V47)
Intonation (3)	• Introduce individual elements of playing technique one by one and consolidate them through exercises • Encourage a student to sing or imagine the sound before playing • Let the student listen to the recorded performance, invite her/him to discover where in her/his opinion the intonation was either good or not • In group sessions, let the children play the evaluation game all together, in a sort of peer tutoring, with each child helping the peer to solve the problem	"Intonation on violin is a challenge. I encourage the student to sing and, subsequently, to imagine the sound before playing. Frequently, we listen the recorded performance again and I invite the child to discover where in its opinion the intonation was good or not. [. . .]" (V45) "[. . .] Control over several elements, e.g., intonation and simple bow guidance; you have to introduce individual elements of the playing technique one by one and consolidate them through exercises" (V39)

> from parallels with evident movements from daily life: with a downward and upward movement on the hi-hat, or for accents on a drum, you can start from dribbling or throwing and catching a ball. You make them aware of the movement of their arm-wrist-hand. You can of course also use these resources for adults. [. . .]" (D32)

To reduce adults' levels of self-evaluation and overthinking, respondent V48 for example asks them to simply watch, listen and try to repeat, whereas, with children, he tries to stimulate self-awareness and self-evaluation:

> "Sometimes older people have more difficulties in reenacting the examples and in accepting concrete tips. Questioning or analyzing aspects of the violin playing too deeply sometimes stands in the way of acquiring new skills. They talk more about the difficulties they are having than children; they sometimes more easily 'take the plunge' without worrying too much about how or what (or why!). To adults I often say: don't think too much, just watch, listen and try. Children I often ask the question: what should you do, or what have you just done?" (V48)

However, sometimes, adult novices might be reluctant to accept teaching methods based on modeling and imitation:

> "Adults [. . .] are not open to the above-described exercises, simply because they think they can reason. Making adults feel something physical is often difficult, so you have to verbally explain it, which in turn becomes very complicated because you have to think about a lot at the same time" (V50)

And as a consequence, teachers might refrain from using these techniques:

> "Children: demonstrate the movements enlarged. Also: 'this is how it should not be done'. You don't do this so easily with adults because you do not want to offend them." (D19)

The majority of violin teachers (78.1%, n = 32) agreed that physical interaction is key since it is required in all aspects of violin playing, i.e., for general posture, instrument and bow positioning, bow movement and trajectory guidance, bow and neck finger positioning, finger and hand placement, tension relaxation/optimization, elbow movement indication in string crossing, stage fright suppression, sound quality optimization, artistic expression facilitation and collective performance. 53.1% (n = 17) of drum kit teachers regarded physical guidance as pivotal, acknowledging its value to correct posture, showing a student how to hold and control a drumstick, guiding arm movement, and transmitting emotional and expressive content. Additionally, 56.3% (n = 18) of drum kit teachers acknowledged the importance of movement demonstration and imitation, and the relevance of playing along with students (e.g., to help them to maintain a steady tempo).

Attitudes toward wearable devices and virtual reality use

Wearable devices

According to 28.1% (n = 9) of drum kit teachers and 12.2% (n = 5) of violin teachers, a postural support device could help to reduce excessive fatigue and discomfort of novices after a class or training; 18.8% (n = 6) of the drum kit teachers and 39% (n = 16) of the violin teachers disagreed; respectively 21.9% (n = 7) and 17.1% (n = 7) of the drum kit and violin teachers were undecided; while 31.3% (n = 10) of the drum kit and 31.7% (n = 13) of the violin teachers did not have an opinion (see Figure 1). Generally, violin and drum kit teachers would rather recommend doing sports or specific exercises to increase muscle strength and prevent injury. They were mainly concerned that the use of such devices could have undesired effects:

> "I do not know whether, with the help of such a device, the proper posture reflexes would be developed and whether such a device would not stiffen the entire body and posture of the player, as the point is to seek natural freedom." (V37)

Moreover, they believed that wearable devices could be used for other purposes than mitigating fatigue and discomfort. According to drum kit teachers, ideally, wearable devices would correct posture, enhance drumstick grip and movement, provide feedback and facilitate mirroring of the observed movements (see Table 3). For violin teachers, optimally, wearable devices would stabilize overall posture, relax shoulders and other joints, keep the left wrist in the correct position and prevent the fingers of the left hand from being clenched. Design ideas included equipment for straight bowing and a restrictive device inhibiting all other movement except for that of the elbow and forearm. Table 3 further outlines these recommendations.

One of the main concerns regarding wearable device use is that it might impair certain aspects of the learning process. Some brought up device dependency as a potential risk, with students trusting in the efficacy of the device rather than employing their own cognitive and motor capabilities. As a consequence, if the device would be removed, bad habits might return.

> "With aids, it is often the case that if you stop using them, you start making the same postural mistakes again." (V62)

Virtual reality

Most respondents (79.5%, n = 58) were inexperienced with VR. When asked whether, in their opinion, the use of VR could facilitate musical skill development, 19.2% (n = 14) of the teachers responded positively, 27.4% (n = 20) were somewhat hesitant, 23.3% (n = 17) were not in favor of employing VR, while 30.1% (n = 22) had no opinion (see Figure 1).

Teachers who recognized or were undecided about the potential of VR believed it could be especially useful for distance learning, posture correction and overall motivation. Furthermore, they presumed that VR use could facilitate motor skill development, but largely discredited its potential to improve other musical skills or sound quality:

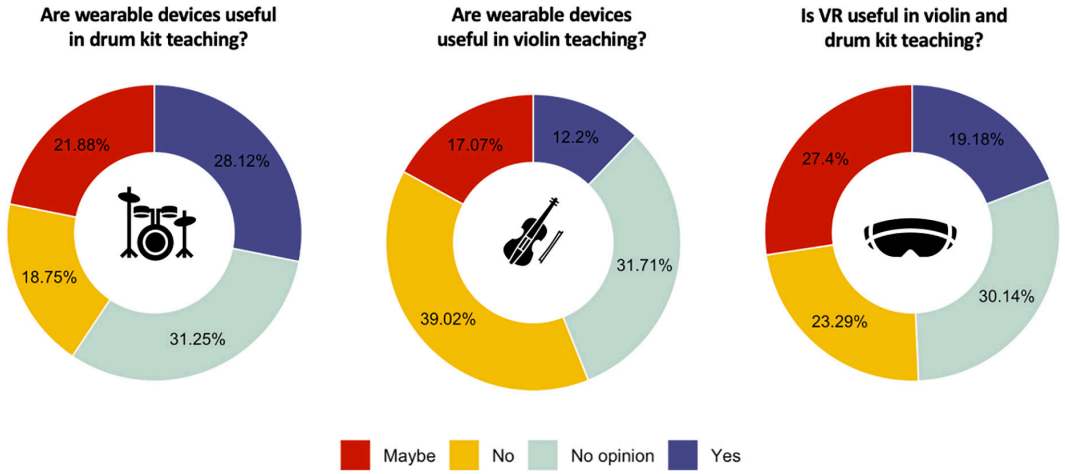

FIGURE 1
Teachers' opinions about usefulness of wearable devices and VR applications in violin and drum kit training.

> "Musicality seems difficult to practice given the virtual situation. However, coordination/motor skills seem to be fine to practice. VR can be useful for teaching new movement combinations." (D15)

> "Yes, if the virtual world responds to errors such as in a computer game, e.g., the student 'drowns' (the environment becomes water) if his arms drop too much. Real muscle training. For the rest, I don't think VR can be used." (V61)

> "Probably for developing motor skills, it could provide good results. However, musical skill development requires lively contact with people, communing with beauty and music, and an attempt to simplify this path will not have a positive impact on shaping the sensitivity and musical individuality of a young art adept [. . .]." (V43)

At the same time, respondents were afraid that VR tools might fail to provide correct feedback since teachers commonly adopt tailored communication strategies when dealing with students. Additionally, they were concerned about the lack of physical interaction in the VR environment, as *"touch seems to be an integral part of motor memory and, at the moment, I have no idea how to bypass/replace it."* (V36). Furthermore, their answers also touched upon the practicality as well as the technicality of VR:

> "If it can be integrated playfully and does not take too much time [to set it up], this can certainly be an asset. Especially if they can also use it at home." (D24)

> "It could of course help, but I think it would be quite laborious in terms of setup and technical requirements." (D13)

More hesitant respondents also stressed the need for optimal technical rendering:

> "Virtual reality has nothing to do with playing music. [. . .] The only way it could help would be when technology evolves to the point of holographic technology, and real-time recording and teaching. Let's wait for that." (D30)

Furthermore, they were also concerned that "*the subtle nuances in playing an instrument would be lost*" (D22) and that "*there is way too much technology in the life of students already*" (D10). For a more elaborate description, see **Table 4**.

Discussion

This paper investigated learning profiles of novice students and teachers' opinions on the potential supportive role of new technologies in music education. As an increased understanding of the needs and challenges encountered while teaching could improve the design of technological tools facilitating skill acquisition and technology adoption in the studio, we examined distinctions between adult and child novices, explored teachers' attitudes toward postural support devices and VR applications in instrumental music training and considered suggestions regarding device design.

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TABLE 3 Teachers' design ideas for wearable devices.

Objective of wearable devices	Illustrative quotes of design ideas
To correct and stabilize overall posture	"I think most students should especially pay attention to their back [posture/position]; so, a kind of little harness to avoid sagging on the drum seat?" (D31)
	"Something to keep the chest open and the chin tucked back for a normal good posture." (V46)
	"A center of gravity scanner with an audible signal for excessive deflection would probably make the most sense. Most posture problems begin with bad daily habits. Posture problems only further emphasize the existing flaws." (V36)
To give real-time feedback and indicate errors	"A device that registers how the student plays and immediately indicates what is wrong, a camera that indicates which zones must be adjusted + checks tone formation (correct playing field, full stroke,.). And if a program can be connected there where you can set methods, then that would be handy. Less dragging around with books! + ability to download and play music." (D24)
	"Quite simple: a robot that is mirroring your movements in exactly the same way." (D12)
To relax shoulders and other joints	"No idea what it should look like. The device should facilitate a relaxed posture. This means that when the drummer sits down on his drum seat, all drums/cymbals/feet should be positioned so that they can be reached with a minimum of physical effort. Upper arms should fall next to the body, completely relaxed." (D15)
	"To develop and relax wrist muscle." (D25)
	"[. . .] muscular tension tracking devices." (D07)
	"Device to relax shoulders while playing. Most students have too much tension in fingers –>elbow –>shoulder." (D49)
To stimulate correct upper limb movement and hand grip	"Perhaps a controlled harness that can make the student feel the required movement and experience the synchronization between hands and feet." (D28)
	"A device that shows the stick bouncing on the skin (trampoline principle), and we use the 'force' of the skin to make the stick bounce back." (D19)
	"It would be some sort of separator for the first and second fingers in the left hand. It would prevent the fingers of the left hand from being clenched. Also, something that would reduce the clenching of the thumb on the left hand would be helpful." (V33)
	"Device 'blocking' the right elbow from rolling backward." (V40)
	"A stand to put the right elbow in, which can be adjusted according to the string on which one strikes. Pole with holder. Serves to bow straight from center to tip." (V51)
	"Something to clamp on the left shoulder over which you can slide a stick (guided) in a similar way as when you bow on the violin." (V63)
To support students' practice at home	"A device could be a small robot that takes over the movement we did in class and then does the exact same guidance during practice at home. But this would presumably require extensive means to provide this for every novice student." (D32)
	"Something that also gives the student all the necessary information regarding the exercises to be performed at home and provides the necessary feedback in case of mistakes (also in posture)." (D22)
Other	"Automatic lights on the sticks or drum set that blink in the same rhythmical pattern. This give the student a sense of playing a computer game." (D06) "Foldable electronic drum kit." (D13)

TABLE 4 Teachers' design ideas for VR applications.

Objective of VR application	Illustrative quotes of design ideas
To demonstrate movement	"When the student can better detect whether he bows straight, it might be easier to correct it." (V53)
	"If they get more and better visual feedback about their movements as a result, it can certainly help. Now it is difficult to see all movements (such as straight bowing); even in a mirror, this is not evident." (V70)
	"A hologram of someone playing with a perfect technique; speeding up, slowing down, zooming in and out on every aspect of gameplay. Such virtual models are used in sports, for example for professional swimmers." (V48)
To correct posture	"This may help to demonstrate the correct posture and amplitude of body movement, in respect to their body size ratio." (D06)
To indicate errors	"Holding the stick and seeing different angles, developing coordination." (D09)
To work on stage experience	"Jamming with other musicians like guitarists or pianists. This may help them to experience how to combine their simple drum patterns with other musical input. To increase their aural skills in ensemble/band playing." (D06)

Age appropriateness

Our results suggest that the learning profiles of novice violin and drum kit students are of similar nature and follow general developmental stages. We observed clear differences depending on the age of the students (i.e., young vs. adult novices), but less relating to the musical instrument (i.e., violin vs. drum kit). Hallam et al. (2018) investigated the differences between instrument groups with regard to motivation and practice. On the one hand, they found differences in the amount of time spent practicing in relation to instrument groups, with string and guitar players practicing the most and singers the least. On the other hand, the amount of practice as well as most of the other items that differed significantly were mediated by age or differed only in relation to students' age. Age-related differences can be related to Piaget's Four Stages of Cognitive Development (i.e., the *sensorimotor stage, preoperational stage, concrete operational stage and formal operational stage*), describing how our cognitive processes change as we grow (McLeod, 2010). They are also in accordance with the account of Goodway et al. (2019) regarding motor skill development, which discusses gradual changes between eye and limb coordination, reaction times and muscle development in relation to age. Children who start to learn to play violin or drum kit are most commonly between 7 and 11 years old and are usually at the *concrete operational stage*. This stage is characterized by the development of organized and rational thinking that can only be applied to previously encountered physical objects (Goodway et al., 2019). More abstract cognitive abilities and self-consciousness emerge by the end of this stage. In contrast, adult novices are commonly at the *formal operational stage* and are able to imagine the outcome of particular actions and use abstract reasoning (McLeod, 2010; Goodway et al., 2019). Hence, they can more clearly foresee the benefits of regular practice and usefulness of particular exercises for specific musical skill development. Furthermore, children initiating the *concrete operational stage* (6–7 years old) tend to have more difficulties with eye-hand and eye-foot coordination (Goodway et al., 2019). However, when children are given the opportunity to practice and experiment with their coordination, the integration process of perceptual and motor abilities occurs more rapidly and limb coordination is usually well established by the end of this developmental stage (11 years old) (Goodway et al., 2019). In contrast, adults undergo structural changes in joint and muscle tissue, which lead to a gradual decline in joint flexibility and detrimental motor performance causing a reduced capacity for adaptive change in the motor output (Abernethy et al., 2018). Hence, these developmental stages can indeed help to explain why, at the start of the learning process, children are inclined to progress more slowly, yet tend to outperform adults after some time and practice. However, even though cognitive processes and motor skill development are already well described in music pedagogy and psychology, developers rarely use this wealth of knowledge when designing technological tools (Revelle, 2013).

This study demonstrates that, for violin as well as drum kit teachers, tailored, age-appropriate instructions and communication strategies are essential in order to tackle the wide range of challenges encountered when dealing with novice students. However, in music education, technologies are often applied and designed for specific instruments (Grindlay, 2008; Löchtefeld et al., 2011). Arguably, an instrument-specific design is more straightforwardly related to technological aspects (e.g., correct rendition of specific movement trajectories, device placement avoiding movement obstruction, etc.) than to pedagogical and developmental aspects. This technology-driven design has been criticized in the literature as it often neglects the opinion of the end user and numerous variables inherent in the learning process (e.g., Revelle, 2013; Malinverni et al., 2016). Our findings suggest that physical, cognitive, social and emotional developments of specific age groups should be taken into account during the design process. In doing so, when being used by novice students, wearable devices and VR applications could more adequately support and facilitate postural development and enhance optimal movement trajectory execution.

Practice at home, playfulness and social interaction

According to the participants in our study, engagement in practice at home is a key challenge for adult and child novices. Teachers propose to seek collaboration with parents as a potential solution to keep young novices motivated to practice at home. This is in line with studies on motivation and dropout prevention in music education, which highlight the relevance of interpersonal dynamics between the teacher, caregivers and child in order to develop a long-term commitment to engage with music (Davidson et al., 1996; Zdzinski, 2021). A study by Costa-Giomi et al. (2005) showed that, when compared to novices who persevered with piano lessons, novice pianists who dropped out had looked for more (yet received less) approval from the teacher at an early training stage. As another possible solution to keep children engaged with practice, teachers propose using positive reinforcement (e.g., stickers and class concerts). Contrastingly to children, in order to motivate adults to regularly practice at home, teachers in our study suggested to create work plans and select varied, musically engaging exercises.

Given the above-described results, ideally, assisting technologies should integrate playful activities and enable social interaction for young as well as adult novices. The introduction of gamification elements into teaching/learning strategies (i.e., earning virtual goods such as badges or points, leveling up), for instance, was shown to improve educational outcomes, motivation and engagement with the learning material during botanical classes (Su and Cheng, 2015) and second language English courses for primary school students (Sandberg et al., 2011). Such an approach enables learners to carry out tasks in a relatively relaxed and pleasant environment, where effort, rather

than mastery, is rewarded (Ofosu-Ampong, 2020). Moreover, it might help to reframe failure as an essential part of the learning process (Su and Cheng, 2015). Also in the musical domain, *"the playful experience of working with music technology, together with the rewarding sounds that can be produced by it, provide strong motivators for young children to experiment and develop their musical ideas"* (Rowe et al., 2017; reported in Liu-Rosenbaum and Creech, 2021, p. 436). Notably, studies exploring the potential of the MIROR-Impro system (a program that enables interactive improvised musical dialogs with a computer) suggest that experiences with music technology are particularly rewarding for children when they are shared with their peers or teachers (Wallerstedt and Lagerlöf, 2011; Lagerlöf et al., 2013). Also, research focusing on adult engagement with music suggests that, rather than skill acquisition, this group especially values a strong focus on social interaction and musical enjoyment (Roulston et al., 2015; Zhukov, 2021).

Tailored learning and communication

The results of our study indicate that teachers differentiate their communication strategies according to the students' age. With adults, verbal instruction prevails. On the one hand, teaching strategies correspond to the finding of Howard et al. (2007) that adults might benefit greatly from clearer verbal instructions, which are especially sensitive to teaching style idiosyncrasies. Teachers in our study reported on their use of specialist terminology, such as muscle and joint names, and describe movement sequences in detail. On the other hand, by directing (too much) attention toward the student's body movements, teachers might end up obstructing elements of the movement execution. This phenomenon is referred to as "paralysis by analysis" (Ehrlenspiel, 2001) and describes how too much focus on the properties of the execution can eventually inhibit the intended action (Allingham and Wöllner, 2021). Allingham et al. (2021) emphasized that redirection of attentional focus (only through verbal instruction) can significantly improve learning outcomes in violin playing. Somatic attention focus that directs awareness toward tactile feedback (e.g., to the resistance of the violin bow against the strings) significantly improved performance on spectral centroid, bow contact point consistency, shoulder muscle activity and novices' violin sway in comparison with redirection of the focus to sound (external focus) or arm movement (internal focus). At the same time, several teachers acknowledged the difficulty to transfer knowledge to adult novices through modeling, since they do not always feel comfortable with this way of communicating.

Considering these findings, it is worthwhile to reflect on the goals of music educational technologies. As they are often driven by the desire to reduce the ambiguity that may characterize student-teacher interaction through verbal feedback and modeling (Howard et al., 2007; Grindlay, 2008; Blanco et al., 2021), such technologies display detailed information on one's performance [e.g., bowing movement, posture; see for example Amir (Ng and Nesi, 2008), MusicJacket (van der Linden et al., 2010) and TELMI (Blanco et al., 2021)] and as such may support the internal attention focus. A suggestion would be to use technology that challenges and expands the skill acquisition process, i.e., for adult novices it might be redirected to visual, auditory and physical channels, and (somatic) external focus instructions, while for children it might be directed toward exercises that increase self-awareness. An example of a tool that aims to enhance the skill acquisition process is the Music Paint Machine, a system that allows a musician to draft a digital painting while playing a traditional music instrument and manipulating properties of the music (e.g., pitch, amplitude) as well as body movements (e.g., twisting the upper body and moving the feet) (Nijs and Leman, 2014). This interactive music system does not aim to monitor errors, instead, it supports instrumental music instruction by inviting students to explore and experiment with the music, the instrument, the body and the visual representation of movement and sound (Nijs and Leman, 2014). Additionally, it augments the dynamics of the master-apprentice model by promoting sensations of autonomy and agency.

Visibility

Overall, our respondents did not seem to be inclined to equip their students with wearable devices or VR applications in daily practice. This might relate to the fact that teachers were relatively inexperienced with these kinds of technologies and might lack the capability to judge their usefulness or to envision potential applications for their teaching routine. Also, teachers who expressed more straightforward positive or negative opinions regarding the application of such tools were mostly concerned with technical rendering and usage complexity. These findings confirm the relationship between technology acceptance, perceived usefulness and willingness to apply the tool (Teo, 2009; Teo and Bahçekapili, 2012).

Given our respondents' overall unfamiliarity with technologies such as VR and wearables and their hesitance to use them, it would be fitting to increase the visibility of these technologies by involving teachers from the initial stages of technological development (Bobbe et al., 2021) or through more ecological study design (van der Linden et al., 2011). Researchers acknowledge three main points that need to be considered when creating an effective learning device, i.e., matching the device to the experience of the user, considering the task level and scrutinizing how to involve the teachers in training (van der Linden et al., 2011). Yet, in practice, these principles are hardly fulfilled as the end users are generally involved when the product design is already finalized (van der Linden et al., 2011; Bobbe et al., 2021). The aforementioned

TPACK framework and SAMR model might help to facilitate communication and mutual understanding between educators and developers regarding technology integration in music education contexts (Bauer, 2014; Mroziak and Bowman, 2016). These frameworks might actively engage teachers to reflect on all the encountered learning tasks and challenges while teaching with or without technology. At the same time, SAMR and TPACK might help developers to determine the complexity of technology design and its integration in specific contexts (Hilton, 2016).

Cooperative and collaborative teaching styles

In our study, teachers' design ideas for wearable devices predominantly addressed sensorimotor skill monitoring, including feedback regarding overall posture and control of limb movement. Also, VR applications were expected to provide students with postural feedback, movement demonstration and general error indication. The focus on movement and posture monitoring (instrumental gestures) might be explained by the prevailing educational approach in instrumental music education, namely the master-apprentice approach (Bowman, 2002; Lehmann et al., 2007; Schiavio et al., 2020). This approach may provoke an instrumentalist's conception of the musical instrument as well as the body (see also: van der Schyff, 2015a,b), in which both are considered as mere tools serving the technically perfect reproduction of the written music. In such an approach, the monitoring of movements and postures is at the core of the instruction. At the same time, our findings suggest that teachers would be rather reluctant to use monitoring technologies as they worry that the learner might start to rely more on the device, rather than trusting in his/her own mental and motor processes, to correct mistakes. Therefore, new interactive technologies such as wearable devices and VR applications could go beyond merely monitoring performance and reinforcing a teacher-centered master-apprentice approach. Instead, they could contribute to the development of students' self-efficacy and stimulate educators to engage with cooperative and collaborative learning/teaching styles (Welch et al., 2005; Collens and Creech, 2013; Gaunt et al., 2021). These technologies could provide new insights into music education and help to support transformational models of music learning, promoting long-term engagement in music study (Varvarigou and Creech, 2021).

Limitations

Some limitations of this study need to be acknowledged. In this study, we did not inquire about *subjective educational theories* (Kelchtermans, 2009) nor conducted field studies on respondents' teaching methods in practice. *The subjective educational theory* is an important component of the teachers' personal interpretative framework, which is developed throughout their career and might substantially impact their perception of the usefulness and potential of technological support for instrumental music education (Kelchtermans, 2009; Bauer, 2014). Furthermore, we mainly focused on sensorimotor skill development, hence, teachers could be biased toward formulating their answers from this perspective. In future research, aspects of expressivity and other musical skills could be investigated in greater detail. Forthcoming work could also employ a wider range of technologies and adopt a longitudinal research design. Ideally, it should also involve students, since they are also foreseen end users; their ideas and feedback would for instance be useful to consider when developing esthetical properties of such applications (Bobbe et al., 2021). Future work might also focus on the evaluation of specific scenarios of technological device and application use. Moreover, it could more strongly target the teacher-student relationship, as well as music educators' overall motivations and approaches.

Conclusion

In conclusion, by overcoming some of the limitations of more traditional strategies, wearable devices and VR applications might have the potential to enhance overall music training quality by addressing physical, cognitive, social and emotional developments of specific age groups, expanding the student's skill acquisition process through a multimodal design as well as enhancing social aspects of music learning/playing. This study identified several important factors of the technology design process that would benefit from user involvement in all stages of technology development and could improve student-centered training design, enhance motivation, boost the overall learning process and promote healthy and positive lifelong engagement with music.

Data availability statement

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

Ethics statement

This study involving human participants was reviewed and approved by the Ethics Commission Faculty of Arts and Philosophy, Ghent University. The participants provided their written informed consent to participate in this study.

Author contributions

AM and AC participated in the design of the study and carried out the thematic analysis. AM carried out the study, processed the data, and performed descriptive analysis. AM, LN, and EV carried out manuscript preparation. AM, LN, EV, and ML read and approved the final manuscript. All authors contributed to the article and approved the submitted version.

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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.

Publisher's note

Supplementary material

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Affordances of musical instruments: Conceptual consideration

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While the concept of affordances has been applied in music research, it has not been satisfyingly developed regarding musical instruments. The resulting vagueness restricts the potential of the concept to guide exploration, discussion, and development of new approaches towards musical learning. Also, the concept of affordances comes with strong ontological claims and thus prompts the researcher to be careful when merging it with other theoretical domains or applying it in empirical studies. Consequently, the present article aims at contributing to a conceptualization of affordances of musical instruments by highlighting and discussing components that are necessary to consider in such a project. The first part consists of an overview of key elements of ecological psychology and more recent theoretical contributions, which are of relevance to the aim of the article: Material Engagement Theory, Skilled Intentionality Framework, and Sensorimotor Contingency Theory. A brief review of examples on how the concept of affordances has been applied in music research is presented. The main section of the article discusses four components, vital to further theoretical developments on affordances of musical instruments: the musical niche, spatial networks, sensorimotor relationship, and the amodal nature of affordances. Central to the argument is an understanding of affordances as relational, limited in scope and bound up with the physical interaction between musician and instrument. Accordingly, it is proposed that analytical focus in studies of musical instruments should be the sensorimotor relationship, spatiotemporally unfolding through a musical event. The article is concluded with comments upon educational implications of the presented perspective and suggestions on further research on the topic.

KEYWORDS

affordances, musical instrument, music education, enactivism, ecological psychology, Material Engagement Theory, Skilled Intentionality Framework

Introduction

Ecological psychology and its key concept of affordances has been applied to music research (examples include Folkestad, 1996; DeNora, 2000; Clarke, 2005; Godøy, 2010; Nilsson, 2011; Menin and Schiavio, 2012; Windsor and de Bézenac, 2012; Akoumianakis,

2013; Coessens and Östersjö, 2014; Krueger, 2014; Schiavio, 2014; Duby, 2019; Koszolko, 2019; Clarke, 2020; Duinker, 2021; Tullberg, 2021; Cross, 2022). However, while literature within the field shows a variety of understandings, interpretations and applications, the concept has not been satisfyingly defined with regards to musical instruments. Confusion and vagueness surrounding the concept restraints its analytical potential to explore, describe and explain the complex ways that musicians interact with their instrument. A central issue seems to stem from the differences regarding analytical focus and scope following from the various available definitions.

The aim of this article is to contribute to a conceptualisation of affordances (Gibson, 1979/2015) of musical instruments. I do this by bringing forth and discussing components necessary to consider when applying the concept in studies on musician-musical instrument interaction. I refer to theories that support and refine Gibson's ideas in relation to the topic, and which seems helpful in future work along these lines.

The first section recapitulates key elements of Gibson's work, which are central to the present article, as well as relevant theoretical contributions by other scholars, sharing the same concerns as Gibson. The second section consists of a brief review of how the concept of affordances has been applied in music research. The third section discusses four conceptual components; the musical niche, spatial networks, sensorimotor relationship, and the amodal nature of affordances. I close the article by commenting upon possible educational implications.

Affordances and socio-materiality

Gibson's ecological psychology is best understood as a reaction towards cognitivist views. As such, it is the first fully-fledged situated theory of perception and cognition (Heras-Escribano, 2019). The concept of affordances, being a central piece of Gibson's larger theoretical framework, cannot be abstracted from the foundations of this radical position without losing its potential to spur rethinking of perception, action, and cognition.

Among these foundational claims is the idea that perception does not rely on mental representations, memories, or internal maps (Heft, 2020). On the contrary, necessary information for the agent's actions is available directly, without any inferences. This information includes *invariants* – consistent patterns of information that, through perceptual action, reveal the structure of the surrounding environment or the object. This interwoven relationship between action and perception includes overt movements conducted in order to manipulate objects, as well as how things are brought into focus by means of attention.[1] The concept of affordances refers to the opportunities for action that emerge in and though these perceptual actions. Rooted in an embodied and situated perspective, affordances are related to the agent's capabilities, needs and interest. As described by Michaels and Carello (1981): "humans do not perceive chairs, pencils, and doughnuts, they perceive places to sit, object with which to write, and things to eat" (p. 42). Affordances are thus inherently meaningful. Moreover, affordances cannot be studied or discussed without addressing the context in which an agent exist, what Gibson (1979/2015) refers to as an *ecological niche*. A niche includes the surrounding space, seen through the behaviour of its inhabitant. Thus, several niches may overlap in terms of physical space but since a niche exists in tandem with the agent, they may still be separate in terms of affordances.

However, ground breaking these ideas were, Gibson's writings have been noted to be confusing and contradictory (Chemero, 2003; Käufer and Chemero, 2015). Hence, there are many different interpretations and applications of his concepts. Specifically, I would like to clarify my position regarding two issues.

The first point is the question whether affordances are to be understood as (i) *dispositional* or (ii) *relational* (Heft, 1989; Chemero, 2003; Stoffregen, 2003; Heras-Escribano, 2019; Magri, 2019). This question has consequences when it comes to the unit of analysis. A dispositional view leads towards studies on properties and dispositions.[2] Instead, the relational interpretation – the position I support in this paper – implies that the continuous agent-environment system will be the locus point of analysis.

The second point concerns sense modalities. Beyond his work on visual perception (Gibson, 1979/2015), Gibson also discussed other sense modalities in terms of perceptual systems (Gibson, 1966). However, as noted by Stoffregen et al. (2017), Gibson's argument can be understood as one irreducible perceptual system, through which the senses operate. Affordances are thus perceptual content of the *global array,* since "behavior always requires control relative to referents that cannot be specified in patterns that exist within any single type of ambient energy" (Stoffregen et al., 2017, p. 166). Accordingly, affordances are to be considered as amodal in nature.

Gibson's work is part of, and has contributed to, a broad movement that views cognition as non-representational, situated, and embodied.[3] Among the many noteworthy later contributions are Malafouris' (2013) *Material Engagement Theory* (MET). Being a cognitive archaeologist, Malafouris draws inspiration from

1 The interwoven relationship is referred to in slightly different ways: "perception-action interrelationship" (Michaels and Carello, 1981, p. 48); "perceiving-acting cycle" (Shaw, 2001, p. 296); "action/perception loop" (Östersjö, 2008, p. 78); and "perception-action coupling" (Warren Jr., 1990, p. 33).

2 See for example Warren Jr.'s (1984) classic experiment with stair-case raiser height.

3 Before him, similar ideas were presented by phenomenological thinkers such as Husserl (Jorba, 2020). Especially Merleau-Ponty's (1945/2013) work on perception and the lived body has been combined with Gibson's ideas. Examples of such approach within music research include Kim's (2020) analysis of the process of learning to play a musical instrument and Nilsson's (2011) artistic dissertation on improvisation on digital instruments.

extended and embodied perspectives on cognition. Based on this, Malafouris (2013) proposes a hypothesis of the constitutive intertwining of cognition and material culture. Throughout the book, Malafouris presents evidence of the historical entwinement between material culture and human thinking and shows how the human mind has been shaped – and continues to be shaped – by objects and tools. MET holds that cognition emerges in the transactional space between actor and object, and that symmetrical relationship cannot be reduced to isolated components (Alessandroni and Malafouris, 2022).

Another important contribution is the *Skilled Intentionality Framework* (SIF), developed by Rietveld and colleagues through a series of publications (see for example Rietveld et al., 2018; Yakhlef and Rietveld, 2020; Bruineberg et al., 2021). Through Wittgenstein's notion of *form of life,* SIF takes affordances as communal and relevant to either a species or a particular socio-cultural practice (Van Dijk and Rietveld, 2017). As such, affordances are normative. This, so called *zoomed-out perspective* deals primarily with regular and stable patterns of standing practices. The *zoomed-in* perspective on the other hand focuses on the lived experience of a local agent, negotiating a landscape of affordances in flux (Van Dijk and Rietveld, 2017). Affordances can thus be both small-scale (inviting a confined action with immediate feedback) and large-scale (unfolding in a wider time span and part of a complex project; Van Dijk and Rietveld, 2020). This double perspective is a result of a strive to bridge a gap between two sides of ecological psychology: one dealing with affordances emerging in material engagement, the other exploring social coordination (Van Dijk and Rietveld, 2017). I believe studies of affordances of musical instruments are rooted in a similar position since creative processes are as much bound up with material affordances as of cultural (Clarke, 2020).

Beyond MET and SIF, I utilize ideas from enactive researchers.[4] O'Reagan and Noë (2001) take their point of departure in the perception-action cycle, foundational for ecological psychology. Their concept *sensorimotor contingencies* (SMC) refers to the rules of structural correspondence between motor actions and sensory changes (O'Reagan and Noë, 2001). Patterns of sensorimotor contingencies become familiar to the agent through a history of interaction with the environment, giving rise to *sensorimotor skills*. Such skills are used both in trivial tasks (e.g., opening a door handle) and in fields of expertise (e.g., playing a violin). To some degree, sensorimotor tasks are conducted subconsciously. However, we may become aware if our attention is captured or if we chose to attend to our actions, for example where we put our feet to avoid a puddle on a rainy day. Being familiar with an object, it is possible to be visually aware of things not present at the moment (Noë, 2004). I cannot see the back of the computer screen on my laptop. Yet, I know what it looks like and I have access to it if I so desire. Similarly, I do not have the flute beside me on my desk, but still I have a visual awareness of it if I chose to attend to it. In a later publication, Noë (2012) refers to this phenomenon as *presence-in-absence*.

Beyond visual perception, the theory of SMC has been applied on aural perception (Froese and González-Grandón, 2020) and tactility (Di Paolo et al., 2017). The latter group of researchers also proposes the concept of *sensorimotor schemes*. These are patterns of coordination we act through when we confront a task. Sensorimotor schemes are both a matter of perception and action. Or rather, one presupposes the other. The concept of sensorimotor schemes also includes a dimension of normativity, since motor actions generally are more or less successful, according to intentions.

Affordances and music research

Among the disciplines of music research, different definitions of affordances are offered. One of the points on which interpretations are diverse, is the scope of the concept. Can affordances be applied to possible actions beyond the immediate situation, or should the concept be reserved for sensorimotor interaction in an unfolding event? The lack of consensus regarding implicit and explicit answers to this question has led to affordances being characterized by an "*epistemological vagueness*" (Schiavio, 2014, p. 85). While not offering a complete review of the use of the concept of affordances in music research, some examples are needed in order to position the present paper in the research landscape.

The divide between two sides of ecological psychology highlighted by Van Dijk and Rietveld (2017) can be used to discern different approaches to the concept of affordances in music research. One example of the focus on material engagement is Folkestad's (1996) study of children composing music on computers. In this study (to my knowledge the first to apply the concept of affordances in music), affordances provided a way to discuss the possibilities of computer software as these were used by the children. Interestingly, children without prior experience of playing instruments showed a more exploratory approach towards the software than those with musical background, whos' perspective and expectations on the computer were more in line with those on traditional acoustical instruments. As Folkestad

4 While enactivist theorists share the general concerns with Gibson (1979/2015) – the rejection of cognitivist perspectives – some of them are further apart from his work than others and (see Heras-Escribano, 2019; Heft, 2020; Alessandroni and Malafouris, 2022). Convergencies and divergencies between the ecological approach and enactivism has recently been explored in depth in a Frontier's special topic (see the editorial article by McGann et al., 2020). As the editors note, taking the concept of affordances as locus point can further the theoretical debate: "In several papers here, affordances are deployed as a lens to bring certain points of contact between the ecological and enactive approaches into focus and examine them" (McGann et al., 2020, p. 3). Although this wider theoretical debate is beyond the scope of the present article, this paper is one example of how the ecological approach and enactivist theory can complement each other.

(1996) notes, the perspective of affordances implies a definition of creative action as being an ability to perceive and utilize new affordances.

The focus on a social dimension can be exemplified with DeNora's (2000) study on the role of music in people's everyday life. In her words, "music's affordances – moods, messages, energy levels, situations – are constituted from within the circumstances of use" (DeNora, 2000, pp. 43–44). Examples following this interpretation of affordances include a study on a music education outreach project in Australia (English et al., 2021).

Exploring ecological psychology and musical listening, Clarke (2005) proposes a "reverse" understanding of perception of musical meaning. While traditional, cognitivist perspective on auditory perception builds on a bottom-up approach (parameters such as rhythm, pitch, and intervals are perceived and the musical meaning is constructed in the brain of the listener), the ecological approach according to Clarke (2005) claims that musical meaning is perceived directly. As Clarke shows, this meaning can be discussed in terms of affordances. In a similar vein Krueger (2014) adapt the concept of affordances in his exploration of musical listening and emotional regulation. Krueger combines the extended mind hypothesis (Clark and Chalmers, 1998) with music's ability to scaffold affective states. Within this framework, the concept of affordances is used to highlight the relational character between the agent and the surrounding environment.

The concept of affordances is also taken as analytical focus in studies on certain aspects of musical practice, such as gestures (Godøy, 2010; Duby, 2019) and musical structures (Duinker, 2021). Norman (1998) transformed the concept in his work of design theory. Through this work, affordances found its way into digital design. Studies within these fields are commonly using an interpretation of the concept that relies more on conventions of communication than on ecological psychology (Heras-Escribano, 2019). As such, the concept of affordances can be found in music research concerning digital technology. Examples include Koszolko's (2019) study in digital tools in music production and Akoumianakis (2013) study on music lessons depending on computer software. In a recent paper, Cross (2022) explores interactive affordances as properties of rhythm and pitch in music and speech, emerging in the interaction between humans.

While the concept of affordances has been applied in music research to some extent, examples of research with an explicit focus on musical instruments are more scarce. A dispositional understanding of affordances in this context is close to the notion of *idiomaticity*: "Whether one has the adequate effectivities or chooses to attend to them or not, the instrument does come with a set of carefully designed affordances which guide exploration and constrain action" (Windsor and de Bézenac, 2012, p. 8). A contrasting view can be discerned in the writings of Coessens and Östersjö (2014): "an instrument affords different musical possibilities to different performers; hence, the affordances of an instrument are as dependent on the individual performer as on the acoustic properties of the instrument" (p. 337). Along the same lines, Clarke (2020) states that "the creative process emerges from what a physical instrument affords to the specific body of a particular player" (p. 14). Menin and Schiavio (2012) articulates a similar view:

> A skilled guitarist might be unable to say where to put her/his finger to perform a solo, but s/he can use the motor knowledge of the fingers to reconstruct the actual set of notes played, by just putting the hand on the strings. We believe that this sensory-motor process not only represents the basis of musical understanding, but it can also shed light on the notion of musical affordance, relying on a sub-cognitive, pre-linguistic, intrinsically motor form of intentionality. (p. 210)

The above quote is a good point of departure for the next section, which discusses components that I find essential to consider in further conceptual work on affordances of musical instruments. I focus on a zoomed-in perspective which takes the sensorimotor relationship between musician and instrument, situated within a musical niche, as a spatiotemporal transactional space and analytical focus point.

Conceptual considerations

The instrument and the musical niche

The concept of affordances is part of a situated understanding of cognition, and even with a definition of affordances limited in scope, environmental conditions must be taken into consideration (Clarke, 2020). These conditions are constituted by genre-specific elements, such as aesthetic value systems, institutional framings, historical background, function of the music at hand, its role in society, and its acoustic dimension. Taken together, such conditions form, what can be thought of as a *musical niche*, in which the musician-instrument relationship is situated.[5] One of these conditions – the acoustic dimension – is omnipresent and constitutive of any musical event. Sound projects from the instrument and returns to the musician. Thus, the surrounding space is embedded in the perception-action cycle. Accordingly, the acoustic dimension needs to be considered as a component of any given musical niche.

Starting with a zoomed-out perspective, it is necessary to take into account the historical axis of the acoustic properties of a musical niche.[6] Particular instruments require certain acoustic conditions,

5 In line with Gibson's (1979/2015) notion of *ecological niche*, a musical niche does include, but is not limited to, physical space. For example, a music academy may be hosting several genres. Although residing inside the same building and being embraced by the same organization, various genres come with significant differences regarding the above conditions.

6 Spivacke (1936) anticipated the research interest for coupling between acoustic space and musical stylistic development. Later musicological research along this line includes a study on how early Western art music

and vice versa: changes of performance contexts are driving developments of musical instruments (Townsend, 2020). Emerging music ideals put pressure on instrument developments. For example, new harmonic structures brought with it a demand to be able to play in different keys within the same piece. New ensemble settings invited players, and thus instrument makers, to strive for a larger sound (Powell, 2002). In short, the current standing practices have in part emerged through a co-evolution of instruments, aesthetics, and acoustics.[7]

Zooming in, acoustic properties of a certain space are not always noticed or brought to a musician's attention. Extreme situations can however highlight the effect of acoustic feedback. Performing or recording music in an anechoic chamber not only impacts the reflection of sound, but also the experience of performing and thereby the performance itself (Freiheit, 2010; Autio et al., 2021). My own experience of playing flute inside an anechoic chamber was a physically (and musically) very unpleasant and "unreal" experience. Although nothing happened with the instrument as a physical object, the instrument felt numb. Also recording studios with dry acoustics may influence how an instrument is played. An example of the opposite provided by Östersjö (2020) in his description of performing a guitar piece in a room with a reverberation time of thirty seconds. Although both cases are on the extreme ends of a continuum, musicians continuously adjust their playing to meet the acoustic properties of the performance space (Meyer and Hansen, 2009; Kalkandjiev and Weinzierl, 2015; Steensgaard Gade, 2015; Tullberg, 2021). Furthermore, Steensgaard Gade (2015) states that if sound in a concert hall improves over times, it is probably because musicians learn to adjust their playing to the space. Beyond their playing technique, musicians today negotiate the acoustic properties of their musical niche through amplification, instrument manipulation, or by controlling the environment (Ryan and Gallagher, 2020; Segundo-Ortin and Heras-Escribano, 2021). In Nilsson's (2011) words: "the system self-adjusts in order to optimize its resonance with the environment" (p. 123). In short, musicians' musical lives are embedded in different acoustical realities depending on their musical niche. Whether it is a jam session, recording studio, a festival stage, an outdoor dance evening, or a concert hall, the setting influences how a desirable sound is defined and achieved. Accordingly, core elements of aesthetics are linked to such acoustic conditions – both historical and current – of a particular genre. In this way, the surrounding space can be understood as an extension of the instrument and constitutive of the affordances thereof.[8]

Understanding the instrument as inhabiting a musical niche, more that its acoustic properties are interesting. A line of research within ethnomusicology explores musical instruments as bound up with its musical, cultural and social context (see for example Ronström, 1989; Qureshi, 1997; Dawe, 2001; Bates, 2012; Eriksson, 2017). From this perspective, musical instruments can be seen as "one specific acoustical aesthetic complex" (Racy, 1994, p. 51). As Kvifte (2008a) points out, the identity of an instrument is not static. A fiddle and a violin share the same physical appearance, but the two names bear different connotations. The *taragot* forms a reverse example as the name refers to two physically different instruments, sharing the same identity as Hungarian national instrument (Kvifte, 2008a). Further exemplifying with the Norwegian instrument *sjøfløyte,* Kvifte (2008a) states that "the style of music is a decisive factor to establish the identity of an instrument" (p. 47).

The perceived identity of an instrument has bearing upon how it is commonly used within a particular genre. Such normative meaning can be understood in terms of *canonical affordances* (Costall, 1997). Considering a clarinet, the most apparent canonical affordances invite individuals to hold the instrument in two hands and blow into it in order to produce a sound. However, embedded in the standing practices (Van Dijk and Rietveld, 2017) of a musical niche, is yet another normative value system in terms of its aesthetics (Alperson, 2008).

Zooming in further, it is necessary to draw a distinction between *occasion* and *event* (Qureshi, 1987). Occasion refers to a generalized performance context of a musical niche (e.g., a jazz jam session, a piano recital). As such, the notion of an occasion comprises concepts, norms, and typical acoustic conditions. An event refers to a specific performance, the unfolding of which depends on its underlying nature (the occasion), the specific space, and the actions of the present individuals.

Instrumental space and spatial networks

The notion of space carries a multitude of meanings in relation to music. These shifting meanings can be broadly grouped into

and church architecture developed together (Navarro et al., 2009). See also Aletta and Kang (2020) for examples of research on historical acoustics.

7 A rather drastic example of how stylistic development is constrained by the surrounding acoustics is *kulning*, herding calls found in Swedish traditional vocal music (Rosenberg et al., 2022). Acoustic characteristics that arose due to the desire to project sound over large distances remains as integral aspects of kulning, even when the practice is removed from its previous function and context, and instead performed on stage or in recording studios. In short, genre aesthetics develop in synergy with the acoustical spaces of the musical niche in a continuous process.

8 Taking the surrounding space as an integral part of the instrument may seem counter intuitive as traditional organology treats instruments as sounding objects and rarely considers the acoustic environment. This line of research is probably best illustrated by Hornbostel and von Sachs' (1914/1961) well-known classification system. Here, instruments are classified according to their sound producing mechanism. With its focus on the instrument itself, and isolated from the musical context, acoustic research carried out on musical instruments can be seen as an extension of this perspective. See Bijsterveld and Peters (2010) for a discussion on interdisciplinary potentials existing between the fields of organology and science and technology studies.

either literal or metaphorical (Di Stefano, 2022). The literal meaning refers to the sound source in physical space, while the metaphorical meaning refers to non-physical, imaginery space. Space, in both meanings is perceived, albeit in different ways. Instrumental space refers to the first (the spatial layout of the instrument), while the concept of *spatial networks* also draws upon metaphorical perceptions of space. Bielawski (1979) offers an interesting perspective on this topic, proposing a model that takes musical instruments as transformers of bodily gestures into musical gestures. By not viewing the instrument as input and output device,[9] the analytical focus can be the interaction between musician and instrument (see for example Sudnow, 1978; Baily, 1985; Edlund, 2003; Aho, 2016).[10]

From such an interactional perspective, the musician's hands are equally important as the spatial layout. The "sub-cognitive, pre-linguistic, intrinsically motor form of intentionality" (Menin and Schiavio, 2012, p. 210) mentioned above is not limited to musical practice, but a general characteristic of human hands. Almäng (2008) provides an example from an activity relatable to non-musicians:

> I am unable to report the location of the various keys on the keyboard. If someone gave me a keyboard with the signs of the letters removed and asked me to point out where the letter 'A' normally is I would be unable to answer, unless I was allowed to write on the keyboard and could observe the movements of my hands. (p. 167)

Likewise, the ability to play a musical instrument relies on specific sensorimotor schemes (Di Paolo et al., 2017). In musical performance the role of the hands is not only as executors. Their movements are coupled with haptic and tactile sensations and furthermore, having coevolved with the brain they are integrated in the expressive system of human beings, in that the movements have a potential to give rise to an embodied response (Leman et al., 2017). This has implications for the experience of musical performance, since the expressive system includes a motivational, autotelic and sense-giving component dimension.

Bringing together instrumental space and the role of the hand, DeSousa (2017) devises the concept of *spatial networks*. By this he refers to perceptual content, dependent on both the spatial layout of the instrument and idiomatic conventions of the musical niche, as well as on capabilities, interests, background, and preferences of an individual musician.[11] While the spatial layout of an instrument is generally a stable property – an invariant (Gibson, 1979/2015) – of a musical instrument, spatial networks are not. They are dependent on both the physical manifestation of the instrument and sensorimotor schemes. Furthermore, spatial networks can also be a product of theoretical concepts such as scales, chords, and recurring melodic structures. When a spatial network is integrated through sensorimotor schemes it can be said to reside in the musician's fingers (Leman et al., 2017, p. 177). This "automaticity" allows the musician to direct attention to aspects of the performance other than the movements of the hands. However, this phenomenon necessarily obscures aspects of the playing for the musician. Ornamentation can for example be described as "a disease, spreading without control" (Tullberg, 2021, p. 171). In order to make these hidden actions available for reflection, a shift of perspective is needed. One way to accomplish this is to record oneself, since a listener perspective is distanced from the performing body (Windsor, 2016).[12] Another path is exemplified by jazz musician Kurt Rosenwinkel's process of retuning his guitar (DeSousa, 2017). Disrupting the spatial networks, Rosenwinkel is forced to innovation, and thus new affordances of the instrument can emerge.

> Rosenwinkel plays a chord on his radically retuned guitar but claims not to know what it is. In the moment, he cannot name it or place it in a theoretical system. He cannot reduce its sensual qualities – its felt shape, its sonic color, even its specific pitches – to an internal idea. (DeSousa, 2017, p. 106)

As this quote exemplifies, spatial networks emerge through multiple perceptual processes, a cross-modal phenomenon which becomes overt when it falls apart. Given that both literal and metaphorical meaning of space (Di Stefano, 2022) are relying on perception, spatial networks can be said to blur the line between them.

The sensorimotor relationship and the musical event

The continuous interaction with the instrument leads to development of a sensorimotor relationship with the instrument. The spatial networks are but one, although central part of the

9 Bielawski's (1979) model can also lead to studies on control functions of musical instruments, which are in line with a dispositional view of affordances. Such mapping systems are generally not descriptions from "a performer's point of view. Rather, the aim is to contribute to an analytical framework that may be used to describe general properties of instrument control" (Kvifte, 2008b, p. 355).

10 Musical gestures are more fully explored by Godøy and Leman (2010).

11 There are important differences between idiomaticity and spatial networks. While idiomaticity generally is understood in terms of instrument-specific movements or as musical conventions typical to a genre, spatial networks are not inherent properties of the instrument, nor a disposition of the musician. Instead, spatial networks emerge through the continuous interaction between the two.

12 See also Hamilton and Duke (2020) regarding the relationship a co-development between performance level, motor behavior and perceptual skill.

sensorimotor relationship. Playing technique, understood broadly as structural patterns of coordination, involve gestures in a wider sense (Alperson, 2008; Kim, 2020). In the case of wind instruments, the respiration system needs to adjust to embouchure and bore of the instrument in similar ways as hands adjusts to the instrumental space (Ljungar-Chapelon, 2002; Balosso-Bardin et al., 2017; Tullberg, 2021). For a church organ, the spatial networks are not limited to the hands, as also the feet are involved. In short, a musician is bound up with the instrument through the perception-action cycle and constantly reacting and adjusting to the sensorimotor contingencies according to a normative framework. A fundamental difference from a cognitivist approach is that a normative framework is not a matter of internal, mental processing, but rather a constitutive dimension of sensorimotor schemes (Di Paolo et al., 2017).

While affordances of the musical instrument are situated within this sensorimotor relationship, these emerges in an unfolding event, in Qureshi's (1987) sense of the word. The unfolding of an event can be understood as "changes in the layout of affordances" (Chemero, 2003, p. 192). This means that the affordances of any given moment are dependent on what just has happened and on expectations on what to come next. A single note is, among other parameters, meaningful in relation to the temporal dimension. The immediate future is anticipated, but also imagined (van Dijk and Rietveld, 2020). This imagination, constrained by contextual and musical structures guides the intentional exploration of the musical event.

Taking the sensorimotor relationship as the unit of analysis also implies that musical skills are situated and fragile. Although the sensorimotor relationship is developed over time, through practice and experience, it can be subject to temporary or permanent negative change. Having a cold, for example has drastic negative impact on wind instrument playing and may also affect hearing. Injuries or tendinitis may cause long term restrains and a necessity to fundamentally adjust the fingering technique.[13] But the sensorimotor relationship is also volatile due to changes in the other end – the instrument. Strings are bursting, keys are sticking, wood is cracking, and instruments need to be broken in. Temporary changes can also arise in the hands of the musician. Having practiced particular movements (i.e., a challenging passage) may momentarily make a musician more attuned to the spatial networks with which the musician engages (Tullberg, 2021).

In order to avoid affordances to remain "impossible, ghostly entities" (Chemero, 2003, p. 182), I present one example from my own practice (Tullberg, 2021). During an interview with Breton flute player Jean-Michel Veillon, he played a melodic phrase in which he used an alternative fingering for the tone Bb. On my request, he stopped and demonstrated the fingering, which was new to me. I reproduced the fingering and the accompanying movement (a forward nod). The pitch and timbre corresponded with what Veillon produced. He explained that he had found this fingering himself in order to enhance this particular melodic phrase. For Veillon, this alternative fingering was an affordance of the musical instrument, but for me it was not. At the moment of reproducing the fingering, it was solely an isolated piece of playing technique. For the fingering to be perceived as an affordance, something else is needed. With practice, the fingering could be integrated as a sensorimotor scheme and become part of my sensorimotor relationship with my instrument. If so, I can make use of it in a musical event.

Although this particular fingering can be described as a property of a spatial network, the dimensions of the sensorimotor relationship are interwoven. The fingering was bound up with a loosening of the embouchure and the nodding gesture, which modified the angle between the lips and embouchure hole as well as impacted the airflow. The resulting sound was a veiled tone which had the character of a wave, both in terms of dynamics and pitch. In context of the melodic phrase, the fingering certainly contributed to the expression that Veillon sought and indeed it was a distinctive example of his aesthetics.

Perceiving affordances of a musical instrument

The sensorimotor relationship cannot fruitfully be sliced up according to traditional modalities. Such analytical approach would be a brutal abstraction of the experience of playing a musical instrument, at least from a perspective on affordances as emerging through an active exploration that involves the whole body (Noë, 2012; Stoffregen et al., 2017). One component of this active exploration is the overt movements integrated in the act of playing. Another component is attention, which can be both "caught" and intentionally directed (O'Reagan and Noë, 2001; Froese and González-Grandón, 2020). Therefore, attention is of vital importance in musical practice. An amodal understanding of affordances suggests that attention is less constrained by different sense modalities, but rather about focusing on different aspects of the unfolding event (Chemero, 2003).

An observation from a previous project (Tullberg, 2021) can serve as example. A musically rather homogenous group of flute players, including myself, met for ten two-hour sessions in a co-operative inquiry (Heron, 1996). All of us were focused on orally transmitted traditional music. Nevertheless, when we probed into the experience of flute playing, a quite diverse picture emerged when it came to how we perceived our instruments in the act of playing. Our attention was directed towards different aspects of the interaction, shifting as the musical event unfolded. There were also individual variations with regards to how the musicians in the group used their attention, both consciously and intuitively. For example, while learning a new tune, some focused on the fingering and the spatial layout of the instrument as a way to "grasp" the melody. Others were "thinking"

13 Clarke (2020) provides such an example through a description of guitarist Derek Bailey's hand problems, drastically altering his ability to utilize the spatial networks.

in sound and focused on being able to repeat the melody either by singing or through *musical imagery* (Bailes, 2007; Huovinen and Tuuri, 2019). When we experimented with musical tasks such as transposition and improvisation, some of the participants were able to access spatial networks of other instruments, not present in the room. Flute players with experience from instruments such as guitar and piano could be "visually" guided by the structures of chords of these instruments. These structures could be transferred to the flute in the moment of playing. This is an example of what Noë (2012) refers to as *presence-in-absence*.[14] Such findings imply that musicians interact with their instruments through habit as well as active exploration through attention.[15] Since affordances emerge through active perception, these are partly defined through how a musician consciously directs his or her attention.

Furthermore, affordances are skill-relative (Noë, 2004) and emerging expertise develops perception, specific to the field of practice. This cultivated attunement to the fine-grained nuances of the interaction with the instrument has the potential to become an integral part of the body and the perceptual apparatus (Froese and González-Grandón, 2020). In terms of sensorimotor relationship, a trumpet in the hands of a beginner is a different instrument from a trumpet in the hands of a professional musician. They both may hold the exact same instrument in their hands but the perception of it will be very different. This is not due to subjectivity and a matter of perspective, but a matter of an embodied, physical reality and a process over time of adjusting to an instrument. Accordingly, the concept of sensorimotor relationship is one way to explain the collapsed dichotomy between the subjective and the objective, that one of Gibson's (1979/2015) most often quoted passages is referencing: "an affordance is neither an objective property nor a subjective property; or it is both if you like. An affordance cuts across the dichotomy of subjective–objective" (p. 129). Taken together, developing sensorimotor relationship allow for sensorimotor mastery (Noë, 2004), or what in musical, everyday language may be referred to as virtuosity.

Educational implications and concluding remarks

Viewing musical practice through the lens of affordances implicate an emphasis on creativity and exploration (Folkestad, 1996). With this follows a focus on agency since not all affordances must be realised (Stoffregen, 2003). Also imagination plays a crucial role (Van Dijk and Rietveld, 2020). Here, the learning environment is of importance. An open and safe environment will probably promote an explorative approach to learning, one which allows for affordances to emerge through open-ended interaction. The reverse scenario is equally likely – that a more determinate environment invites less imagination (van Dijk and Rietveld, 2020). In line with this, the focus on musical instruments of the present article must be seen as one piece of a wider creative ecology (Clarke, 2020). What might seem like peripheral activities of music learning might over time have profound consequences in terms of affordances. Beyond practice, there are a number of ways through which a musician may develop the sensorimotor relationship with their instrument. As noted above, this can mean alterations of the instrument end of the continuum, such as changes of the spatial layout (e.g., retuning, remodelling of keywork) and the sound-producing system (e.g., different strings, changing the bore of the instrument, preparations). These alterations have the potential to open up for explorations of new affordances of the instrument (DeSousa, 2017; Tullberg, 2021). Also, practising another instrument may impact the perception of the own instrument, as in the above example of piano playing. The same potential exists in learning music theory, through which conceptual knowledge may be transferred to spatial networks. Experience of learning other music traditions can reveal habitual ways of interacting with the instrument. Such awareness can direct attention to aspects of musicianship that previously were not available for reflection, and thus be the first step towards change, if so desired.

One way to operationalise these kinds of learning processes is through so called constraints-led approach, which has been applied in sports to some extent, for example in the learning lab at Southampton football club (see also Brymer and Renshaw, 2010). An example of such approach within musical practice is described by Slater (2020). By altering the constraints of the performance context, he is creating conditions through which new affordances can be explored. I think that the ecological approach within music research has gained momentum and that a joint forum for discussions and exchange of ideas on how the theory can be applied in practice would be beneficial.

I hope the path suggested in this paper can contribute to such a process. In essence, I have argued for a relational interpretation of affordances based on sensorimotor interaction with the instrument. Focusing on small-scale affordances, four conceptual components have been discussed above. (i) Even from a zoomed-in perspective, the musical niche is a crucial aspect, since it defines genre-specific conditions framing the musical practice. Among central aspects of the musical niche is the acoustic dimension as it is omnipresent and directly influencing the affordances of any musical event. (ii) There is a spatiality in all instruments and playing will cause spatial networks to emerge. (iii) These spatial networks are one essential part of the sensorimotor relationship, taken as the transactional space (Alessandroni and Malafouris, 2022). In line with MET, this sensorimotor relationship cannot be reduced to isolated parts, but is one cognitive system. (iv) From this follows an understanding of affordances as amodal. The sensorimotor relationship involves the whole body and its attunement to the situation (including

14 See Jorba (2020) for a discussion on Husserl's notion of horizons and genuine and non-genuine presentations.

15 See Magri (2019) for a discussion on the role of habits and attention with regards to a conceptualisation on affordances.

abstract thought). Thus, it is not fruitful to seek to situate affordances in singular perceptual senses.

Moving forward, progressive theoretical work is necessary. Also, empirical accounts are crucial in order to make visible other conceptual components that needs to be considered in detail, and to more fully explore the ones highlighted in this article. Ethnographic projects have a potential to investigate the particular conditions in which musicians are working and thereby reveal structures of musical niches. Through inspiration from ethnomusicological work, such projects need to embrace the value pluralism (Alperson, 2008) that underly and inform musical practice.

The sensorimotor relationship, including spatial networks, can be further explored through variety of methods. Some of these, such as motion capture, naturally gravitate towards a laboratory setting. Nevertheless, taking the musical niche into consideration in the analysis, the results can be interpreted through an ecological lens. Furthermore, researcher-musicians and educators can contribute by autoethnographies and phenomenological explorations of their craft. Such first-person accounts have the potential to inform our understanding of perceptual and cognitive processes, hard to access from a third-person perspective. Collaborative research on and through musical practice, such as co-operative inquiry can contribute by exploring the diversity of experiences that exist even within a group of musicians playing the same instrument and working within the same genre.

These examples form a path in which empirical findings can feed back into a robust theoretical framework and conceptual clarity can guide educational progression.

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. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements. 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 author confirms being the sole contributor of this work and has approved it for publication.

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Exploring agency and entrainment in joint music-making through the reported experiences of students and teachers

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This qualitative interview-based study draws on the reported experiences of students and teachers to explore how agency and entrainment resource and constrain each other in joint music-making. The participants were 23 students of Grades 6 and 11 music teachers from different primary schools. The qualitative content analysis of the 11 student pair interviews and 11 one-to-one teacher interviews indicated that experiences of music-related interpersonal entrainment intertwine with different dimensions of agency. In the analysis, four themes were identified as follows: presence, belonging, safety, and continuity. These findings provide insights into the relationship between agency and entrainment in classroom-based joint music-making and provide a novel lens through which to examine the complementary experiences of students and teachers. This study builds bridges between the concepts of agency and entrainment in the context of music education, offering theoretical clarification as to how and why joint music-making can be considered an intersubjective activity that fosters group cohesion and social interaction. The findings further present a view of the constitutive nature of the relationship among agency, entrainment, and intersubjectivity in joint music-making. The findings offer educators concrete grounds for using joint music-making as a platform for an agency.

KEYWORDS

agency, entrainment, joint music-making, music education, teachers, students, intersubjectivity

Introduction

A number of studies show how singing together promotes one's wellbeing and has a significant impact on various factors of social cohesion (Pearce et al., 2015; Salminen, 2020). Many individuals find joint musical action profoundly and emotionally satisfying—being part of socially constructed music-making results in positive experiences and emotions (Pearce et al., 2015). Feeling, hearing, and sharing togetherness through music are experiences that many of us can identify with. These moments and encounters with music are highly affective, relational in nature, and based on communication that goes beyond words (Trondalen, 2016). When individuals come together to dance or to make music, their joint action is characterized by entrainment, that is, mutual sharing and complex rhythmic timing (Phillips-Silver and Keller, 2012). However, little is known regarding how entrainment benefits from and contributes to student agency, that is, students' willingness, capacity, and interest to act (Skinnari, 2014; Rajala et al., 2016) in music education. Thus, this study explores how agency and entrainment resource and constrain each other in joint music-making. As a qualitative study, this research focuses on the social nature of music and the potential of music to help children move beyond a sense of individual self to a shared sense of "us."

Entrainment in sociomusical contexts is used to describe and characterize in-time interactive synchronization between two or multiple participants through music (Phillips-Silver and Keller, 2012; Cross, 2014). Although entrainment is often regarded as a spontaneous neurophysiological process influencing cognition, the concept of interpersonal entrainment, defined as the interaction and coordination between human beings mediated by sound and movement (Clayton et al., 2020), highlights entrainment's social nature. Moreover, the social nature of entrainment is highlighted in different levels of musical entrainment. One level is intra-individual entrainment which involves the perception of metrical structures in music and the coordination of actions. A second entails inter-individual and intra-group entrainments, which pertain to coordinating actions between individuals in a group, while a third is an inter-group entrainment which includes coordination between different groups (Clayton, 2012). These different levels emphasize the embedded nature of social context, conscious awareness, the experience of being in time, and the contribution to sociality (Kim et al., 2019). They also suggest that entrainment can also be explored and examined at different levels through different approaches (Clayton et al., 2020).

Although interpersonal entrainment is affected by social considerations, such as the participants of the group, their interactions and the environment, resources available, the knowledge the participants hold, and how their internal representations enable them to participate (Clayton et al., 2020), these aspects of interpersonal entrainment have received little attention to date. Recognizing that interpersonal entrainment is characterized by intentionality, active participation, and mutual sharing (Trondalen, 2016; Clayton et al., 2020) creates an opportunity to explore joint music-making from a qualitative rather than quantitative perspective. Our study took place in Finland, where joint music-making is one of the core curriculum's central methods used in music education in basic education (EDUFI, 2016). Joint music-making involves every student in the classroom playing together as a group, despite their background or perceived skill. In joint music-making, students are encouraged to try different instruments, body percussion, a range of musical genres, and various ways of participating in promoting their musical and social skills. The goal is to teach and bring the whole class of students together to play at the same time and to experience interpersonal entrainment through musical activity. While including joint music-making as part of the curriculum is an opportunity for students to develop the ability to be entrained with others and to be in time (in sync) with others (Cross, 2014), it cannot be assumed that students will automatically enter into joint music-making. Arguably, as in other areas of the curriculum, joint music-making requires skills that develop through practice and the willingness to act and participate (e.g., Skinnari, 2014; Rajala et al., 2016). In other words, joint music-making is in part resourced by the agency of students.

Student agency has become a central concept in recent educational research (Niemi et al., 2015; Kangas et al., 2017; Vaughn, 2020). It is widely acknowledged that supporting the agency of children advances the development of a responsible society by increasing their competence and motivation to encounter changes in life, advancing equity, and encouraging them to take responsible actions that will make a difference (Vaughn, 2020). In this study, we use a sociocultural conceptualization of agency as a dynamic process interdependent on the individual and social aspects where a subject actively chooses, acts, and reconstructs their worlds (Eteläpelto et al., 2013), thus complementing the social considerations of entrainment. Furthermore, student agency is fostered through *a student's experience of having access to or being empowered to act through personal, relational, and participatory resources, which allow him/her to engage in purposeful, intentional, and meaningful action and learning in study contexts* (Jääskelä et al., 2020, p. 2).

However, to date, a limited amount of research has shed light on student agency in music education, where interpersonal entrainment plays a central role in the joint music-making of everyday classroom settings. Furthermore, little is known about children's or teachers' experiences in this process. Thus, the current study contributes to the discussion about the agency not only by exploring the relationship between entrainment and agency but also by investigating both student and teacher experiences of the process to gain an understanding of joint music-making as a forum for the

agency. The aim of this study is to explore children's and teachers' experiences of joint music-making and to ascertain whether and how student agency contributes to joint music-making and whether entrainment supports the agency of students. This is particularly important when we are developing new pedagogical practices and transforming music education practices to support human agency and to understand the social aspects of interpersonal entrainment.

Subject-centered sociocultural approach to agency

In this study, we drew upon a subject-centered sociocultural approach to conceptualize agency (Eteläpelto et al., 2013). Previous studies on student agency have indicated how both teachers' and students' active participation in education leads to effective learning, and how teaching practices can increase the agency of the students (Niemi et al., 2015; Vaughn, 2020). The subject-centered sociocultural approach (Eteläpelto et al., 2013) views individuals as feeling and willing agents who actively and continuously reconstruct their realities by choosing and considering what is worth pursuing within a complex interplay of individual, social, temporal, cultural, and material aspects of agency. This approach conceptualizes agency as a constantly evolving process over time in relation to social and material environments in terms of their constraints and resources (Priestley et al., 2015; Jääskelä et al., 2020). The work of Jääskelä et al. (2020) highlights how student agency in tertiary settings relates to certain *individual* resources, such as competence beliefs, self-efficacy, and intrinsic motivation, *relational* resources including emotional atmosphere, experiences of trust, support, and power relations, and finally, *participatory* resources referring to subjects' experience of the opportunities for active participation, influencing, and making choices. Eteläpelto et al. (2013) argued that agency should not be analyzed by focusing on the events of action, as the agency can manifest itself eclectically. Rather, the subject's interpretations, meanings, and purposes in the process of manifesting agency need to be considered, which can appear, for example, as resistance to or purposeful maintenance of existing practices.

A subject-centered sociocultural approach connects with the socio-cognitive perspective of Bandura (1986, 1999) in that perceived self-efficacy is the most central foundation of human agency. From a socio-cognitive perspective, the agency is approached by emphasizing the individual capacity to influence and produce the desired effects by one's actions, where the belief in that capacity is intrinsic to the evaluation of goal setting. While a socio-cognitive perspective (Bandura, 1986, 1999) usefully highlights the individual experience of determination, self-esteem, and competence, which play an influential role in motivation, the focus on the individual tends to bypass the significant role of others and environmental conditions in the realization of agency. Nevertheless, the subject-centered sociocultural approach acknowledges the processes by which subjects construct and practice their agency and focuses on how the subject learns through these processes (Eteläpelto et al., 2013). Furthermore, it is acknowledged that agency cannot be considered as a power that an individual possesses but, conversely, as a dynamic process where the agency can be achieved through engaging with unique temporal–relational contexts and environments (Emirbayer and Mische, 1998; Biesta and Tedder, 2007). Thus, the agency can only be realized in the present moment; it cannot be separated from the involvement of the past and the future, or the available resources or structural factors provided by the environment (Biesta and Tedder, 2007; Eteläpelto et al., 2013; Priestley et al., 2015).

An increasing amount of research acknowledges the role of emotions in enhancing or hindering the actions and agency of an individual (Eteläpelto et al., 2013; Slaby and Wüschner, 2014; Ruud, 2020). In particular, tertiary educational research has indicated how an emotionally safe climate in learning situations facilitates student agency (Ruohotie-Lyhty and Moate, 2016; Juutilainen et al., 2018; Jääskelä et al., 2020). As emotions are the primary indicators of what we regard as potential doing or potential happening (Slaby and Wüschner, 2014), we believe emotions are a significant prerequisite in the process of agency as they demonstrate resistance or active participation in social action. The research on students' agency recognizes the presence and range of emotions children experience and use to inform and understand their agentic action and participation (Kirby, 2020; Mameli et al., 2021). Students' agency is not just carrying out the instructions of teachers, but students' actions alter the shared space of the classroom, the possibilities of teaching and learning activities, and their experiences (Kirby, 2020). Arguably, this creates a foundation for future action or inaction (Emirbayer and Mische, 1998).

Approaching agency through interpersonal entrainment and intersubjectivity in joint musical action

In addition to student agency, musical agency, as an important part of music education practices, has been acknowledged in research (Karlsen, 2011; Juntunen et al., 2014; Saarikallio, 2019; Ruud, 2020). Musical agency refers to both individual and collective ways of interacting with music (Karlsen, 2011), becoming aware of one's personal, relational, and material resources (Ruud, 2020), and being a resource for development, empowerment, and identity construction (Saarikallio, 2019). For example, in Karlsen's (2011) work, the individual dimension of musical agency includes aspects of how one can use music to extend one's position in the world and to construct oneself in relation to others, such as perceiving and

playing music, shaping self-identity, and using music for self-regulation. The collective dimension of musical agency (Karlsen, 2011) includes aspects of how collectively, through music, it is possible to explore social relationships, regulate and structure social encounters, and affirm and establish collective identity.

Musical entrainment, to a degree, is present from the early stages of a life span (Winkler et al., 2009; Zentner and Eerola, 2010), and it continues to develop and change over time. Entrainment for a primary school student, for example, is not as precise as for professional musicians (Clayton et al., 2020), which suggests that entrainment is something that can be partly learned and developed. Entrainment has been widely studied in music education and music therapy contexts, as it has been regarded as a significant factor in uniting humans throughout their life span. Rhythmic entrainment has been argued to result in prosocial behavior and foster the social competence of children (Kirschner and Tomasello, 2010; Ilari et al., 2018). Furthermore, in the work of Mogan et al. (2017), synchronous actions were found to affect prosocial behavior, perceived social bonding, social cognition, and positive affect. As previous studies have indicated that entrainment contributes to prosocial behavior and social cohesion, they justify entrainment being further studied from a social perspective. Thus, in our research, we focus on the social dimension of interpersonal entrainment in a joint music-making context. From the social theory perspective, musically entrained behavior, like music and dance, connects profoundly to human sociability (Clayton et al., 2020), which plays a central role in the conceptualization of a subject-centered sociocultural approach to agency (Eteläpelto et al., 2013).

Research suggests that synchrony drives prosocial effects, such as cooperative behavior and empathy, through affective mechanisms (Mogan et al., 2017). Also, Launay et al. (2016) have argued how synchrony, active engagement in musical activities, and moving together influence social bonding by emphasizing the role of neurohormones, such as oxytocin and endorphins. Furthermore, Trost et al.'s (2017) work illustrates why entrainment could be experienced as a desirable and pleasant state, as they found that a level of mostly positive and arousing emotions is induced through perceptual, autonomic physiological, motor, and social entrainment. However, although the mechanisms between entrainment and emotional experiences remain unclear (Clayton et al., 2020), the connection between affective entrainment of sharing affective states between individuals in joint music-making and social bonding has been strongly suggested (Phillips-Silver and Keller, 2012). Thus, entrainment in joint music-making should be understood through social and interpersonal synchronization with complex affective experiences, in addition to synchronizing with the beat alone (Phillips-Silver and Keller, 2012; Clayton et al., 2020).

The work of Clayton et al. (2020) proposes a new model of interpersonal entrainment that compares two separate components, synchronization and coordination within musical contexts, in terms of their role in culturally shared knowledge and the connection between entrainment and social processes. They argue that there is a need to study this phenomenon in relation to other social processes in order to increase our understanding because, alongside aspects of evolution, development, psychology, and neurophysiology, there are also social and cultural dimensions that have a clear impact on interpersonal entrainment. They describe how social, material, environmental, and cultural aspects affect interpersonal entrainment, and how knowledge, in other words, being able to plan and anticipate, plays an important part in the process of interpersonal entrainment. As participation and engagement are necessary for the realization of interpersonal entrainment in joint music-making, it requires highly agentic action and will from an individual to take part in social music-making. In other words, entrainment in collaborative musical action does not just happen; rather, individuals have to want, be able to, and actually act for entrainment to be possible. Repetition and loops open participatory musical forms and create a sense of safety (Turino, 2008), whereas the dense musical texture hides "mistakes" made by individuals and eases the contribution at different skill levels (Ruud, 2020). Ruud (2020) suggests that the participatory aspect of making music together emphasizes contribution and democracy among participants instead of musical skills. Possibly, the music itself creates a safe environment, thus resourcing opportunities for agentic action by students.

As in the work of Phillips-Silver and Keller (2012) and Trondalen (2016) points to the significance of affective experiences and intersubjectivity (Stern, 2004) when seeking an understanding of the relational nature of joint music-making in the here and now. According to Trondalen (2016), intersubjectivity, at the practical level, encompasses awareness and the exchange of affects in time, as well as experiencing each other through the body, affect, and such experiences of "I feel that you feel that I feel." Microprocesses, such as movements, facial expressions, timing, and intensity of moment to moment, are unspoken and relational, and they form the basis for subjectivity, togetherness, possibilities of action, and language itself in the intersubjective process among participants (Stern, 2004; Trondalen, 2016). Similarly, Vass (2019) argues how musical encounters, embodiment, and mutual resonance open the way to dialogical space that is a prerequisite for intersubjectivity, the nature of which reaches beyond the verbal world and intellectually constituted thought. Furthermore, Vass (2019) highlights students' embodied agency in the joint musical activity that opens a unique way to the center of learning through the embodied experience of knowing and relating. These aspects of intersubjectivity in joint music-making elucidate the multimodal environment and the available and constraining resources for the construction and development of agency, as likewise, intersubjectivity is regarded

as a key quality of agency (Damşa et al., 2010; Vass and Littleton, 2010).

Becoming entrained points to conscious relational experiences and the non-verbal interactive processes that are inseparable aspects of joint music-making (Trondalen, 2016). As Cross (2014) highlights, interaction in music is something other than interaction in language because music can provide a space to sense others in which the participants can align their attitudes and motivations with those of others. Similarly, Trondalen (2016) emphasizes that through verbal conversation, it is possible to describe the meaning of musical experiences, but it can never replace the experience of meaning at the non-verbal level. These experiences also shed light on *implicit relational knowing*, that is, one's feeling of oneself and others in the here and now when making music together. Implicit relational knowing emphasizes one's feeling of how to do things with others in a musical presence, as its essence lies in the attunement of affect and involves joint intersubjective recognition. This expands an individual's state of consciousness and increases the opportunities to create new ways of being together (Trondalen, 2016). Thus, in this study, joint music-making is considered to be a holistic, highly interactive, embodied, and affective process among individuals through music, which creates a platform for subjective experiences and agentic action. While measurements provide insight into physiological changes and alignments, quantitative research provides little insight into the conscious activity of participants. Interpersonal entrainment no doubt involves spontaneous neurophysiological processes, but more understanding is needed about the intentional participation of individuals as a part of entrainment as well as the individual, social, and cultural processes that influence interpersonal synchronization and coordination in music.

Aim of the study

In the present study, we explored the relationship between entrainment and agency through the reported experiences of students and teachers in joint music-making. The following research questions focused more specifically on:

(1) What characteristics of agency are present in the reported experiences of students and teachers in joint music-making?
(2) In what ways do agency and entrainment resource and constrain each other in joint music-making?

Methodology

This qualitative interview-based study draws on the reported experiences of 11 teachers and 23 students. The findings reported here belong to a larger study examining different aspects of music education in Finnish primary education. The overall dataset comprises 11 teacher interviews and 11 student pair interviews. The first study focused on teacher beliefs about student agency in whole-class playing, in which an abductive approach was used to identify and examine the manifestations of student agency and musical agency (Stolp et al., 2022a). An abductive approach (Timmermans and Tavory, 2012) was chosen as it allows the interplay between data and existing theories as well as the extension of theoretical perspectives through the creative process. The abductive analysis was double-coded by two coders for teacher interviews, and intercoder reliability was 93.75%. The findings highlight the significance of student agency in joint music-making from the teacher's perspective. A second study examined students' experiences of whole-class music playing (Stolp et al., 2022b). A complementary insight from the two initial studies was the significance of interpersonal entrainment in relation to agentic activity and joint music-making, described as, for example, *"The most significant thing in joint music-making is that through music, through musical experience, and with the help of music, you become part of something bigger than yourself and you have a special role in the group. That you kind of disappear and you become part of an entity. Once you get the experience that you are part of the wholeness of the sound, with the sound you produce, and once the wholeness sounds very good, you want to do it again"* (Teacher 10) and *"Everyone is focused and concentrated on the same song. The best thing is that we have a good rhythm, and everyone is participating actively and seriously"* (Student 10). The study reported here brings the teacher and student interview datasets together to specifically explore the interpersonal entrainment resources and benefits from student agency in joint music-making.

Participants

The individual teacher and student pair interviews were conducted when strict guidelines were in place due to the COVID pandemic. While the pandemic significantly limited access to research participants, the participants in this study include 11 music teachers and a class of sixth-grade students (23 students, 12–13 years old). In Finnish schools, there is usually only one specialist music teacher who teaches music to nearly all pupils in one comprehensive school, although a willing and qualified class teacher can also teach music. The teacher participants from various schools in Central Finland were recruited through school email or social media. Student participants were recruited *via* one of the music teacher participants. The selection of Grade 6 students was guided by the timetables of the school and the interviewer (first author) as well as the willingness and ability of the students to participate in the pair interviews.

TABLE 1 Backgrounds of the participants in the study.

Participants	Number	Age	Male/Female	Work experience (teachers)	Education (teachers)
Teachers	11	28–55	2/9	2–25 years	Class teacher (n = 3) Music teacher (n = 4) Class + Music teacher (n = 3)
Students (Grade 6)	23	12–13	11/12		

With regard to increasing the diversity of the teacher participants, we sought variation in their educational background, the schools they taught in, work experience, and age. All of the teacher participants taught music in Grades 1–6 in Finnish basic education. Three of them were qualified as music teachers and three as class teachers, and four of them had the qualification of both music and class teachers. The teacher participants' backgrounds, including their gender, age, education, and work experience, are presented in **Table 1**. Due to the pandemic, it was not possible to recruit more student participants; nevertheless, the class of 12–13 years old included 11 male students and 12 female students with a variety of musical backgrounds, ranging from enthusiastic hobbyists to those who only regarded music as a compulsory school subject.

Ethics and procedure

Before contacting the student participants, we contacted the ethics committee of the university for the evaluation of the need for an ethical review to be carried out for our study. However, consent from student participants' guardians was enough to comply with the guidelines of the Finnish National Board on Research Integrity (TENK, 2019). No ethical review was required. Consent forms were collected from all teacher participants. Permission for the study was obtained from the municipal school authorities and the principals of the schools involved, and teacher participation was voluntary. Before data collection, the teacher participants, as well as the student participants and their guardians, were informed by the first author about the purpose of the study, methods, and ethical commitments, after which oral consent was given by the students, and written consents were signed by their guardians and teachers. Prior to the student interviews, the first author also visited the students' class to give them information, such as explaining that the questions would be about their experiences of joint music-making and to reassure them that there would be no need to prepare for the interviews. The students were also told to just be honest when answering the questions and that they would be able to ask questions. Teacher participants were interviewed in October 2020, and the students were interviewed during normal school hours on the school premises in April 2021.

Student interviews

Semi-structured interviews (Tracy, 2013) were conducted by the first author and guided by the subject-centered sociocultural approach to student agency (Jääskelä et al., 2020) and musical agency (Karlsen, 2011). The class teacher divided the student participants into pairs and one triad prior to the interviews by allowing the students to freely choose their pairs. The questions were designed so that the students could easily answer descriptively and concretely but also be able to share their experiences and perspectives of joint music-making. The questions concerned the students' relationships with music and their actions in the process of joint music-making. For example, a typical question was as follows: *When you begin to play a song with your class, what are the things encouraging you to participate?* As theories (Karlsen, 2011; Jääskelä et al., 2020) indicate, there are individual, relational, participatory, and musical resources of agency that either foster or limit agency; our questions were formed in a way that participants could give us examples of what affects agency in joint music-making. All the questions used in the interviews are presented in **Appendix 1**. The interviews (lasting from 6 to 15 min) were conducted as pair interviews (with one triad) in a small room during the lessons. It was noticeable during the interviews that when one student shared their reflections, their pair often built on this reported experience by sharing something similar or using this as a contrast. The interviews were recorded, transcribed, and anonymized. The final dataset included 103 pages of transcribed text (double-spaced, 12-point font).

Teacher interviews

Interviews were conducted remotely on a one-to-one basis by the first author *via* Zoom or Microsoft Teams. Before the interviews, the teachers were asked to complete a short questionnaire on their background information, including their gender, age, education, and work experience. This information was used only to ensure the diversity of the sample and was not used in the analysis. The semi-structured interviews (Tracy, 2013) were guided by a subject-centered sociocultural approach to student agency (Jääskelä et al., 2020) and musical agency (Karlsen, 2011). The questions allowed teachers to reflect on their own experiences and meanings of being part of joint musical action, and space was provided for them to share their

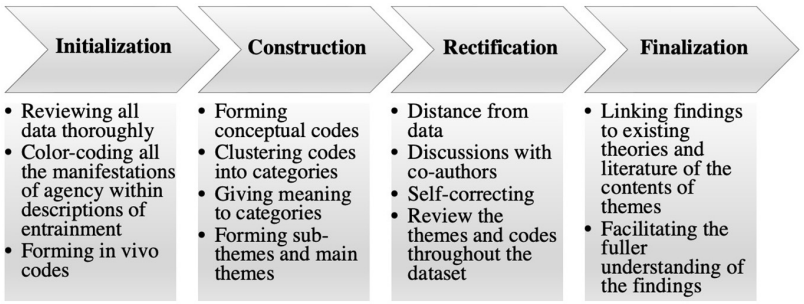

FIGURE 1
The process of theme development after Vaismoradi et al. (2016).

experiences and perspectives of joint music-making playing as teachers. An example of an interview question is the following: *In your opinion, what affects how a whole group of students starts to play together, and how is the joint music-making playing situation built?* All the interview questions are presented in **Appendix 2**. The average length of interviews varied from 30 to 60 min, and the recorded interviews were transcribed and anonymized. The final dataset included 260 pages of transcribed text (double-spaced, 12-pt. font).

Data analysis

The data were analyzed within a qualitative content analysis framework (Vaismoradi et al., 2016). While our interest in the agency in music education informed the data collection process, our four stages of analysis included both abductive (first stage) and inductive (second, third, and fourth stages) approaches to be as open as possible to the themes raised by the student and teacher participants. In the analysis, we adapted Vaismoradi et al.'s (2016) theory of the theme development process, as shown in **Figure 1**. The goal of the qualitative content analysis was to identify the themes that reflected the experiences of the participants regarding agency during entrainment in joint musical action.

Teachers' interviews were double-coded by two independent coders for calculating intercoder reliability, which was 93.75%. Since the first author ran the double-coding process of the teachers' interviews, she was also responsible for the coding of the student interviews, which were not double-coded. However, the third stage of the data analysis process included going through the data analysis with the co-authors and discussing the codes and themes as there were also some unclear codes that were placed together under certain themes to ensure the integrity of the analysis. The overall analysis consisted of four stages. The first stage, which was abductive, was to become familiarized with the data through careful rereading, identify the manifestations of agency based on the individual, participatory, and relational dimensions of student agency in the descriptions of experienced entrainment in the transcribed text, and utilize them as *in vivo* codes. The second stage was to sort the *in vivo* codes, based on their similarities, into conceptual codes and further sort these codes into potential themes (see **Figure 2**). After 11 student pair interviews and 11 one-to-one teacher interviews, data saturation was reached, meaning that the data were collected until nothing new was apparent (Tracy, 2013). Third, after distancing, discussions with co-authors, and self-correcting, potential themes were reviewed to ensure that the themes were representative of meanings that arose in the data. The final stage in the analysis was to examine the findings in relation to existing theories and literature to facilitate a deeper understanding of the findings.

Findings

The findings of the study are presented through four themes identified in the analysis: presence, belonging, safety, and continuity, which opens a unique pathway to view the relationship between experiences of agency and subjects' experiences of entrainment and the resources and constraints involved. Each theme is presented in its own sections.

Presence

When discussing playing together as a group, both student and teacher participants emphasized in many ways the meaning of being present in the moment, here and now. In a way, presence crystallizes the collective, focused moment where individuals become visible and aware of not only their environment and themselves but also others, as Teachers 11 and 9 described:

> Teacher 11: It starts from the moment, while we play, when I get to engage every single student in that very moment by saying that "you are here now, I see you, and you are part of this thing that we do together" and "you, as yourself, are

> part of this and it is enough" and "how cool [it] is that you are here and part of our band!"

> Teacher 9: It is like living the music in the moment together. It means that our awareness and our attention is focused on the mutual thing that we are doing together. It requires that our attention cannot be focused on anything else at that moment. It is, like, here and now, meaning that it is something you cannot do remotely tomorrow or alone during the break.

Students also described entrainment in their experiences of joint music-making as having a "good rhythm," and as intensive moments of collective concentration and focus, which they seemed to be willing to aim for and maintain. Experiences of entrainment made them feel positive emotions when succeeding or, on the contrary, disappointment if the level of engagement of peers was low, as indicated in the following extracts:

> Student 1: When everyone concentrates and participates and succeeds it makes you very happy.

> Student 10: Everyone is focused and concentrated on the same song. The best thing is that we have a good rhythm, and everyone is participating actively and seriously.

> Student 8: I think it is because we are playing in the same rhythm and we all play the same thing, and when everyone concentrates, then everyone stays in the same rhythm.

> Student 12: The attitude of the others, like how they come to participate and if everyone concentrates. If they don't, you can't concentrate either.

These extracts indicate how experiences of entrainment, which is often related to an unconscious body synchronization process, connect not only with various aspects of musical agency, such as consciously perceiving a good rhythm that participants produce collectively by playing their instruments but also becoming aware of relational and individual aspects of agency, such as peers' support, active participation, and motivation.

Interestingly, teacher participants provided insights into how presence in joint music-making is a strongly embodied experience, as teachers described how they became aware of themselves physically. Playing together was felt in their bodies as "resonance" (Teacher 9), "vibe" (Teacher 2), or how "the body just starts to go along" (Teacher 7). There were also comments in the teacher interviews about how the presence in music was experienced bodily by their students. Teacher 8 described how a student would refuse to play any instrument, but as the playing started, the student immediately started to physically "sulk in tempo." Teacher 7 described how when there were not enough instruments for all students, those without instruments began swinging and moving to the music while others played.

The findings indicate how presence in joint music-making includes becoming aware of the embodied experience but also actively sensing and becoming aware of shared feelings that are present in the moment, as in the following comments from teachers and students:

> Teacher 10: There is always shared emotional experience that takes shape in playing together, like enthusiasm for example. I can see the enjoyment from their faces.

> Teacher 1: It was a memorable experience for all of us, me and the students, because we were so excited. We just went to play together during the breaks because we enjoyed it.

> Teacher 6: It is a kind of emotional language, or a way to experience emotions together. You have to experience it and be part of that before you can give meanings to your experience.

> Teacher 11: We [students and teacher] always stop at some point just to reflect on how we feel after we manage to play something together.

> Student 9: The moments when everyone is able to concentrate and is happy in what they do are precious moments. It feels like we have a good team spirit in those moments.

The findings indicate how presence and the immediacy of the moment in joint music-making are elements that often defuse the resistance of a student and help them to focus. Teachers described how "a resistant student changes course quickly" (Teacher 11), "no one bothers to fool around" (Teacher 1), and 'hyperactive and unfocused students just start playing without a problem" (Teacher 10) once the music and playing start.

The findings point to the active and intentional way of becoming aware of the moment with music, self, and others, engaging with the moment by concentrating and participating, and feeling the shared positive emotions that are taking shape through the collaborative act. These experiences connect with individual resources of agency, such as motivation and self-efficacy, through experiences of success and positive emotions,

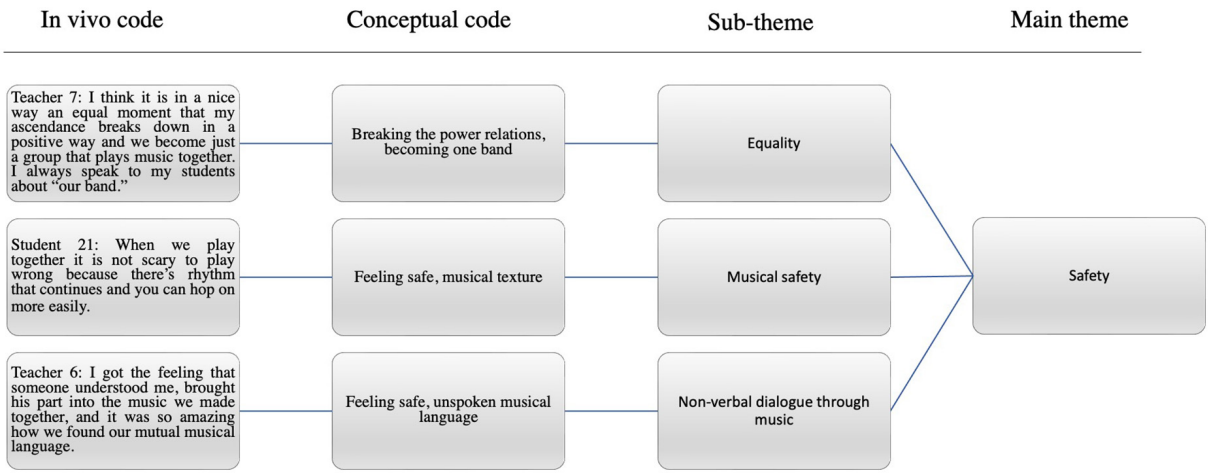

FIGURE 2
Phases of coding and theme development.

but also with relational resources, such as peer support, which intertwine with participation activity and a will to be part of an experience. Becoming entrained with others in these experiences leads to increased agentic participation, affect attunement, and joint focus in the very moment, which are central aspects in intersubjectivity and supply feedback to agency. However, the environmental constraints, such as peers having problems with concentration and the availability of instruments, during joint music-making have a significant impact on the participatory resources of agency, as to at what level it is possible to take part in the activity. It is, after all, that "music lives in time. It is a unique sound that we produce in this very unique moment, and this sound and moment will never come again" (Teacher 10).

Belonging

The student and teacher participants provided insights into the belonging and sense of togetherness during joint music-making in both social and musical dimensions, a moment before students "disappear" into the entity and become a collective "one." They described how, through music, they perceived themselves as being part of a musical and social entity, through which they experienced strong positive emotions, such as feelings of success or enthusiasm, and which further strengthened their agency such as their willing to actively take responsibility in entering or maintaining activity. These descriptions of musical experiences where one disappears and becomes part of an entity with the help of music, and being part of the wholeness of the sound which sounds good, are interpreted as experiences of entrainment. Teacher 10 described this:

> The most significant thing in joint music-making is that through music, through musical experience, and with the help of music, you become part of something bigger than yourself and you have a special role in the group. That you kind of disappear and you become part of an entity. Once you get the experience that you are part of the wholeness of the sound, with the sound you produce, and once the wholeness sounds very good, you want to do it again.

Describing a special role in the entity and producing sound underlines the individual aspects of agency, such as active participation and competence, and the relational aspects, such as becoming collective "one" with and with the help of peers. By mentioning "you want to do it again" points to the individual aspect of agency where motivation, which is central to agency, seems to be fostered through the musical experience of entrainment. Moreover, there are both individual and collective aspects of musical agency present in this extract: actual playing, perceiving music and its elements, and collaborative musical action.

The theme of belonging was based on two sub-themes, the social and musical, which could partly be analytically separated but overlapped and constituted each other. In the interviews of students, these sub-themes were easier to separate, whereas, in teacher interviews, they were intermeshed in a way that made it almost impossible. The significant factor in all these experiences of belonging, in terms of the social and musical aspects, is that they awaken positive emotions that are closely linked to agency (Slaby and Wüschner, 2014) when considering and choosing what is worth pursuing or maintaining (Eteläpelto et al., 2013). In the student interviews, the social aspect was highlighted by Students 8 and 9, who stated how they "like to play with their class because you don't have to be alone" and by Student 11:

> The best thing is that we have a good team spirit when we play together.

There were a great number of comments by the students describing the musical togetherness, that is, actively perceiving the music and adapting their acts to collaborative musical action, which seemed to lead to satisfaction and experiences of success, as can be seen from the following comments:

> Student 13: It sounds like real music when we all play together.

> Student 4: The best thing in joint music-making playing is the fact how it sounds. When everyone plays instruments in the same tempo, it sounds really good.

> Student 8: The best thing is what the end result sounds like if we succeed.

> Student 17: We sound like a real band.

However, there were also comments from both students and teachers about how failing to maintain entrainment makes the sound unpleasant and causes feelings of failure, and how the entity is fragile and dependent on individuals and their efforts:

> Student 5: If we all play together, then it might lose the same pace if everyone plays at a different tempo.

> Student 4: If the class just messes around and does not succeed, then it just sounds stupid.

> Teacher 9: It doesn't work if we don't listen to each other. If we are missing the joint tempo, it won't work, and you can hear it and feel it in the same way you can hear and feel it when it works. And then the student gets the feedback right away if it works and whether he succeeded. That now we succeeded together. The feedback is immediate when something succeeds.

> Teacher 7: Unfortunately, if the drummer, for example, can't maintain the tempo, the whole group can get the experience of how the whole thing collapses.

In the teacher interviews, the social and musical aspects of belonging were more intertwined. Teachers shared their own meaningful experiences of joint music-making and moments of entrainment, as well as their experiences of their students playing together. These experiences shed light on the emotional aspect of both agency and entrainment, where the experience of entrainment opens the way to a sense of togetherness and which arouses positive emotions affecting and expanding participants' beliefs about what they are capable of and willing to enter, as can be seen in the following comments:

> Teacher 4: To me, the significance is in making something big together. Something much more than my own part alone. That together you can do more than you can alone. It is just the best thing being part of the great sound machine. Like it is such an amazing feeling if I play this, and you play that, and the entity sounds so good.

> Teacher 2: That you feel you can have an impact on the joint sound that is produced together, realize your own part in that entity and how your part influences the whole. That you hear what the others are doing and perceive yourself as a part of an entity. Those are rewarding and motivating experiences.

> Teacher 3: It was super nice when the class got the song to sound good together! When it starts to sound good, whether it was sung or played, it is a totally different thing to experience the moment of succeeding as a group than alone. I asked them, "Did you all notice?" and they were gasping, "It sounds ridiculously good!"

> Teacher 7: Maybe the feeling when you notice that this is a shared experience of succeeding, that together we got this done and we sound amazing. We always toot our own horn if we succeed.

These extracts indicate how the moments of success are perceived through the quality of entrainment and reached through active participation, enactment of individual competence, and are both responding to and becoming aware of the support and emotions of peers and the teacher. In other words, the agency is needed for entering, perceiving, and becoming aware of the whole experience of entrainment, and it further facilitates the motivation and self-efficacy of an individual.

An interesting aspect of belonging was highlighted in one teacher's comment that the sense of belonging in joint music-making can be so strong that it, in a way, can overcome a student's insecurity of being competent through the experience

and facilitate the self-efficacy of an individual, which is one characteristic of individual resources of agency:

> Teacher 3: It was incredible because there was this student who could not play all the chords, but he did not care, did not toot his own horn, but instead played those chords he could. The entity did sound so nice that he was engaged and felt being fully part of that.

These extracts reveal how the increased motivation, sense of self-efficacy, and being capable of having an influence, not only individually but also collectively, comes out of the enactment of belonging, which requires active participation, willingness, and taking responsibility as an individual. These extracts also provide insights into the experiences of entrainment, as perceiving the musical structures and coordinating actions that connect with the experiences of togetherness and extend the relational resources of agency, such as the sense of safety and peer support. These experiences outlined here depict the resourcing and constraining relationship between agency and entrainment. They show how the ongoing social and musical interaction and the perception of oneself as being part of a larger entity are followed by positive emotional and musical feedback, which, in turn, contributes to motivation and agentic participation.

Safety

Safety as a characteristic of joint music-making in the experiences of students and teachers relates to the interactional, musical, and relational aspects from a subject's point of view that construct and shape the social environment through musical experiences. Joint music-making connects to an individual's sense of safety, which is an important relational resource in facilitating the self-efficacy of an individual. Safety in joint music-making occurs through social interaction, such as listening, being responsive, respecting others, adjusting to them, and taking them and the responsibility for the collective into account. Students and teachers provided insights into the experiences of entrainment of how music itself creates a safe place to become part of something more because once the rhythm and dense musical texture go on, it is safe to make mistakes, as noted in the following comments from students and a teacher:

> Student 21: When we play together, it is not scary to play wrong because there's rhythm that continues and you can hop on more easily.

> Student 20: You don't have to be scared if you say lyrics wrong or play a wrong chord. You are not alone because we are together in it.

> Teacher 11: I feel very safe and nice when together with people I do the same thing at the same time.

Experiences of teachers also point to the concept of equality, which is one central aspect of relational resources of agency, as differences in skill levels blend into the music and as the power relations break down as a result:

> Teacher 6: Everyone plays the same. so there is nothing like someone being way better than anyone else *per se*.

> Teacher 7: I think it is in a nice way, an equal moment, that my ascendance breaks down in a positive way, and we become just a group that plays music together. I always speak to my students about "our band".

Teachers emphasized the meaning of social skills during joint musical action, such as the ability to "listen to each other," "respect peers," "give space to others," "act responsibly," "adjust," and "be responsive." In joint music-making, these interactions are non-verbal and enacted through music, which creates a platform for a multimodal dialog to unfold, as expressed in the following extract:

> Teacher 11: In my opinion, successful joint music-making playing is an indication of the ability to listen to others and take others into account. I can demonstrate to my student that when he did this in music, he was part of the group, and that he respected his classmates by doing his role, and nothing else, and how, by doing so, he gave the space for others to do their thing.

Teacher 2 described how experiencing playing together is "like reading someone else's thoughts in a different way than you do while speaking," and Teacher 10 noted how "when we play together, we say much more than we can while speaking." In other words, the experience of joint music-making and entrainment gives rise to intersubjectivity, increasing a sense of safety and mutual trust through social dialog that goes beyond verbal understanding. These experiences arouse positive emotions and seem to establish the sense of unity between people, as one teacher described:

> Teacher 6: I got the feeling that someone understood me, brought his part into the music we made together, and it was so amazing how we found our mutual musical language.

Interestingly, this non-verbal social dialog might be one aspect that enables resolving tensions among a class that struggles with bullying and social fear. In joint musical action, the aspect of safety in the experiences of entrainment provides a group of students a chance to explore their mutual relationships and to affirm their unstable relational balance at an abstract level of social interaction. Another teacher shared an experience of classes with social tension that affected how they could (or could not) play together, and once the teacher had managed to get them to play together, there was an ease of doing and a will to keep on playing, as described in the following comment:

> Teacher 2: They wanted to play that song all the time together, many hours. They had this tension in the class all the time, and students were stressed because of that. It was, like, we can do this together, and we are able to do this together, and there was this ease of doing.

These findings emphasize the relational resources of agency, such as trust between peers and a teacher, equality, and a musical environment that creates a sense of safety as such. According to our findings, emotions such as relief and ease take over from fear and insecurity, and they nourish the self-efficacy and agentic participation of the individuals. The findings discussed here suggest that the safety in joint music-making is musically and socially constructed through the experience of entrainment and takes shape as dialog that goes beyond words. These aspects of intersubjectivity through the experience of entrainment are resourcing an individual so they can develop their competence without the fear of making mistakes and establish trust for peers by acknowledging their efforts and supporting them when personally playing something incorrectly. Non-verbal abstract dialog creates opportunities to search for new ways of learning how to build trust and affirm social growth when it is challenging in the verbal world.

Continuity

Continuity is the particular characteristic of the process in joint music-making, which describes the cumulative process toward and through entrainment and its connections to competence, self-efficacy, and motivation as it creates possibilities for participation. Both students and teachers described this continuity when they were relating the processes of joint music-making in their classes, and it was closely linked to interactions between the teacher and students, their relationships, and the way teachers facilitated and supported their students' participation. In particular, a comment from one teacher described the nature of continuity and its affordances for the mentioned characteristics of agency:

> Teacher 9: I see joint music-making playing as a puzzle. First, you give the easy pieces for everyone, and we start to slot them together where they belong. And when I see those easy pieces go to their own places, or if not, I can give those more difficult pieces to those students who managed to slot the easy pieces already.

Many teachers explained how they looped the song continuously so that every student got to come along and how they built up the song with their students by adding new layers, instruments, and rhythms on the fly and stabilizing the joint tempo. In the process, students could then choose their own ways of participation, as two teachers stated:

> Teacher 8: We start with the simple things, and only after that do we add something new so that every student can participate at their own level.

> Teacher 4: After the moment that everyone has had time to get to know the instrument and chords they are about to play, I start to accompany them with piano by looping the chord progression and say to them: "Come along and play those chords that you can and know," and once I see frustrated students who would want it to succeed right away, I remind them, "Play the chord that you can. It is more than enough!" And I see them calming down when they succeed. And they realize it is enough in this moment now.

Students were also aware of the nature of the process, interaction, and continuity as they described the support they needed and got from their teacher. They explained how the teacher "gives instructions how to get started," shows "chords from the screen to keep us together," or "accompanies" their students to help them maintain the entrainment and to help them to find their own ways of participating, as in the following extracts from students:

> Student 21: Teacher gives options for how to play more easily. "Try that one first" and then "After that, you can start to play more," and it makes it much easier.

> Student 2: We always do it first in an easy way, and we slowly fasten tempo. So everyone gets to come along.

The goal of the process seems to be the moment when the teacher no longer supports the entrainment, but students themselves carry the entrainment themselves. That means, from the agency point of view, that students have found their individual ways of participating in their environment and are competent enough to work safely and collectively with their peers, leaning on their peers' support

but bringing in their own efforts as well to that moment. Again, emotions related to pride, success, and joy are present in these moments, as a student and some of the teachers noted:

> Student 2: If it succeeds well, we do not need the teacher to accompany us with any instrument.

> Teacher 6: It is so nice when we can let go of the backing track and students can be, like, "Now WE played this!"

> Teacher 5: I always aim at that moment when I am no longer needed and my students themselves can maintain and go through the song. When I can leave my instrument and the song just goes on, I always praise my students, how they are so skillful and how wonderful it is that they can do it on their own.

> Teacher 3: The idea of using backing tracks is that they keep the whole thing together. But, at some time, you can let them go once the students can act independently enough that they can play the whole song through without any help.

> Teacher 11: In some classes, students just say to me, "Teacher, you don't have to show the chords to us any longer." because they just know. I just say to them, "You see how you start to learn and perceive? I am no longer needed because you know and feel when it is time to change the chord".

However, there were also teachers who were struggling with the resistance of the students:

> Teacher 3: I am wondering how the students are experiencing a classmate being resistant, like if he just refuses, does not want to, or is not able to participate in joint music-making. Like if there is someone who fools around or discloses not knowing how or refuses to do something, which I experience quite often. Like what can I do? Is it about the skill, insecurity, or maybe a psychological problem why it is so hard for someone? Like, can we know why joint music-making works with some class and why not with some other class?

> Teacher 11: I see it almost every day how a student does not even try, or maybe tries a bit but then gives up. This same thing appears within different classes as well with the same student, like how you are able to try. And how quickly you tend to give up when you feel something is challenging and do not learn it quickly.

The extracts above provide insights into the unambiguous side of agency when students might refuse, or even reject, the opportunities to become part of the group or refuse to participate in a way that the teacher desires. However, the findings of the study underscore the richness of the positive experiences the students have outlined, which teacher perspectives have affirmed, like the cumulative process of joint music-making, thus highlighting the relational resources of agency, such as interaction, guidance, and support needed from the teacher and pointing to the opportunities of participating. Through participatory resources of agency, such as opportunities and possibilities to choose, students can move freely toward and through entrainment and thereby stabilize their skills and strengthen their sense of competence and self-efficacy. However, the agency in the joint music-making may be constrained by synchronous collaborative action since the possibilities for individual action are limited. Thereby, the complexity of the aspects of continuity in joint music-making form a significant constraint on agency, suggesting temporality and the individual's self-efficacy, which can create an unpleasant loop where an individual loses the freedom to be agentic and hence demonstrates resistant agency such as withdrawing from joint activity. The findings also emphasize the role of the teacher and their responsiveness and pedagogical sensitivity when guiding students through joint music-making.

Discussion

This study provides a unique view into how agency and entrainment resource and constrain each other in joint music-making. In response to the first research question concerning the characteristics of agency present in the reported student and teacher experiences in joint music-making, four themes were identified that offer different lenses through which to view agency. Presence in joint music-making approaches agency as an embodied, active, and intentional way of being aware and sensing the shared emotions that are taking shape through musical and social acts in the here and now. Belonging, in turn, involves the agentic participation that is at the core of the ongoing musical and social interaction featured by perception and emotions. Safety indicates how joint music-making creates a non-verbal dialogical space for agency and a platform to affirm social growth, but also how perceiving musical elements through entrainment in joint music-making facilitates emotions of ease and relief and creates a sense of safety for an individual to confront and overcome their insecurity. Finally, Continuity clarifies the agentic process of an individual during joint music-making and how, through the opportunities

and possibilities to choose, the way opens up to strengthen self-efficacy and competence.

Second, we investigated the ways in which agency and entrainment resource and constrain each other in joint music-making in the reported experiences of students and teachers. Our study suggests that music and joint music-making function as an invitation for individual agency, as joint synchronous musical action creates a potential environment and opportunity for participation by bringing individuals together in the present moment through entrainment. Musical entrainment becomes an intersubjective experience as individuals make their way to togetherness not only through the musical experience but also through relational and dialogical paths as they are responsive, respectful, and responsible toward others and where emotional encounters are taking shape through joint music-making. Our findings suggest that music produced in joint music-making functions as a form of feedback and a resource for an individual, as by perceiving the tightness or looseness of entrainment, as individuals and as a group, there is an immediate sense of togetherness, raising positive emotions that further enrich the sense of togetherness—we did this, and we sound good! In this feedback loop, awareness, anticipation, and reflection come together, reinforcing one another, fostering the self-efficacy of an individual, a sense of belonging, and confirming the intersubjective experience of joint music-making.

The findings of this study provide insights into the constitutive nature of the relationship among agency, entrainment, and intersubjectivity as they highlight the role of becoming aware of the present moment, emotions facilitating or limiting the process, musical and social togetherness, and the sense of safety, but also the complexity of aspects that may constrain agency and lead to resistance and withdrawal from the activity. The intersubjective experience of entrainment in joint music-making opens a dialogical space for relationships through music and body (Vass, 2019), for both students and teachers, which functions as a platform for agentic participation and the development of relational resource and social safety, which are central for agency (Juutilainen et al., 2018). Thus, this dialogical space can be regarded as a significant resource for agency. Particularly, as the experience of entrainment is often featured by positive affects, and as emotions are closely linked to our agency when considering what is worth pursuing, these emotions are featured by the experience of entrainment and resource agency in versatile ways. However, the temporal aspect of agency or the temporal ongoing process of the experience of entrainment shaped by emotions, in other words, the previous experiences of an individual and how an individual tends to give up when learning something new, seems to be either a remarkable resource or a constraint for agency. Moreover, the findings indicate that there is more to understand with regard to this phenomenon.

The findings of this study indicate how experienced music-related entrainment intertwines with intersubjectivity, as the findings emphasize the active feeling, sharing, and being collectively in the very present moment by means of music. Hence, playing together opens a unique space for dialogical relationships that are an important part of intersubjectivity (Vass, 2019). The findings support the understanding of intersubjectivity (Stern, 2004; Trondalen, 2016), the core of which is becoming aware of the collective moment and experiencing each other through unspoken interaction as the microprocesses lead the way. Additionally, the findings elaborate on how in joint music-making, this shared understanding is highly interactive and non-verbal (Phillips-Silver and Keller, 2012) and how it forms a base for one's experiences of meaning, togetherness, possibilities for action, and subjectivity (Trondalen, 2016), which are also central to the human agency (Eteläpelto et al., 2013).

Through music and the embodied resonance in joint music-making, it is possible to sense and become aware of others, respond to and interact with them, and get the experience of both becoming visible and understood at an abstract level that goes beyond the verbal world. The emotionally safe climate has been recognized as fostering agency in previous studies of education (Eteläpelto et al., 2013; Ruohotie-Lyhty and Moate, 2016; Juutilainen et al., 2018; Jääskelä et al., 2020), but we believe that this study contributes to the discussion about the agency by emphasizing the importance of this unspoken way of interacting and relating to each other that forms a platform for building a significant resource of social trust. However, it is not only the non-verbal communication but also the particular role of music, the musical elements, and the experienced entrainment, such as perceived ongoing rhythm and dense musical texture (Turino, 2008; Ruud, 2020), that in joint music-making are essential to creating the sense of safety and giving rise to social contribution and equity. In educational studies, these are regarded as fundamental outcomes of agency (Vaughn, 2020). This might be the key in understanding how joint music-making can foster social growth (Pearce et al., 2015; Saarikallio, 2019), advance prosocial behavior (Kirschner and Tomasello, 2010; Mogan et al., 2017; Ilari et al., 2018), and bring people together regardless of their conflicting ways of thinking.

The findings of this study suggest that during joint music-making, the agency of an individual is constructed by and intertwined with the sense of belonging, which is achieved through perceiving being part of the musical and social entity and which is featured by strong affects. Previous studies link the experience of entrainment to positive feelings and the arousing of emotions because of the feeling of unity at different levels (Phillips-Silver and Keller, 2012), whereas in educational research, emotions are closely linked to the human agency as they lead the way to active participation (Eteläpelto et al., 2013; Slaby and Wüschner, 2014; Kirby, 2020; Ruud, 2020; Mameli et al., 2021). The results indicate that if there is a strong sense of belonging, there are likely also positive emotions and, therefore, a will to actively participate in and maintain

something that exists that involves apparent manifestations of agency (Eteläpelto et al., 2013). Moreover, the results elucidate how the experience of entrainment increases the sense of belonging, as it is characterized by intersubjectivity as the affects that are taking shape through unspoken interaction among participants. In other words, the key finding of this study is in line with previous research that the quality of agency is highly intersubjective (Damşa et al., 2010; Vass and Littleton, 2010) in joint music-making, relationally constructed, non-verbally experienced, and shaped by affects and an environment where relational resources are an intrinsic prerequisite for active participation of an individual.

However, even though this study shows the richness of joint music-making and its affordances to the human agency, there are complexities and contradictions when it comes to agentic resistance and when there are students who might refuse to participate in such an experience. It is a challenge, particularly in such activity, that depends on the social and musical contribution of individuals to even exist in the here and now. This study emphasizes the meaning of holistic and affective experiences that the verbal world cannot reach. This might also be the answer to why an individual demonstrates resistance in joint music-making. As human agency (Emirbayer and Mische, 1998; Biesta and Tedder, 2007; Eteläpelto et al., 2013) is temporally constructed, there are always previous experiences of an individual that are realized in the present moment. Consequently, an individual does what they know from experience, and it might be challenging to them to see what opportunities and possibilities exist in the present. Moreover, if emotions are inextricably linked to experiences and, thus, to agency (Eteläpelto et al., 2013; Slaby and Wüschner, 2014; Ruud, 2020), it is no wonder that teachers are experiencing challenges with resistant students. Emotions have an effect on how we participate and give rise to the possibility of experience, and experiences evoke emotions that are true to ourselves. Thus, we as music educators should never underestimate the power of emotions that are, according to our findings, an intrinsic part of joint music practices, but we should pay extra attention to the risk of social isolation and keep in mind the delicate and emotional construct of agency.

This study also contributes to the discussion about the agency by bringing together both students' and teachers' experiences of agency in joint music-making that is characterized by entrainment and intersubjectivity. These experiences provide insights into how teachers and students' agencies interact with each other in music classrooms, as resourcing or constraining, as together they create a human experience that makes them feel equal through collaborative musical act and entrainment. In other words, this study underscores the dyadic nature of agency in how teachers facilitate and continuously evaluate the opportunities for their students to participate in the musical environment and adapt their teaching based on the responses they get from their students. Conversely, the students similarly negotiate and consider their agency based on the possible opportunities offered by their relational and environmental reality. With regard to further research, we suggest that this encounter between the agencies of teachers and students should be further investigated.

Limitations and future directions

The limitations of this study include the use of interviews of student and teacher participants without performative data that would provide insights into how the experiences and beliefs are enacted in practice. First, we are aware that some of the participants found it easier to share their experiences and thoughts than others, especially when it involved student participants. Yet, the data provided a broad picture of different individuals with diverse backgrounds and experiences. Second, a larger sample size, with more than one class of Grade 6 students and 11 teachers, would provide a more diverse picture of the experiences of students and teachers. Third, the study was conducted in Finland within an educational context that might differ from that of music education in schools in other countries. Future research could include students and teachers in different countries to see whether the findings are reflective of other cultures and contexts. Last, we are aware that our study did not measure how closely entrained our participants were, nor did we comment on the nature of entrainment. Moreover, if the data were explored from a different perspective, other considerations might come to light.

To reflect on the different levels of reflexivity of the study, it is worth acknowledging that this particular study belongs to a larger study examining different aspects of music education in Finnish primary education. The authors of this study have previously conducted two studies that have influenced the theoretical understanding of this study. Moreover, all the authors are not only researchers holding different specialties and supporting various epistemological and ontological positions but also teachers of different subjects, which influenced the way the study was conducted and how the data were collected, analyzed, and interpreted. However, data analysis included a double-coding process and discussions with co-authors to ensure the integrity of the results. Additionally, we have carefully described our interpretations of the data and linked these to existing theories throughout the findings to increase the reliability of the study.

The interviews provided insight into how, through music, our participants perceived themselves as being part of a musical and social entity, which made them experience strong positive emotions, such as enthusiasm when succeeding, which further made them willing to actively take responsibility in entering or maintaining joint music-making. Hence, based on our results, future research could investigate how the participants respond

to someone not maintaining tempo and how it affects their sense of belonging. Nevertheless, we believe our study provides valuable insights into the relationship between agency and entrainment in joint music-making and shows that there is more to be studied.

Implications

Based on the experiences of both students and teachers, it is clear how there are some human interactions such as joint music-making, which is characterized by entrainment and intersubjectivity, that cannot be replaced by providing verbal meanings in place of actual experience. Our study offers a holistic picture of the dialogical space of joint music-making where agency is resourced and constrained through the ongoing, affective process of interaction with music and other people in the here and now. We suggest that it is important to recognize the emotional side of agency, the inner experiences, and the importance of teacher sensitivity when guiding students through educational practices. These points should be addressed in both pre- and in-service teacher education since the holistic nature of joint music-making should be seriously considered as a means to better understand the complexity of agency in terms of both its richness and ambiguity. Moreover, as discussed earlier, the agency should not be understood only as a bare activity and eagerness to participate but also as passivity and withdrawal that often have social consequences. Based on our study, we suggest that the experience of entrainment is such an effective tool in fostering the agency of students and enhancing holistic learning but also that agency is a prerequisite for entrainment and intersubjectivity in joint music-making as it is dependable on the will and participation of an individual. Entrainment is not just an intrinsic part of music education; thus, we would encourage all educators to consider how education could better benefit from having music or experiences similar to those outlined in our study as part of the curriculum. After all, the most important goal of education is the development of human potential at both the subjective and collective levels.

Conclusion

In the present study, we propose how entrainment and intersubjectivity are significant aspects of joint music-making based on the reported agentic experiences of students and teachers. Agency is an important aspect in enabling entrainment in joint music-making, and, in turn, the positive experience of entrainment feeds back to agency in versatile ways. It is notable that agency and entrainment are intertwined with intersubjectivity in the experiences of joint music-making in a way that they together form the whole experience. This means they can be analytically separated, but in practice, they complement each other. Furthermore, our study suggests how an experience of entrainment is conscious and which can be learned and aimed at, and how it feeds into the development of agency through the agentic processes.

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

Author contributions

ES was responsible for the original study design, data collection, material preparation, and data analysis and wrote the first draft of the manuscript. All authors contributed to the study's conception and design, commented on previous versions of the manuscript, and read and approved the final version of this 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.

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Appendix

The questions in Appendices 1, 2 are constructed in a way that they would cover the individual (competence beliefs, self-efficacy, and intrinsic motivation), participatory (subject's experience of the opportunities for active participation and influencing and making choices), and relational (emotional atmosphere and experiences of trust, support, and power relations) domains of student agency, as in the questions for students: "In your opinion, what is the nicest thing when your whole class plays and sings together?" and "Is there something that makes it not so nice?" Additionally, the important individual and collective aspects of musical agency, such as relationship with music, perceiving music, playing instruments, and collective coordinated action are present, as in the question for teachers: "In your opinion, what affects how a whole group of students starts to play together, and how is the joint music-making situation built?"

Appendix 1

The questions used in the student interviews in this article are as follows:

Do you listen to music in your free time, and if so, what do you listen to? Is there an instrument that you especially enjoy playing, and why? Is there an instrument that you do not enjoy playing, and why? If you begin to play a new song with your class, what do you usually do, and how does the process go? When you begin to play a song with your class, what are the things encouraging you to participate? Are there things that make you not want to participate? In your opinion, what is the nicest thing when your whole class plays and sings together? Is there something that makes it not so nice? What does your teacher do when you start to play together as a class? How does your teacher teach you?

Appendix 2

The questions used in the teacher interviews in this article are as follows:

What kind of experiences do you have of playing as a group in your personal life, and what kind of meanings do they have for you? In your opinion, what affects how an individual student participates in joint music-making? In your opinion, what affects how a whole group of students starts to play together, and how is the joint music-making situation built? How do you support an individual student and the whole group in the joint music-making situation as a teacher? Is there something concerning joint music-making we have forgotten to talk about in addition to what we have discussed already? Is there something you want to mention or talk about?

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Playing with tradition in communities of Swedish folk music: Negotiations of meaning in instrumental music tuition

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The present article explores meaning in relation to musical learning. One starting point is the assumption that a meaningful music education is strongly related to the social domain of music-making. The aim of this article is to provide analytical tools to understand how meaning is negotiated within instrumental music tuition. Our interest lies in formal higher music education, an arena where the social dimension tends to be rather obscure, in contrast to the genre of Swedish folk music, which is our empirical context. There is a strong case for revaluing the social dimension in the study and creation of a meaningful music education. In line with this, our analytical framework draws primarily upon theories of situated cognition, situated learning, and communities of practice. In particular, our analytical focus is negotiations of meaning, which are understood as constituted by two reciprocal processes of participation and reification. Meaning negotiation can be defined as a process that is incomplete, ongoing, and open-ended. Since negotiations of meaning refer to a larger picture, they become a useful point of interest in understanding the dynamics between a single learning situation, the educational framing, and the wider musical world of the learner. We exemplify how this analytical perspective can be applied by referring to our ongoing research project, which investigates trajectories of learning within different communities of Swedish folk music. We focus on two analytical nodes that have bearing across the communities and serve as locus points for ongoing meaning negotiations: (i) the identity of *spelman* and (ii) the approach to notation. With these two examples, we hope to show the potential of the framework. We also present methodological considerations that come from applying the proposed analytical tools in our study. Using an ethnographic approach, we lean toward the ideas of "messy research," musical research sensibilities, and stepwise-deductive induction. In the final section of the article, we elaborate on the educational implications that follow from a perspective that takes meaning as its point of departure.

KEYWORDS

music education, communities of practice, messy research, meaningful, instrumental education, identities, competencies, Swedish folk music

Introduction

"All bowings are bodeful" (Jonny Soling, fieldwork notes).

With this citation from one of the case studies of our project,[1] the master fiddler and pedagogue Jonny Soling, captures one of the important dimensions of folk music playing: To learn how to become a *spelman*[2] (traditional fiddler), a person needs to understand the power of the bowing, which is how bodily movements and musical ideas are expressed in the contact point between the bow and the string. The balanced tension created by the musician in action is crucial to the result of the intended musical communication, as musically argued by Jonny Soling in his playing and teaching.

The statement on meaningful bowing was made in a learning context, dominated by oral transmission, in a circle of learners learning from an elderly expert. Most of these learners are already insiders in a folk music community and thus active agents in the making and re-making of values connected to the transmission of Swedish traditional music. While our study uses empirical data from different learning contexts for folk music, our aim goes beyond the genre-specific findings, to contribute to the broader area of instrumental music tuition in formal and informal settings. More specifically, in this article, our intention is to contribute to the understanding of balanced tensions involved in "sense-making" and meaningfulness from the perspective of how instruments matter "to both our sense of personhood and as ways, we engage with/in/through projects of love with the world" (Silverman, 2020, p. 8). In engaging with what a meaningful music education might be, our study contributes to a growing body of research that explores alternatives to a narrow perception of instrumental education. Assuming that a meaningful music education is strongly related to the social domain of music-making, the aim of this article is to provide analytical tools for understanding how meaning is negotiated within instrumental music tuition.

Concerns have been articulated on music education being isolated in research silos of higher music education (Westerlund and Karlsen, 2016), and on educational cultures leaning toward simplified understandings of social and cultural diversity (Sæther, 2003; Schippers and Campbell, 2012; Westerlund and Karlsen, 2017). Thomson (2021) in her study on ensemble teaching with music teacher students and refugees, takes an active approach to break down educational silos. She shows how creative intervention initiatives might contribute to the reciprocal integration and inclusion of learners from inside and outside higher music education. With the concept of *musical thirdspace*, she outlines collaborative musicking as a tool to create a shared identity as a musician in the mixed ensemble. Further expanding on the theme of how music and the social domain are related, MacDonald (2022) calls for music education to include the development of new virtuosities, beyond exceptional technical skills.

Building our results, we present methodological considerations that come from applying the proposed analytical tools in our study. Using an ethnographic approach, we lean toward the idea of "messy research" (Law, 2004), musical research sensibilities (Sæther, 2015), and stepwise-deductive induction (Tjora, 2019). In the final section of the article, we elaborate on the educational implications that follow from a perspective that takes meaning as its point of departure.

Theoretical perspective

In this section, we outline the theoretical framework of this article. First, we outline key characteristics of the social dimension of music-making and introduce important concepts such as *art worlds, musicking*, and *tradition*. In the second section, we move to the central idea of *communities of practice* and introduce concepts connected to the negotiation of meaning.

The social dimension of music-making

Our project rests upon an assumption of music as a form of social and participatory activity. As such, our position is rooted in the works of scholars, who during the last decades questioned the implicit ideas of the nature of music through new perspectives. As a way to emphasize the often overlooked collective and social dimensions of artistic practices, Becker (2008) coined the term *art worlds*. Such an art world consists of people, "all sorts of people, who are in the middle of doing something that requires them to pay attention to each other, to take account consciously of the existence of others and to shape what they do in the light of what others do" (Becker, 2008, p. 375). Viewing art as the practice of an ecosystem of people rather than the result of an isolated genius, Becker made an effort to include people not usually regarded as important. This idea is shared by Small (1998) in his project of reframing our understanding of music as an activity rather than a thing. In this work, he coins the term *musicking*. Such a move brings forth the participative character of musical events, challenging an often assumed divide between (active) performers and (passive) listeners.

Whereas Becker (2008) primarily works from the perspective of jazz music, Small (1998) takes Western art

1 This article is based on empirical material from our ongoing research project "Tradition, Identity and Learning" (TIL).

2 "Spelman" (litteraly translated: Playman) is a term used for referring to the profession of a musician who performs traditional Swedish music. The gender component of the title is sometimes highlighted by using the term "Spelkvinna" (Playwoman) for female musicians in the Swedish folk music genre. The reification process of the term is not discussed in the present study, but it is of interest for future research.

music as his case, and our project is focused on the domain of Swedish folk music. As such, it is important to ponder upon the notion of *tradition*. Bearing connotations of history and approaching the meaning of cultural identity (Ronström, 1989), it is embedded in the understanding of traditional and folk music. In line with the ideas promoted by Becker and Small, tradition as a concept has undergone a transformation during the last decades. Tradition can be thought of in terms of an object or in terms of process, and Schippers (2009) distinguishes five approaches to understanding what constitutes tradition: "[i] tradition as canon or body of works, [ii] a standard with an explicit or implicit set of rules, [iii] a performance practice, [iv] music in culture, and [v] a mechanism of handing down music" (p. 45). Depending on which approach is taken, the emphasis shifts between object and process. As Schippers notes, even though the concept of tradition bears the connotation of history, it does not mean that it must be understood as static.

Emphasizing the interpretative dimensions of tradition, Rice (1994) brings in the four senses of tradition, proceeding from the non-reflective to the fully self-conscious:

> First, in some instances tradition must be constructed analytically by the researcher because it is beyond discourse in the culture itself; second, the word "tradition" sometimes labels a subset of the world or culture in which it is found, as for example, musical tradition, political tradition, literary tradition; third, where it is explicitly invoked in "native" and scholarly discourse, it is a concept requiring both historical or cultural distanciation and reflection; and fourth, when made the object of reflection, tradition becomes a "text" for interpretation and appropriation. (Rice, 1994, p. 13)

In this study, our data can be understood as reflecting all of the four above-described senses: beyond discourse in some of the case studies, clear political labels in at least one of the cases, an outspoken discourse of insiders, and finally as an object for reflection to us, the researchers. Furthermore, even if tradition has a collective scope, the understanding of, and approach to tradition may be different (Tullberg, 2018). As exemplified in our study, tradition is being used and commodified by musicians within the scene.

Finally, the influence of post-colonial thinking as introduced by Bhabha (1994) and Said et al. (1993) has implications on a meta-theoretical level to our study in which we lean toward the conceptual framework of communities of practice (CoP), elaborated in the next subsection. Bhabha's work on the concept of *third space* serves as a metaphorical way to acknowledge that there is a need for a space where working with differences can take place, without a dominant voice, allowing for epistemologies of "the other" to be included in the conversations and negotiations. His argument is that majority cultures tend to include minorities, only if they adapt to the rules and regulations stipulated by the host society. As higher music education takes place within an academic culture, the dominating discourses on music education are sometimes in conflict with other ways of approaching musical learning than what is suggested in Western classical music, for example, as other genres are included in the programs, and widened recruitment opens up for musicians with immigrant background.

Edward Said, interviewed by Beezer and Osborne (1999), suggests that academics (in our case, musicians) have a dramatical duty to perform in special arenas, to dramatize urgent questions, and make them visible. One concrete example of how the concept of third space can serve in re-imagining the role of musicianship and artistic practices is Thomson's (2021) study on collaborative music-making. Her study argues that "by creating musical thirdspaces through social innovations higher music education can prepare future musicians and educators to navigate the intersections of artistic, educational, and social dimensions of music and music education. . .(p. ii)." On an overarching level, our study is informed by post-colonial concepts, as intertwined with an understanding of tradition and musicking.

Communities of practice

Central to our theoretical perspective is the work of Jean Lave and Etienne Wenger (Lave, 1988; Lave and Wenger, 1991; Wenger, 1998).

Before the two met at the Institute for Research on Learning, Palo Alto, Lave had authored the book *Situated cognition* (Lave, 1988), in which she questions the assumptions of human cognition as being isolated to the brain and constituted by linear, abstract calculations. The analysis draws upon extensive empirical data from her fieldwork in Liberia (further presented in Lave, 2011) and the "Adult Math Project". The latter project investigated how mathematical skills were used across different settings, in particular educational and everyday activities. Showing the situated nature of the use of math, Lave (1988) critiques the assumption of *learning transfer* that traditional school math rests upon. She argues that the gap is too wide between the abstractions in the educational settings and the real-world problems she investigates through field research. This has implications on how cognition is understood:

> The point is not so much that arrangements of knowledge in the head correspond in a complicated way to the social world outside the head, but that they are socially organized in such a fashion as to be invisible. "Cognition" observed in everyday practice is distributed—stretched over, not divided among—mind, body, activity, and culturally organized settings (which include other actors). (Lave, 1988, p. 1)

To study cognition and learning while considering the dimensions over which they are stretched, Lave (1988) states

that "a contextually grounded theory of cognition requires a theory of situations" (p. 84).

Lave and Wenger (1991) present such a theory of situations, in which a new concept is coined: *communities of practice* (CoP).

Based on a series of cases, Lave and Wenger (1991) highlight what constitutes apprenticeships and how such learning trajectories can be seen as a learner moving from being a peripheral newcomer to a central actor and finally an oldtimer. Communities of practice are the social landscape that is both essential for the learning process and the context in which competence is defined.

Wenger (1998) continues to develop the framework. He discerns three dimensions of a community of practice. (i) *Mutual engagement* corresponds to the social relations among the participants. As such, a *community of practice* is not necessarily equivalent to a workplace or a school setting (although they might overlap). (ii) *Joint enterprise* is the defining purpose of the group. Although this in certain contexts may be formalized, this is not to be understood as static, since the essence of the pursuit is negotiated among the participants. It is a coordinating feature. Wenger (1998) provides a metaphor from music:

> Rhythm is not random, but it is not just a constraint either. Rather, it is part of the dynamism of music, coordinating the very process by which it comes to being. Extracted from the playing, it becomes fixed, sterile, and meaningless, but in the playing, it makes music interpretable, participative, and sharable. It is a constitutive resource intrinsic to the very possibility of music as a shared experience. An enterprise is part of a practice in the same way that rhythm is part of music. (p. 82)

(iii) *Shared repertoire* refers to the resources of action and communication that emerge through the joint enterprise, and are available to the members of the group. The shared repertoire includes for example everyday verbal communication, specialized terminology, routines, anecdotes, and gestures. These are the means through which the involved individuals negotiate meaning, a process we use as an analytical tool.

Negotiation of meaning

Taken together, the perspectives presented above signify the importance of considering the situated and social dimensions of music when discussing meaningful learning. However, these wider perspectives may be hard to grasp and to be made concrete. In this article, we turn to one specific process, which is bound up with the wider social context and at the same time observable in everyday interaction—the negotiation of meaning. As Wenger (1998) states: "we produce meanings that extend, redirect, dismiss, reinterpret, modify or confirm—in a word, negotiate a new—the histories of meanings of which they are part" (p. 53). This process is incomplete, ongoing, and open-ended. As such, negotiations of meaning refer to a larger picture.

Wenger (1998) describes the negotiation of meaning as constituted by two processes: *participation* and *reification*. While participation refers to engagement and social interaction, reification is a less commonly used term in everyday speech. It refers to the generation of real and abstract objects through which aspects of the practice become concrete. Furthermore, reification refers to both process and its product; the two mutually imply each other. Products of reification may be artifacts (such as musical notation) or ideas (such as the identity of *spelman*). In short, "aspects of human experience and practice [that] are congealed into fixed forms and given the status of an object" (Wenger, 1998, p. 59). In Wenger's framework, reification does not necessarily come with negative connotations (Vandenberghe, 2013), but is rather a part of the structure of human thought:

> With the term reification I mean to cover a wide range of processes that include making, designing, representing, naming, encoding, and describing, as well as perceiving, interpretating, using, reusing, decoding, and recasting. (Wenger, 1998, s. 59)

Although music, as seen through the perspective of musicking (Small, 1998), should not be taken as a reified object (Ryan and Schiavio, 2019), certain aspects of music can. In fact, Wenger's (1998) description of reification fits well with the above-mentioned perspectives on tradition, which may also refer to both process and object.

As we shall see, notation (as object and process) and the concept of *spelman* (as within Swedish folk music) are two examples of reification of the music, which are taken as aspects of tradition. The negotiation of meaning, as constituted by processes of reification and participation (Wenger, 1998), has similarities with the concept of sense-making in music as explored in music education (Silverman, 2020). As a result, meaning is not a static characteristic, but rather is negotiated and continuously defined by the community of practice. Here, we will follow the two examples mentioned (notation and *spelman*) across different communities of practice within the Swedish folk music scene.

Method and "messy research"

Our study is conducted with an ethnographic approach, making use of our own musician identities as flutists and fiddlers, including six cases. In this process we are using a

range of methods, such as participant observation, observation, interviews, surveys, and group interviews. Presented with this wording, it sounds as if we are following an already decided plan, making use of established methods in qualitative research.

Working and living within the field of music education has already influenced our ways of performing research; however, there might be more to it, connected to the idea of "sensuous scholarship" (Stoller, 1997). In this line, ethnography is an art situated between different systems of meaning (Clifford, 1986): "Ethnography decodes and recodes, telling the grounds of collective order and diversity, inclusion and exclusion. It describes processes of innovation and structuration, and is itself part of these processes" (pp. 2–3). Therefore, all ethnographic texts cannot be more than "partial truths" (Clifford, 1986, p. 7), as power and history work through the researcher.

In exploring the relationship between experience and theory, Hastrup (1995) concludes that the task of a researcher with ethnographic ambitions is to construct a world outside time and place, a space for a shared social experience. Following this insight, the researchers' position can also be described as creating and investigating "in-between," moving between distance and proximity. Social anthropologist Stoller (2008) claims that the position of "between" is a productive and even powerful starting point for ethnographic work. With this study, we take the opportunity to use that power, resting on anthropological traditions. An early voice giving attention to the importance of researchers' cultural background and the impossibility of objectivity is anthropologist Gourlay (1978):

> The "scientific method" of this conception [objectivity] is self-contradictory in its failure to include all variables, while achieving a semblance of authenticity through the use of an abstract expression which conceals their omission from the writer. The analogical reasoning that empirical methods which have produced objective results in the "hard" sciences are equally and directly applicable to the human sciences may or may not be valid. (p. 7)

Following this line of thought, Law (2004) introduces situated inquiry as a way of dealing with the world, as the world cannot be understood in general by holding tight to methodological rules. Rather, deliberate imprecision might be a technique for grasping the indistinct, such as in our case negotiations on meaning. The messiness of research that comes with an improvised and intuitive study design opens up for "a way of pointing to and articulating a sense of the world as an unformed but generative flux of forces and relations that work to produce particular realities" (pp. 6–7).

Such an approach goes hand in hand with our chosen theoretical perspective, which emphasizes communities, practices, and negotiations, and with our understanding of the object of our study as belonging to a world of flux and unpredictability. Studying particular realities, our methodological considerations have mainly been an attempt to respond to the generative forces and relations that we, from our positions, understand the world to consist of. Systems, also those of learning, include a great degree of "mess" (Ackoff, 1973) and these unpredictable components and mechanisms cannot be overlooked other than risking obscuring vital aspects of the CoP. Inviting messy research often has a consequence; it implies slow research, which engages with detours and uncertainties. In our study, for example, the informal gatherings and the courses have been clearly defined by the effects of the COVID-19 pandemic. Interestingly, the informal gatherings continued throughout the pandemic restrictions, with a higher level of motivation to compensate for the increased physical distance between the musicians. The courses at the folk high school[3] were periodically closed down which impacted both the course participants and our fieldwork. Thus, what we present in this article is a slice of our empirical data, produced by us as participants, folk musicians, and music education researchers.

With inspiration from Tjora (2019), our data have been generated and analyzed both upward, from the empirical ground to theoretical concepts, and downward, the other way round. Stepwise-deductive induction (SDI) does not invite researchers to use a standardized method for analysis, but rather to get prepared for a progression in stages with a consistent movement between the empirical and the theoretical to facilitate conceptual generalizations.

Examples from our data

Learning to play Swedish traditional music takes place across several different contexts. Our ongoing study explores six contexts that span from what is generally considered formal arenas to informal ones:

A. **Music academy (performers program)**
   Interview with the main teacher (129 min), individual interviews with students (n = 5) (60 min per interview).
B. **Folk high school (full-time course)**
   Observation of ensemble lessons, a group interview with participants (n = 5) (60 min).
C. **Folk high school (distance course)**
   Observations of group lessons with 27 participants and group interviews with six participants (55 min).
D. **Fiddlers' group (*spelmanslag*)**
   Interview with a musical leader (n = 1) (60 min).

3 Folk high schools are centers for adult education. Courses are not granting academic degrees. In Sweden, there are music education programs in several genres.

E. **Professional musicians** Individual interviews ($n = 7$) (45–90 min).
F. **Informal, regularly occurring jam sessions** Participant observation from July 2021 to August 2022 in weekly jam sessions organized by a loosely coupled group of musicians at two different venues in an urban setting: an outdoor café and a meeting room provided by a political party.

Although all of these are related to the broad umbrella of Swedish folk music and are interdependent and overlapping, they all have their own characteristics in terms of mutual engagement, joint enterprise, and shared repertoire. As such, they can be articulated through the terminology of CoP, and distinctions and similarities are brought forth by the theoretical framework. To highlight the analytical tool of meaning negotiation, we present two analytical nodes, which cut across the different CoPs explored. The statements are taken from the empirical data articulate underlying value systems in terms of prioritized concerns. In the following, we have structured the text around two analytical nodes, the first one covering the use of notation in Swedish folk music and the second one discussing different constituting elements in the identity construction of a *spelman*.

Notation

Notation is not a recent phenomenon in Swedish traditional music. As such, it is a form of reification with a continuous history tied to the practice. An early form of sheet music is the so-called *spelmansböcker* (Ramsten et al., 2019), personal notebooks used by musicians to collect and store their repertoire. Contrary to Romantic ideas regarding folk music practices from the 17th to 19th centuries, musicians performing dance music were a diverse group, with many musical literates moving between different musical contexts (what we today may think of as genres) (Gustafsson, 2019). It is important to note that this is an era when the term folk music was not in everyday use. This means that this early notation, seen as the material output of processes of reification, was untinged by later, not yet emerging, ideologies (Wachenfeldt, 2015).

A later version of the notation process is the collections that became a part of the Swedish romantic nationalism (Boström et al., 2010). Primarily dance music—what was then being considered by the collectors as folk music (as coined by Herder)—filled a function in the larger project of nation-building. This collection process culminated in the publication of *Svenska låtar* (Andersson and Andersson, 1922–1940/2000), a 24-volume collection of tunes and short biographies. The publication was structured through a geographical perspective, a decision that contributed to a persistent way of thinking about Swedish folk music repertoire in categories of geography and individual musicians (Tullberg, 2018).[4] Also, the publication of *Svenska låtar* was preceded by a selection process that further conceptualized and defined the boundaries of the genre of Swedish folk music (Boström et al., 2010).

For an individual interested in Swedish folk music today, a significant amount of archival material (sheet music) is available, as well as printed publications from the 20th century up until today. These are products of reification processes and are in themselves objects for academic studies. However, with this brief background in mind, we now turn to the empirical data of the present study.

In our material, there are both similarities and differences in how notation is used, produced, and approached. Taken in isolation, these statements of our informants may not be revealing. But seen through the rather vast empirical data, patterns are emerging in terms of tensions between these functions.

Notation in our study fills a number of functions, and the following section uses these examples: (i) building a repertoire from old sources (archival or published), (ii) an aid for memory, (iii) a tool for thinking (such as working out musical arrangements), (iv) a tool for learning, and (v) in performance.

These different functions are bound up with different sets of competences. One of the tensions concerns the importance of musical literacy. A statement made by one of the teachers in context A (the music academy) illustrates some aspects of this point:

> They [the students] do not read sheet music. As one student said: "I have a hard time finding repertoire." And I said: "You have [refers to major collections of tunes]. And the student responded: "Yes, but I find it hard to get anything out from the notation." And it is. You have put an effort into it. And that is something that has changed. The literacy has decreased. Playing technique is really good, but the literacy is crap. And it helps to understand your own role and to be able to navigate your role as musician if you have both a historical and future perspective. [. . .] It helps if you can handle a notation and if you are tempted at that. How can you get something historical? And it is hard. How do you interpret that [the notation]? (Informant A:1)[5]

In this statement, the teacher stresses the importance of being musically literate in order to access the repertoire and build a relationship with tradition. This has been a crucial part in his own path to becoming a *spelman* (see below). The students do not meet his expectations. The competing position

4 Hence, it is common to refer to tunes either as from a certain place or as *after* (collected from) a certain musician.

5 The quotations taken from the empirical data have been translated from Swedish into English by the authors.

is illustrated by one of the students in Study B (the folk high school, full-time course):

> Yes, I think it is super exciting, this way of making music. Because it is a big part of folk music in the whole world, what you do is that you learn tunes by ear, always. But this means that we spend much time on learning the tune, and don't have time to play it good or so. [. . .] What is great about folk music is that you should be good at learning tunes by ear quick. But at the same time, we don't have time for much else. (Informant B:3)

Development of skill (learning and playing by ear) is prioritized above repertoire development. Notation is sometimes distributed to the students after they have learned the tune, as an aid for memory. One of the other students (B:2) states that starting to play folk music was a way to avoid written music.

The leader of the *spelmanslag* (fiddlers' group) in Study D provides a counterargument: "It takes too much time to sit and drudge . . ." (Informant, 4:1). By this, she means to repeat phrase by phrase until everyone in the group knows the tune. Instead, they use a mix, where a notation is used as a reference point for learning the tune. While having the score in front of them, the group plays the tune phrase by phrase. The leader guides the fiddlers through interpretational aspects, such as dynamics, rhythm, and phrasing. During the interview, she also comments on what she perceives as a general view within the domain of Swedish folk music: "Sometimes I find it so silly, this [attitude] that you need to play without sheet music. No, you don't have to. Notation is there to help you." Developing a large, collective repertoire is more important than mastering the skill of quickly catching a tune by ear. Since sheet music is used in performance, it is not necessary to memorize the tunes. Furthermore, sheet music is also a means of inclusion, since it enables peripheral members of the group to show up for performance[6] even if they have not attended the rehearsals.

Among the professional musicians in study E, sheet music is frequently used: "Often, I send the other musicians notation before we meet. But that is because we have too little time. It's not as [.] when we had five days a week. I am happy if we find one or two days" (Informant E:1). The essence of this statement resonates through the interviews of Study E. The rehearsals are not primarily a place for learning, and the prioritized concern is to reach a musical result.

In the jam sessions (study F) sheet, music is not generally used during the meetups. The gatherings often commence with the tune-sharing. Usually, one of the group's more central participants teaches a tune by ear. Participants record the tune for the sake of memory and/or to learn it at home. However, notation carries other functions. Tunes are distributed among the members as a way to share repertoire between the sessions. In this way, the joint repertoire is expanded. During one of the gatherings, a brief argument arose since two participants had different versions of the same tune. The argument continued afterward on the Facebook group connected to the community. One of the involved tried to settle the dispute by uploading sheet music along with comments on the rhythmical interpretation and biographical notes on the composer.

The tensions illustrated here arise partly due to time pressure. But these tensions also point beyond pragmatic concerns. What is being reified here is not so much the notation itself as the competences related to notation: musical literacy and what we refer to as musical orality. These two competences are not dichotomies but exist in relation to each other as different methods of participating in music-making. It is not a binary position where one side is completely oral, and the other is completely dependent on symbols (some form of musical notation)—nor is it necessarily so that a musician masters one of the two, but can master both or be less capable in both areas.

A community of practice defines and redefines what competences are relevant and how they are valued (Wenger, 1998). This may change over time and the fluent nature is reflected in the above examples. For example, musical literacy in the contexts of A and E refers not only to decoding pitch and time but also to extracting an interpretation of the notated tune, something that is not always easy (Ahlbäck, 2010). This is, however, not required in the fiddlers' group (D), where the leader is scaffolding the interpretation of the notation. The statements in context B reflect an opposite position where the students hold aural competency as central.

To take part in, or even to be a central participant of, context F does not require musical literacy. It is, however, needed to participate in the (digitally) extended dispute regarding tune variations.

Even though the statements primarily concern the resources of shared repertoire, these perspectives are bound up with aspects from the dimensions of joint practice and mutual engagement. As such, the statements articulate the nature of the underlying value system and current negotiations. In short, these competences reflect the requirements for participation in the respective community.

Identities

During the Swedish "Folk music wave" in the 80s and 90s, being a traditional musician was loaded with a political dimension, implying an openness toward immigrant musicians and an understanding of the musician as a citizen. This dimension of a *spelman's* identity can be understood as growing out of the musicking approach with democratic ambitions that arose in urban cultural scenes, clearly noticeable in the new types of formalization that organize active folk musicians, for

6 Performances in this case include both concerts, contributing with music at church services, and playing for dancing.

example, RFoD.[7] In the following section, we mainly build on our data from two folk high schools, one attracting older students with a distance course (C) and another recruiting younger students with a full-time course (B).

In our six studied contexts, one of the folk high schools stands out as a context where the civic dimension of learning folk music is present. The ideological history behind the phenomenon of a folk high school underpins the musical activities that take place during the distance course for fiddlers, led by a legendary fiddler and pedagogue. To one of the participants, a reason for being at the course is that it takes place precisely at a folk high school and that this kind of learning environment is by its nature a democratic enterprise:

> . . .to travel here and actually support this activity, that it continues, that is important to me. As a place for Bildung [an institution that promotes education for all], the folkhögskola is threatened by political forces who want to cut the state subventions. That is a huge threat. Then you have to show that this is important. (Informant C:1)

As the average age of the participants at the distance course for fiddlers is rather high, 60 plus, the ideological heritage from the 1980s is still alive and nurtured:

> I think that the folk music wave was very good at emphasizing a resistance against that [xenophobia] by showing that we have musical influences from near and far, and that we love to mix traditional music from different countries – but that trend has disappeared, hasn't it? (Informant C:2)

The question about trends mentioned in the quote above is connected to how folk musicians identify themselves in relation to citizenship; (i) as musicians in a local tradition that strives to survive (as a member of a local Spelmansförbund) or (ii) as citizens striving for social justice, democracy, and inclusion. Ternhag (1996) describes membership in a Spelmansförbund as an important part of what constitutes a fiddler (*spelman*). In our study, the first type of identification is found in context D, the fiddlers' group, where the leader has her roots in a regional Spelmansförbund:

> And he [the informant's fiddle teacher] wanted to find out whether we had a local folk music tradition, and they found a few older spelmän from our region [. . .] The community that we experienced together with the folk dancers, because there were young members too, was significant [. . .] The joy of. . .and belonging to a group that shared an interest, it was incredibly important for my continued interest. It was decisive to me. (Informant C:1)

Keeping a focus on local traditions is typical for the activities of a Spelmansförbund; however, in relation to citizenship, there are different co-existing trends in our material, depending on the context of each case. For example, the young aspiring folk musicians in the full-time course do not place themselves within a community of cultural activists as the older students in the distance course tend to do. In positioning themselves, the younger students have a more apolitical approach toward folk music, mentioning international contacts with musicians from other musical traditions and connections with the jazz field.

The folk high schools in our study are two of many Swedish folk high schools that have developed a music profile. Most of these form part of the "education loop" (Borgström Källen, 2014, p. 286) for music education, preparing for the entrance tests to higher music education. Nylander (2014), in his study based on 50 folk high schools with a music profile, discusses these schools' position as intermediary education institutions, with local game rules and competitive relations. In these relations, value, selection, and career are at stake. Importantly, the original vision of the Swedish folk high school points toward the informal and democratizing qualities of these schools, providing an alternative to formal education. Consequently, the values at stake in these learning contexts balance between the approach toward the idea of "an education for all" versus the claim that there is a need for young folk musicians to gain skills needed for a future as "folk music professionals." As expressed by one of the young students in the full-time course, talking about why he applied to the school to prepare for a musical career:

> I felt that I had been at several other folk high schools before, and played for example Irish folk music. Swedish music mainly because I live here. You travel around [. . .] I did not know that many people who play this kind of music where I come from. So, another "folkis" [nick name for folk high school] where I can really do music and prepare for the entrance tests at one of the Academies of music. (Informant B:4)

At the folk high school offering distance courses, the students are not career oriented. The folk music courses that have been running since 1978 emphasize life-long learning, in line with the original idea of folk high schools as part of the Swedish "folkbildning" tradition. Söderman (2019) refers to former prime minister Olof Palme when describing "folkbildning" as a tool for civic education, promoting democracy, and gaining "insights about the complexity of

7 RFoD, Riksförbundet för folkmusik och dans, [the national association for folk music and dance], started in 1981 and exists as a parallell or alternative to the older Spelmansförbundet. The latter was formed in 1947 to promote folk music and dance, while RFoD's purpose is to strengthen, develop and spread folk- and world music. RFoD has 17,000 members, while Spelmansförbundet with its 23 regional sub-associations has 6,000 members (according to the organizations' respective webpages).

existence" (p. 487). Following this tradition of being a musician in the world, in a society characterized by cultural diversity, is a theme that stands out as a main area of concern to the distance course students:

> The multicultural aspect is extremely important in the music that we gain our influences from. In Sweden today, there are so many large immigrant groups, so we think it is super important that folk music is not kidnaped by a political party and defined as traditional [in the sense of national] and that it should not change. Folk music has always changed, and now the world looks as it does, then the music is there, in its openness. (Informant C:3)

Combined with the larger societal engagement comes a personal duty for the course participants to prioritize an inclusive atmosphere at the nightly jam sessions. In the evenings, the participants gather to share tunes in a large group including fiddlers at varying levels of competence. One of the participants confessed that there have been moments when she would rather have concentrated on in-depth duo or solo playing to develop her own fiddle playing, but that she prioritizes the social dimension of sharing and inviting. To the less experienced, the evening gatherings are truly important: "And that warm caring, it is comforting. As being a person who knows almost no tunes, I still feel included," says one of the learners. There is a shared consciousness about the collaborative aspect of learning that is expressed both in the nightly jams and in the group interviews, pointing toward fundamental dimensions of humanity, mainly a sense of belonging. Being in a community of learners is also emphasized by the students at the folk high school with the full-time course:

> Right now, I am very much in this bubble . . . and I have never before been at a place with so many people interested in the same type of music. So it is optimal to play together with the ones who are here. (Informant B:1)

In the group interview, one of the other students reinforces this statement by talking about how improving your instrumental skills is dependent on the learning environment:

> The bubble that he was talking about is really important to get better at playing your instrument, and to find yourself within the music. It is of very little importance what kind of music we play. It is the environment that matters. (Informant B:3)

The negotiations on what constitutes a *spelman* and on identification as a *spelman*, as illustrated in the voices from our material, touch on a dimension of education that is elaborated by Biesta (2022). In his concept of "a world-centered education," he dissolves the dichotomy between student-centered and curriculum-centered education. In doing so, he promotes the idea that "educational questions are fundamentally existential questions, that is, questions about our existence "in and with" the world [. . .] and not just our existence with ourselves" (p. 91). The examples of the two folk high schools as arenas for folk music education point to learning arenas that, in different ways, strive with, on a metaphorical level, being in the world.

Just as the negotiations on competences in relation to notation in the first node reflect requirements for participation in the communities of our study, the identification processes in the second node indicate issues of exclusion and inclusion. Expanding on the implications of negotiations in the two nodes, in the following, we turn toward the potentials of the analytical tools, as they bring forth the results through our stepwise-deductive induction.

Potentials

As stated in the introduction, the aim of this article is to provide analytical tools with which to understand how meaning is negotiated within instrumental music tuition. The focus here is negotiations of meaning. In our work, we seek to highlight the implicit and explicit connections between the concepts of reification and participation. In the context of the present article, this interplay is understood as relations between competences and identities (reification) and meaningful musical practice (participation), whether that refers to learning, professional performance, or rehearsals within a group of amateur enthusiasts. We also want to say something about how this perspective can be helpful for music teachers to reflect upon their roles and further develop as professionals.

In our continuous analytical process, the theoretical framework has been useful to highlight aspects of the various contexts that are being taken for granted by the insiders. While not always completely beyond reflection, approaches to the themes presented above remain intuitive in everyday undertakings. As Wenger (1998) states, "it is often convenient to act as though meanings are in actions or artifacts themselves." Naturally, we cannot scrutinize the rationale for our actions in every step we take, but it is necessary to take a step back once in a while and reflect upon habitual ways of proceeding. However, this is not an easy process. Even from our vantage point as researchers, it is a continuous struggle.

Our observations and the statements given by the informants have become more meaningful as the empirical material has continued to grow and the connections between competences and the contexts have been more clear to us along the way. In this process, we can discern both differences and similarities. What holds the separate contexts together as a whole, is among other aspects the repertoire. As such, the contexts can be seen as different parts of the same musical genre, with the tunes being reified objects of the Swedish folk music tradition.

However, focusing on the ways that this repertoire is approached, understood, interpreted, and learned reveals diversity. This includes ways of music-making, which implies that different competencies are needed for meaningful participation.

In some cases, the field of practice that is defining the value of competencies is the same as the learning context. For the fiddlers' group, there is a direct relationship between the rehearsals and the performances, and the same is true for professional musicians. In some of the other contexts, for example, the full-time course at a folk high school and the music academy, the desirable competencies are partially defined by the demands of other contexts. Such as folk high school is directed toward the music academy, and the music academy is directed toward the professional scene in the educational loop. As the statement made by the teacher in A shows, this is an area of debate. This is both due to the various understandings of the present state of the field and to the ever-changing landscape of musical practice. What is desirable at the present moment may be on the way to losing its relevance. For the next generation, there are other viable paths to take as a music professional, some of which lay outside the intuitive assumptions found within musical education. In her discussion on meaningful music education and projects of love, Silverman (2020) asks us to:

> [c]onsider the many musical activities one can pursue as an instrumentalist, depending upon the musical-social practices involved: performing, composing, improvising, arranging, conducting/leading, recording, producing, musicing and dancing/moving, musicing and worshiping, and more. An instrumentalist can become a coach and teach one or more musics to others, whether formally or informally. An instrumentalist can write about music, lecture about music, collect artifacts that surround musical ways of being (e.g., recordings, letters from famous instrumentalists), read about music, discuss music, argue about music, and so forth. (Silverman, 2020, p. 8)

This resonates with Becker's (2008) concept of art worlds being a building block of sociology of possibilities. This, in turn, implies that music education ought to be in close contact with the field of practice, not just as a way to calibrate their curriculum to meet current demands, but also to make these possibilities visible.

For meaningful music education, it is necessary to see the relation between the competences valued and cultivated during lessons, and the competences needed to be a part of the community of practice. In our material, we have seen the connections between identity, competences, and educational contexts. It is interesting to note that at both folk high schools, the teachers are active during lessons. In the evenings, however, the students themselves meet in active groups of sharing and developing knowledge, maintaining the bond between self and others that contributes to a sense of meaning (Silverman, 2020). In these respective contexts, *mutual engagement* is expanded to include not only the teachers versus the learners but between the learners themselves. The folk high school context also facilitates the dimension of *shared repertoire*, by providing a free space for tunes and competences to be shared between the community members. The dimension of *joint enterprise*, shaping the purpose and goal of the activity is within educational institutions often a problematic area. At the folk high schools (B and C) and in the *Spelmanslag* (D), the joint enterprise is visible in the material in different ways. In the *Spelmanslag* (D), there is an understanding of notation as a tool for inclusion in a learning context of amateurs who come and go to the rehearsals but still want to perform. At the folk high school with the distance course (C), notation is more or less avoided, and oral transmission is promoted, connected to the idea of learning from and with peers.

In this article, our empirical data mainly focus on the communities under negotiation at the folk high schools and in the *Spelmanslag*. At higher music institutions, the overarching goals are set by curricula, state policies, and university strategies, possibly affecting the agency of teachers to work with the joint enterprise. Nevertheless, with this slice of data, we can point toward the implications for the teacher's role, when focusing on meaning negotiations as a central aspect of instrumental music tuition. As Wenger (1998, p. 145) points out, "Issues of identity . . . are inseparable from issues of practice, community, and meaning." At this point, we see different options, possibilities, and maybe hindrances for teachers to actively reflect and act on in what ways their own teaching relates to or enhances identity formations that allow meaningful learning to flourish.

Along this line, the "humble manifesto for care and compassion in music education research" (MacDonald, 2022), touches upon two points, relevant to our discussion. The first one emphasizes the need to fully integrate human universal musicality into music education research. The second mentions the development of "healthy" musical identities as an aim of music education. In our material, we see amateur musicians contributing to meaningful negotiations with dimensions that are of importance to other communities than the rather small communities that they belong to. In a Beckerian way, our research design has allowed us to include people (amateurs) who are not always considered as important, to inform the wider field of instrumental music tuition.

There is nothing in the theory of communities of practice that implies that CoPs are inherently good (or bad). A framework emphasizes that CoP serves as a productive model for meaningful learning, only when the tension between experience and competence in the communities remains dynamic: "The interaction of experience and competence is a fertile ground for learning, if the two remain in tension. If there is too much congruence, practice becomes stale and in the worst case boring" (Wenger, 1998, p. 214).

With this in mind, we lean toward our two nodes of meaning negotiations to reflect on how our conceptual playing with tradition in Swedish folk music communities might be of interest to educators and learners in other communities, just by providing new ideas. As indicated in our material, there is often a tendency in a community to stay isolated, as in the "bubbles" at the small folk high schools. In such "bubbles," the teachers and learners are not easily provided with tools to imagine what could be meaningful in the future. Any community runs the risk of stagnation, a risk that can be counteracted by giving attention to the main aspects of a functioning community: ".a well-functioning community of practice is a good context to explore radically new insights without becoming fools or stuck in some dead end" (Wenger, 1998, p. 214).

In focusing on meaningful negotiations, we have hopefully brought to the surface possibilities for change as imagined by post-colonial thinking, where negotiations on differences are of vital importance. With this overarching theoretical lens follows that music education could be imagined as a "scene" where societal challenges are dramatized and made visible, thus providing new models for breaking down walls between the "bubbles" described above.

Negotiation of meaning is ongoing and open-ended. With this follows possibilities for those who want to see change. To move forward and to change the current state of affairs, reification and participation offer separate but interdependent possibilities for action. While participation offers possibilities to "seek, cultivate, or avoid specific relationships with specific people" (Wenger, 1998, p. 91), processes of reification provide opportunities to "produce or promote specific artifacts to focus future negotiation of meaning in specific ways" (Wenger, 1998, p. 91).

In a particular community of practice, one or the other path to change will be more accessible than the other. An individual's ability to pursue change will probably align more with one of the paths.

To finalize, we conclude that the meaning of music-making/practice/learning is not inherent in the music itself. It is constructed in the dynamic between the teacher, the learner, and the community. Learning music can be understood as *a tuition of musicking* as much as a matter of skill acquisition. The educational setting depends on different communities, and the community may change, hence the definition of the required competence will change. Since competences are a requirement for participation, the acquisition of these competences—such as the communicative art of bowing described in the opening—is necessary for the formation of musical identity, which ultimately is at the core of meaningful learning communities of practice.

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. Written informed consent was not provided. Due to the open design of the project, and informal character of data gathering the ethical review process has not been possible to conduct before this stage. The emphasis of the article is on the theoretical perspective rather than the empirical data. Furthermore, the article is based on the initial phase on our ongoing study, where an ethical review process is upcoming.

Author contributions

Both authors have designed and conducted the studies, conducted the analysis, wrote the manuscript and approved the submitted version.

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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.

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Exploring the importance of the works of Johann Sebastian Bach: Pedagogical perspectives and the emotional response of listeners

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Music education in the United Kingdom has long been centred on the study of historic European classical music. Many studies within the field of Music Psychology have investigated the various ways in which people respond to Western Art Music, and how those responses may differ in accordance with the listening context, but very few have examined the effect of music by specific composers. Bach's music is still performed regularly around the world—arguably more so than any other composer—and continues to be regarded as essential repertoire by instrumental teachers across many disciplines. This study sought to investigate the potential reasons for this from the perspective of pedagogic value and listener response. A mixed-methods approach was adopted, incorporating semi-structured interviews with music educators alongside a listening experiment in which participants rated their emotional responses to a selection of pieces by Bach, Beethoven and Mozart. A reflexive thematic analysis was used to present an apologia for the continued propagation of Bach's music in mainstream education, and listeners' emotional responses were measured using a standardised scale. Additional ratings for valence, arousal, familiarity and overall enjoyment were also gathered from each participant. Results indicate a statistically significant relationship between the music of specific composers and some emotion categories. These findings could lend support to the continued hagiolatry of J. S. Bach in music education, in spite of the welcome drive towards the diversification of the curriculum.

KEYWORDS

Bach, Mozart, Beethoven, music education, music listening, emotional responses

1. Introduction and background

Western Art Music is a remarkably broad and varied genre. Several centuries of tradition and custom, alongside the ideas and innovation of some key individuals at certain points in history, have created an expansive musical landscape that is the subject of much research and international acclaim (Mehl, 2013). Jorgensen (2003) suggests that it is precisely this fact that makes it worthy of study—that Western Art Music represents a monumental human achievement, and that no further justification ought to be needed for its prevalence within music education. Further, the claim has been made that it is objectively superior to popular music (Young, 2016). Perhaps, it is this line of thought that prompted the Department for Education in the United Kingdom to insist that, at GCSE level, "at least one area of study must be drawn from music composed in the Western Classical Tradition, with all or the majority being composed between 1650 and 1910" (Department for Education, 2015, p. 7), regardless of pupils' individual interests or skillset. This requirement has been called into question in recent years (Green, 2006; Allsup, 2011), based largely on the fact that such

music is less popular from a consumer perspective (Kunst, 2022)[1] and that this may mean it is less relevant to learners. However, the suggestion that education must only focus on what is popular is flawed. After all, popularity does not necessarily equate to universal enjoyment, and nor does it imply objective quality (Hayes et al., 2021).

Previous research has considered the ways in which listeners respond to Western Art Music (Labbé et al., 2007; Castillo-Pérez et al., 2010; Imbir and Gołąb, 2016), but there is often a lack of specificity regarding the music being investigated. Whilst they may state which pieces of music were used in the research, the focus is often quite narrow, emphasising the effect of musical parameters or emotive qualities. It has been shown that musical parameters could hold more sway than genre over listener responses (Sloboda, 1991; Kellaris and Kent, 1994; Solberg and Dibben, 2019), and it can therefore be difficult to draw any generalisable conclusions from such research. For example, Ramirez et al. (2018) found significant differences in heart rate among people who had listened to Rachmaninoff when compared to those who had listened to Julián Carrillo. The dissonant, microtonal music of the latter was shown to have caused an elevated heart rate in participants, whereas the former was apparently able to evoke a more relaxed state. Both composers might rightly be regarded as Western Art Music, and so the markedly different responses in heart rate being caused by Rachmaninoff when compared to Carrillo means it would be misleading to attribute a causal effect to the genre as a whole. It follows, then, that some differentiation between composers within each genre is necessary and worthy of investigation.

Although it is likely to be the musical parameters which caused the effect in the above case, it is fair to say that some composers employ particular musical devices more readily than others (Dor and Reich, 2011; Georges, 2017; Wong et al., 2020). Much of this type of content may be reflective of the various conventions and expectations of the time (Lester, 1996; Webster, 2004), but it can reasonably be suggested that Beethoven seemed to favour an intense, dramatic sound over the mellifluous, flowing melodies one might encounter in Schubert's work (Istel, 1928; Simonton, 1987), even despite their being almost exact contemporaries of each other. Whilst a good deal of scholarly enquiry continues to take place into the styles of individual composers from a musicological perspective, there is a lack of empirical research into the question of whether one composer might elicit certain responses more effectively than another.

Since it is well established that music can and does elicit emotional responses from listeners, it is helpful to understand precisely how and why this happens. Some research has shown that a range of faculties are involved with emotional responses (Juslin et al., 2013), and that these can be targeted with specific musical examples. Logically, then, one can assume that listeners can and do experience a range of emotions during an entire work, since it would be unusual for musical content to simply be repeated for the duration of the piece. The question therefore becomes whether some composers utilise certain types of musical parameter to a greater or lesser degree than others, and whether such usage causes the specific mechanisms described by Juslin et al. (2013) to react more powerfully or more often as a result.

That some composers incorporate particular musical elements more explicitly than others is not in doubt (Van Kranenburg and Backer, 2005; Mearns et al., 2010; Kaliakatsos-Papakotsas et al., 2011), and this may cause music educators to use their work more regularly as exemplars. There is some evidence to suggest that J. S. Bach's approach to harmony has been more influential than that of any other composer (Wu et al., 2015), and, as such, his work is often heralded as the gold standard from a pedagogical perspective (Sanchez-Behar, 2018). Whilst this may provide a basis for the continued study of his music in mainstream educational circles, it does not automatically follow that it will provoke a stronger response in listeners when compared to music by other composers. One of the principle aims of this present study is therefore to investigate listener response to selected works of specific composers, in order to determine whether there are any observable or measurable differences.

When one chooses to learn a musical instrument, there is more often than not a selection of set works and repertoire to draw from in the form of graded examination syllabi. This framework for learning could be said to be rooted in the classical tradition, pioneered as it was by one of the leading establishments in the education of Western Art Music, Trinity College, in 1877 (Anon, 2022b).[2] Other prestigious examining bodies such as The Associated Board of the Royal Schools of Music (ABRSM) followed shortly after (Wright, 2015).[3] Little has changed about the format since then. Where a jazz or contemporary syllabus is offered to candidates, it is not currently available on all instruments. In fact, a jazz syllabus was not introduced by ABRSM until 1999—some time after the genre had experienced its zenith. The systemic tendency of instrumental education to focus on Western Art Music is drawn into question: perhaps it is overly reactionary, leaving it too late to offer a viable alternative for those musicians who are less interested in the formal nature of the classical tradition (Green, 2006). If, however, it is possible to demonstrate that some Western Art Music has an especially broad appeal that transcends demographics such as age, gender, and nationality, it may provide a basis for the continued inclusion of such music within the field of music education. Conversely, if such a discovery is not forthcoming, then this would add credence to the growing efforts to increase the diversification of what is often viewed as an elitist art form, given that it appears to focus predominantly on white men from European history (Whale, 2008). Investigating the required repertoire for graded examinations across a range of instruments may also provide answers to the question of whether some composers are being preferred over others.

A recent poll, conducted by YouGov and published online in 2022, revealed that Mozart, Beethoven and J. S. Bach are the three most popular and well-known composers in the United Kingdom (Anon, 2022a).[4] This is further attested to by an article on the Classic FM website, which states that these three composers enjoyed the most streams on Spotify in 2021 (Hall, 2022).[5] These data can be seen in Table 1. Despite Bach being the least popular and the least well-known, his music has still been streamed more than the others. Although the difference is not substantial, this could be indicative of a greater level of liking for his music among those who enjoy it, despite that group of listeners being slightly smaller than for other composers; perhaps, the

1 https://www.statista.com/forecasts/997919/digital-music-preferences-by-genre-in-the-uk

2 https://www.trinitycollege.com/about-us/timeline

3 https://abrsm.org/en/about-us/news/libretto-magazine/archive/?abrsm[newsId]=70276

4 https://yougov.co.uk/ratings/arts/popularity/classical-composers/all

5 https://www.classicfm.com/music-news/classical-composers-have-earned-on-spotify/

TABLE 1 The most popular composers of Western art music in the United Kingdom.

Composer	Fame	Popularity	Streams (millions)
Wolfgang Amadeus Mozart	83%	59%	6.0
Ludwig van Beethoven	83%	56%	6.5
Johann Sebastian Bach	78%	53%	6.7

Fame refers to the percentage of people polled who have heard of a composer. Popularity refers to the percentage who hold a positive opinion of that composer's music. Streaming data refers to the number of streams on Spotify throughout 2021.

enjoyment is more deeply felt but not as widely experienced throughout the population. Being a baroque composer, it is possible that the comparative lack of available instruments for which to compose, and the overall timbre that characterises his music, is perceived as being lower in complexity and therefore more immediately accessible to non-musicians (Madison and Schiölde, 2017).

In response to the existing literature, and in an attempt to critically evaluate some of the working practices within mainstream music education, this exploratory research sought to answer the following research questions:

1. Is the music of J. S. Bach favoured over other composers in the formal music examination system?
2. Do teachers and practitioners reinforce or undermine any such preferences?
3. Does Bach's music cause any measurable variation in the emotional response of listeners, compared to Mozart and Beethoven's music?
4. Do listeners experience any measurable difference in overall valence and arousal levels when listening to music by Bach, Mozart or Beethoven?
5. Do listeners report any measurable difference in overall enjoyment levels when listening to Bach, Mozart or Beethoven?
6. Do demographics such as age, gender, and musical training have a moderating effect on any such relationships?

The possible implications of the findings of this research are potentially noteworthy for music educators and students alike, since they may shed light on some widely held attitudes among performers and teachers. Since many instrumental teachers focus on a formal graded syllabus and teach the required repertoire accordingly, it is worth investigating their reasons for doing so. Indeed, the very question of whether such reasons exist is quite pertinent. There is the possibility that teachers teach what they were taught, without paying due attention to the objective value of the material. Likewise, music students may seek to understand the rationale behind the in-depth study of music which may appear irrelevant to some. The conclusions of this study may also prove interesting for casual music listeners and those persons with an interest in Western Art Music.

2. Methodology

This study comprised two concurrent elements. Firstly, semi-structured interviews were conducted with high-level music practitioners in order to gather qualitative data relating to their experiences of teaching and learning on their chosen instrument or instruments, as well as some more general opinions relating to music education and musical practice and performance. High-level practitioners herein include any individual who has achieved an advanced level of proficiency on one or more instruments, but was not limited to professional performers; also included were composers, teachers (both instrumental and classroom-based) and portfolio musicians. Participants for this portion of the study were recruited by approaching various conservatoires, colleges and universities, as well as some well-respected individuals within the field. Some were also personal contacts known to the researcher in a professional capacity, or people who were suggested as or presumed to be interested parties further details of which can be found in section 6 below.

2.1. Ethics statement

Full ethical approval for this research was granted by the Arts and Humanities Ethics Committee at the University of York. There were no perceived risks that were not adequately mitigated against, and full anonymity was granted to all participants.

2.2. Interviews

Interview questions were grouped into three broad categories: *Experience of Learning*, *Experience of Teaching* and *General Experience of Music Education*. A copy of these questions is included as Appendix A. The interviews were conducted online *via* the Zoom software. This had the dual purpose of broadening the scope of possible interview candidates without the need for extensive travel, and also enabled interviewees to choose their preferred location. Although no potentially sensitive questions were being asked, and there was certainly no intention for any such topics to arise, this was still believed to be an important consideration. Each participant was invited to consent to being quoted in this report where relevant or appropriate, but was under no obligation to do so. They were also provided with the additional option of being quoted but not named. All interviews were recorded and subsequently transcribed manually, after which a reflexive thematic analysis was conducted (Braun and Clarke, 2021). This process involved meticulously studying the transcripts of each interview, making notes of any key points and topics mentioned by participants and categorising them into prevalent themes. A largely inductive approach was taken to this analysis (Byrne, 2022), although not exclusively so. Some deductive analysis was deemed necessary and appropriate in order to adequately address the research questions and to maintain a degree of conciseness.

2.3. Listening study

The second element was a listening-based survey which took place online. Participants for this survey were recruited in various ways, but primarily by way of a social media drive and word of mouth. Interview participants were also invited to take part in this element of the study, but were not obliged to. This survey required participants to provide some basic demographic information about themselves, such as age, gender, nationality and whether they consider themselves a musician. They were also asked to state the extent to which they usually enjoy

classical music, using a Likert scale. Participants then listened to three pieces of music and answered a series of questions relating to the pieces.

Music selection was made in accordance with the recent YouGov poll, which stated that the three most popular classical composers are Beethoven, Mozart, and Johann Sebastian Bach (Anon, 2022a; see Table 1). In order to minimise the risk of participants simply comparing one piece of historic European classical music with another, it was necessary to select three works by each of these composers; this included one solo piano piece, one orchestral work and one composition for voice and orchestra. The final pieces used were thought to be representative of each composer by virtue of their prevalence, popularity and musical parameters, and are included in Table 2. As some of these musical works are rather long, it would have been unrealistic to expect any participants to listen to all nine pieces as part of the study. Therefore, once participants had completed the demographics portion of the survey, they were given a random combination of three pieces to listen to from the nine pieces selected for use in this study. This was done using a randomising feature of the Qualtrics software on which the survey was created. To further strengthen the internal validity of the survey, the randomiser was set up in such a way that it chose one piece from the solo piano group of pieces, one piece from the orchestral group and one from the group of vocal pieces. In this way, it was possible to mitigate the possibility of a between-observer bias. Participants were required to listen to each piece of music in its entirety and were unable to move on to the next page before having done so. This was a defining feature of the study because it circumvented the risk of examining the effects of particular musical characteristics in isolation. It was crucial to examine the ways in which listeners respond to these musical elements in "real time," as they occur within complete pieces of music, since this appears to be how the majority of people enjoy music in their everyday lives (North et al., 2004; Krause et al., 2014).

After listening to each piece, they would answer some questions relating to their experience of doing so. These questions covered their emotional responses to the music, as well as familiarity, valence, arousal and overall enjoyment.

TABLE 2 Music selection for the three composers investigated in the listening study.

Composer	Piece 1	Piece 2	Piece 3
J. S. Bach	*Prelude in C Major*, from "The Well-Tempered Clavier" (Bk. 1)	*Brandenburg Concert No. 3 in G major*, I. Allegro	*Jesu, Joy of Man's Desiring*
W. A. Mozart	*Piano Sonata No. 16 in C Major*, I. Allegro	*Symphony No. 40 in G Minor*, I. Molto allegro	*Requiem in D Minor*, III. Lacrimosa
L. van Beethoven	*Piano Sonata No. 14 in C# Minor*, I. Adagio sostenuto	*Symphony No. 5 in C Minor*, I. Allegro con brio	*Symphony No. 9 in D Minor*, IV. Finale

Piece 1 is a category for solo piano pieces only. Piece 2 is an orchestral category, whilst Piece 3 indicates music that was written for orchestra and choir.

2.4. Measures

In order to measure participants' emotional responses to the music, the Geneva Music-Induced Affect Checklist was used (GEMIAC; Coutinho and Scherer, 2017). This scale consists of 14 word pairs or short phrases to summarise an emotion category. Although the GEMIAC is very similar in content to the Geneva Emotional Music Scale (GEMS; Zentner et al., 2008), it was preferred here largely owing to the fact that it includes some emotion classes that are seemingly negative in nature, such as boredom and indifference. This was seen as important due to the sampling method used, in that not all participants necessarily enjoyed Western Art Music in everyday life and these individuals would perhaps have had difficulty providing accurate responses without such options. After listening to each piece of music, participants were required to complete all questions of the GEMIAC measure twice; once relating to the intensity of each perceived emotion category, and once relating to frequency, in accordance with the intended use of the scale.

A slightly adapted version of the Affect Grid (Russell et al., 1989) was used to measure participants' valence and arousal levels in relation to each piece of music. In its original form, the Affect Grid requires participants to indicate how they are feeling at a given point in time by marking an area on a grid with *pleasure-displeasure* on the *x*-axis and *arousal-sleepiness* on the *y*-axis. In order to generate precise and meaningful data through the medium of an online survey, this was amended to two separate Likert scales ranging from −5 to 5, one for valence and another for arousal. Participants were asked to provide an overall rating for both valence and arousal in relation to each of the pieces they listened to.

Familiarity was measured using a five-point Likert scale (1 = *I have never heard it before,* 5 = *I know it very well*), where participants indicated how much they recognised the piece. This was done in response to the theory that individuals tend to report greater liking for music that is familiar to them (Hargreaves et al., 1980; Madison and Schiölde, 2017). If familiarity was having a moderating effect on participants' overall enjoyment of the music then it was important to take this into account so that the research questions could be investigated as thoroughly and reliably as possible.

Finally, participants were asked to rate their overall enjoyment of each piece. The question took the form of a five-point sliding scale, ranging from "I did not enjoy it at all" to "I enjoyed it very much." These data were gathered with the intention of comparing it to each participant's stated usual enjoyment of classical music; even if a person does not usually enjoy a particular genre, it is possible that they might still enjoy specific examples of it.

Data from this listening study was gathered using Qualtrics and subsequent analysis was conducted using SPSS software. Because the study design incorporated a repeated measures aspect, it was necessary to restructure the dataset from the wide form into the long form. The index variable created during this process became the individual pieces of music, which were then subsequently grouped by composer in order to facilitate the appropriate methods of analysis.

2.5. Participants

Six semi-structured interviews were conducted. Prior to commencement of the interviews, each candidate was sent a link to complete a consent form and answer some demographic questions.

Details regarding the instruments and disciplines they teach were sought. All six were music educators; two participants teach music at a mainstream secondary school and one also does so at further education level. One interviewee teaches composition at a leading conservatoire whilst two are specialist instrumental teachers. The latter stated that they have also taught music at secondary school level, and all others mentioned that they have additional experience of instrumental teaching.

Interview participants were also asked to state their main instrument. There were three pianists, one violinist, one bass player and one drummer. Some multiple entries were received, with 'cello, viola and guitar all being mentioned. Moreover, all participants indicated that they possess at least a moderate level of ability on the piano. There was an even gender distribution with three male and three female interviewees. No data was gathered in relation to age or nationality.

A total of 31 people contributed to the listening study. Of these, 13 identified as male (41.9%) and 17 as female (54.8%). One participant declined to provide this information. A broad age range was indicated, with the youngest participant being 24 years old and the oldest 74 years old ($M = 40.2$, $SD = 17.5$), although four participants did not state their age. There was a majority of British participants ($n = 23$, 74.2%), with the next largest group coming from China ($n = 4$, 12.9%). One participant was Irish, another Northern Irish and another Australian, with one participant not disclosing their nationality. There were 21 musicians (67.7%), nine non-musicians (29%) and one participant whose musical training is unknown.

2.6. Procedure

At the outset of this study, an appraisal of the current examination syllabus requirements for three musical instruments was carried out. The piano, violin, and guitar syllabi for both ABRSM and Trinity examinations were scoured, and the number of pieces written by each of the three composers outlined above was noted in relation to instrument and exam board. These are the two largest, most well-known examining bodies in the world for music, and the instruments investigated are the three most widely taught tuned instruments in secondary schools.

Participants for the two main elements of this research were recruited using a combination of social media campaign, word of mouth and personal invitation. Interviewees were asked a set of questions relating to their learning journey, their teaching practices and their opinions about music education in general. Interviews were generally around half an hour in length, although this varied somewhat and was largely dependent on how much depth and detail was provided in responses.

The listening study took a similar length of time, but this was contingent on the pieces of music presented to each participant. The shortest piece was Bach's solo piano piece (2 min and 19 s), whilst the longest was the third of Beethoven's compositions (18 min and 14 s). Participants completed a consent form and answered some questions in order to gather some demographic information—this section of the survey took approximately 5 min. Thereafter, one piece of music from each of the three categories was presented to each participant, in a randomised fashion. This portion of the survey was set up in such a way that it randomised the music selection but that it presented each piece as equally as possible. After listening to each piece, respondents completed the GEMIAC checklist (Coutinho and Scherer, 2017) and provided ratings for valence and arousal, familiarity and overall enjoyment as outlined above. An identical process was repeated for the next two pieces of music.

3. Results (interviews and listening study)

3.1. Required repertoire

The total number of pieces across Grade 1 to 8 for each of the three composers being investigated is provided in Table 3. In the ABRSM piano syllabus, Bach's music was featured more regularly ($n = 8$) than both Mozart ($n = 5$) and Beethoven ($n = 6$). Likewise in the Trinity syllabus, Bach's music was more widely featured ($n = 7$) than Mozart ($n = 2$) and Beethoven ($n = 3$).

The ABRSM violin syllabus features Bach and Beethoven equally ($n = 6$), but Mozart less regularly ($n = 5$). The Trinity syllabus for violin features Bach most frequently ($n = 11$), followed by Beethoven ($n = 6$) and Mozart ($n = 2$).

Bach's music is featured most regularly in the ABRSM guitar syllabus ($n = 7$), with Beethoven featured less ($n = 1$). There are no pieces by Mozart in the ABRSM syllabus for guitar. The Trinity syllabus for guitar also features Bach most frequently ($n = 6$), but does not feature Mozart or Beethoven at all.

3.2. Interviews

Participants spoke at length regarding a range of subjects and topics. Although the questions were largely adhered to (see Appendix A), there were some occasional follow-up questions asked in an attempt to add clarity or context to certain responses. Three main themes were discovered in relation to the prevalence of Bach's music in mainstream music education, all of which could be further differentiated into two sub-themes. Figure 1 shows a thematic framework drawn from the analysis, from which it can be seen that there are also some convergences in the sub-themes, as well as the way in which each sub-theme births some distinct key concepts. Additionally, each sub-theme is shown to relate to a justification for the prevalence of each theme.

TABLE 3 Number of pieces by each composer within required repertoire lists, by Instrument and Examination Board.

Instrument	Composer	ABRSM	Trinity
Piano	Bach	8*	7*
	Mozart	5	2
	Beethoven	6	3
Violin	Bach	6*	11*
	Mozart	5	2
	Beethoven	6*	6
Guitar	Bach	7*	6*
	Mozart	0	0
	Beethoven	1	0

The three instruments used to gather this data are the three most widely taught tuned instruments in the United Kingdom, according to data from multiple sources. ABRSM and Trinity are the two most well-known exam boards.*The composer whose music features most frequently in a syllabus is indicated by an asterisk (Bach and Beethoven are used equally often in the violin syllabus).

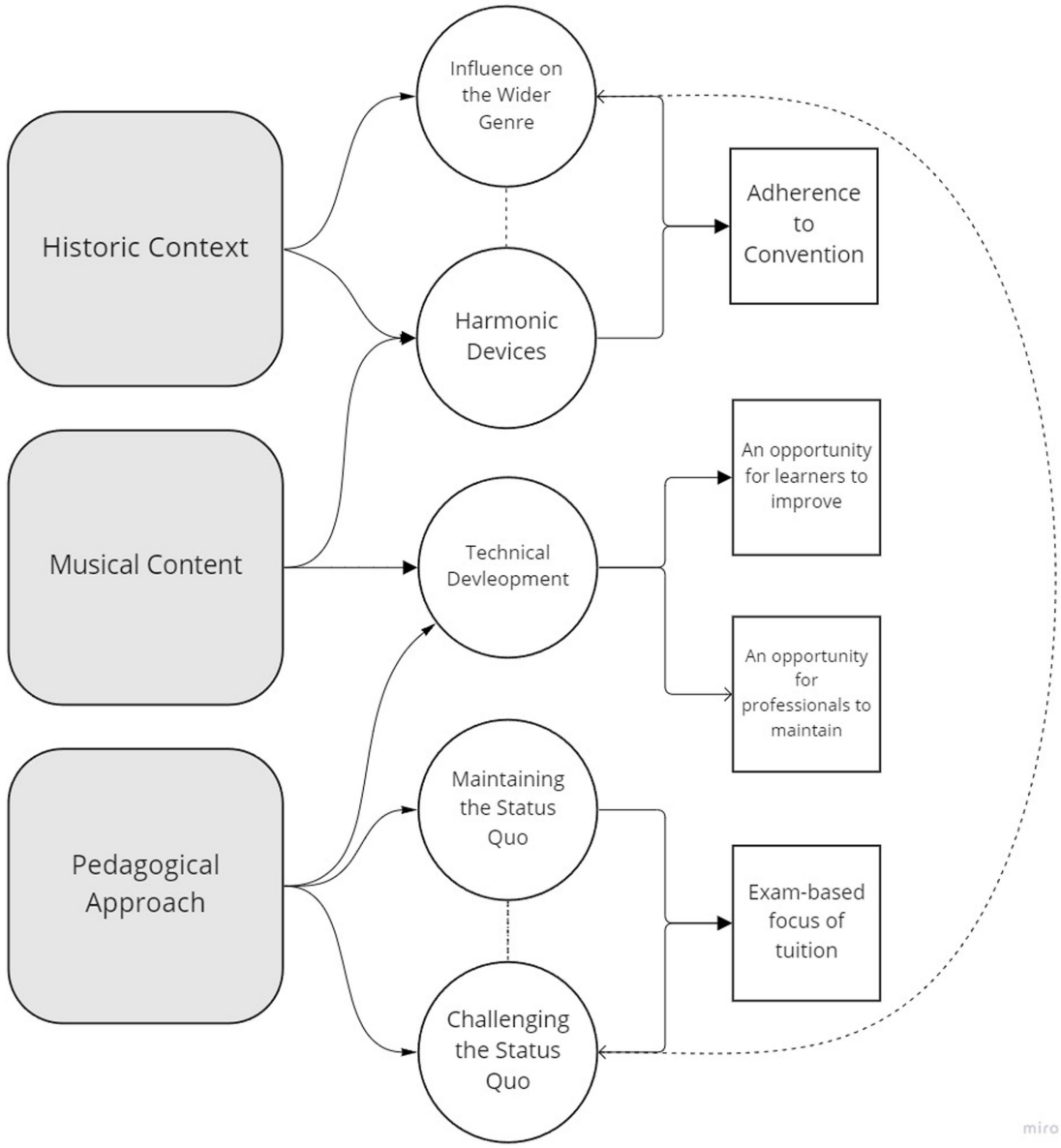

FIGURE 1
Thematic Framework Diagram for the Prevalence of Bach's Music within Music Education.

3.2.1. Historic context

Multiple mentions were made of the importance of understanding the ways in which music has developed over the years. As has been shown, Western Art Music is a centuries-old tradition which has evolved along several strands, and, whilst it would be disingenuous to suggest that J. S. Bach was the only influential or important composer of the late 17th Century, it does seem that he is widely regarded as being of particular importance:

> "He was one of the most important composers in the Baroque period… He influenced many other great German composers as well… If you study classical music, I would say you cannot avoid Bach." [P3].

There is the implicit suggestion that it is not only best practice to study Bach's work, but that it is simply necessary. He is thought to represent a textbook example of the Baroque style, while simultaneously moving it in new directions due to the musical parameters he employed. His work left a lasting impression on the Baroque tradition, and indeed on Western Art Music as a whole (Wu et al., 2015), and this makes it deserving of attention in educational circles. Moreover, whilst most participants were enthusiastic about the value of studying other composers, this was usually in relation to specific works and there was a lack of consensus surrounding an alternative to the study of Bach's music in this context.

Taken together, this theme and its related sub-themes point to the importance of understanding musical conventions regarding form and structure, and how these can be used as a starting point for learners' own musical explorations. Given his pervasive influence on Western Art Music, this could go some way to justifying the continued study of Bach's work within the setting of music education.

3.2.2. Musical content

The musical content utilised throughout the Bach canon appeared to be of particular importance to participants. Most cited his contribution to the ways in which harmony is understood, the ways in which certain harmonic devices occur regularly within his works, and the influence this has had on the wider genre. This represents an area of crossover between the theme of musical content and the previous theme of historic context (see Figure 1). However, of almost equal importance was the technical challenges presented by Bach's music:

> "The Bach… that's a technical exercise for so many different techniques… It's just a minefield for technical development, depending on which angle you look at it from a teacher's perspective." [P2].

This participant describes the multifaceted way in which Bach's music can be used to develop a musician's technique. Again, it is fair to say that repertoire from other composers doubtless affords similar opportunities but, as with the previous theme, there was a general consensus that this was a prominent compositional feature of Bach's work. Participants frequently made reference to the fact that his music is difficult to play, providing an opportunity for learners to refine and develop their technical facility on their chosen instrument, but equally for experienced players to challenge themselves in fresh ways and to ensure that their technique remains of a high enough standard.

This suggests that studying Bach repertoire provides those learners working at an intermediate level with the challenges they may need in order to transition into more advanced territory as instrumentalists. At such a crucial stage in the learning journey, it can be helpful to have reliable source material with a proven track record. The technical challenges of Bach's music, coupled with such influential harmonic content as outlined above, create an invaluable foundation on which to build.

3.2.3. Pedagogical approach

The broadest theme uncovered during the analysis of interview data was that of participants' pedagogical approach. More specifically, although there were several ways in which they differed—sometimes quite fundamentally—there were also several similarities. This theme reflects that paradox.

An observed trend was for instrumental teachers and practitioners who teach at the tertiary level to 'reteach'; that is, to teach students *via* the same methods and repertoire with which they were taught. This could be as a result of positive learning experiences which they are keen to pass on, but it also might point to a lack of awareness on the part of the teacher in relation to what resources are available. This can create a cyclical approach to teaching, which may be contributing to a predilection for Bach's music. As people continue to study it in their lessons, they assimilate into the culture of attributing importance to it. Subsequently, they go on to teach the same music in a similar way, causing another generation of learners to infer the same importance. In addition, the enduring emphasis on the importance of passing examinations causes similarly cyclical teaching practices:

> "Well, I was raised on the ABRSM diet of exam book Grade 1, then Grade 2, then Grade 3… Whatever the ABRSM syllabus had inside it, that's what I learned." [P2].

Given that examination requirements appear to ascribe high importance to the three composers being investigated in this research, and Bach in particular, it is hardly surprising that this music continues to be taught so widely.

Meanwhile, practitioners who teach at the secondary level seem keen to challenge the status quo. For example, there were questions raised regarding a perceived hierarchy of music:

> "If you look at the National Curriculum for music, they talk about 'The Great Composers', and I hate that phrase. What makes them necessarily greater than others?" [P6].

This quote directly challenges the idea put forward by Young (2016) that Western Art Music is somehow inherently better than other genres. It is evidently important to teach young learners about the music they enjoy because they are more likely to engage more readily with it (Green, 2006), and other participants emphasised the importance of allowing learners to explore their own individual tastes and interests.

The practice of "reteaching" may not be as cynical as it first appears, however, as there was also a degree of unanimity regarding the objective quality and pedagogic value of Bach's music in particular among interview participants. This is indicative of the way the two approaches, which initially appear diametrically opposed, can intersect.

In this way, based on the data gathered as part of this research, two distinct pedagogical approaches become apparent. The first is concerned with maintaining the status quo, respectfully honouring the great works of the past and drawing from the deep wells of musical instruction that they represent, whereas the second challenges the status quo and does away with any sense of hierarchy within musical genres. Developing the core minimal skill set of every learner remains important for all teachers, as indicated by the links to the sub-theme of technical development in the thematic framework diagram (Figure 1), as it is this which enables students to pass exams. This represents tangible, measurable progress in many cases. Crucially, though, these two pedagogical approaches have the potential to complement and support each other when applied in their fullness.

A final observation is the relationship between the pedagogical approach of challenging the status quo and the concept of wider influence. Without the former approach to teaching, music as a whole runs the risk of stagnating in the absence of any new ideas (De Smet, 2016). Figure 1 shows this relationship, which, in turn, demonstrates how all the prominent themes and sub-themes are interconnected. Whilst this is by no means offered as a justification for the continued honorific teaching of Bach above all other composers, it is hoped that it provides ample justification for his continued inclusion in mainstream music education.

3.3. Listening study

To investigate the effect of music by specific composers on the emotional responses of participants, a series of one-factorial multivariate analyses of variance (MANOVA) were conducted. The first of these investigated the relationship between music by specific composers and the responses given by participants in relation to the intensity with which emotions were experienced (Box's $M = 71.82$, $p = 0.265$). The internal reliability of the GEMIAC measure was shown to be very good ($\alpha = 0.861$), and a statistically significant relationship was shown, Pillai's Trace $= 0.365$, $F(14, 144) = 2.29$, $p = 0.007$, indicating that music by specific composers had a significant effect on the intensity of listeners' perceived emotions. A second MANOVA was conducted to discern the

TABLE 4 Tests of inter-category effects of music by specific composers and the repeated GEMIAC measure.

	GEMIAC category	df	Mean square	*F*	Sig. (*p*)
Intensity of affect					
Composer	Category 4	2	6.72	4.99	*0.009*
	Category 5	2	16.47	8.98	*<0.001*
	Category 7	2	14.44	10.05	*<0.001*
Frequency of affect					
Composer	Category 4	2	9.30	7.65	*<0.001*
	Category 5	2	17.85	10.84	*<0.001*
	Category 7	2	18.11	13.59	*<0.001*
	Category 9	2	12.43	8.32	*<0.001*
	Category 14	2	3.80	3.00	0.056

Significant results are shown in italic font. Results are significant at the.05 threshold ($p \leq 0.05$).

TABLE 5 Tukey's HSD *Post-hoc* analysis of the relationship between composers and mean scores for intensity of three GEMIAC categories.

Composer	Comparison	Mean difference	*SE*	Sig. (*p*)
Category 4				
Bach	Mozart	−0.90	0.308	*0.013*
	Beethoven	−0.06	0.319	0.980
Mozart	Beethoven	0.84	0.332	*0.036*
Category 5				
Bach	Mozart	−1.44	0.360	*<0.001*
	Beethoven	−0.19	0.373	0.869
Mozart	Beethoven	1.25	0.388	*0.005*
Category 7				
Bach	Mozart	−1.43	0.319	*<0.001*
	Beethoven	−0.60	0.330	0.170
Mozart	Beethoven	0.83	0.343	*0.047*

Category 4 is the "inspired, enthusiastic" emotion category. Category 5 relates to "energetic, lively" emotions and Category 7 refers to the "powerful, strong" category of emotions. Significant results are shown in italic font. Results are significant at the.05 threshold ($p \leq 0.05$).

relationship between music by specific composers and the frequency with which listeners experienced the emotion categories (Box's M = 309.99, $p = 0.252$). Another statistically significant effect was shown, Pillai's Trace = 0.686, $F(28, 126) = 2.35$, $p \leq 0.001$. Therefore, both the intensity and the frequency with which listeners experience certain emotion categories were affected to a statistically significant extent by Bach, Mozart and Beethoven's music.

Table 4 shows the results of the tests of inter-category effects. A statistically significant effect can be seen on the intensity with which participants experienced the fourth, fifth and seventh emotion categories of the GEMIAC scale. These relate to feeling *"inspired, enthusiastic,"* *"energetic, lively,"* and *"powerful, strong,"* respectively. Statistical significance was also shown in relation to the frequency with which participants experienced the fourth, fifth, seventh, eighth (*"full of tenderness, warm-hearted"*) and ninth (*"relaxed, peaceful"*) GEMIAC categories. There was no statistical significance in relation to any of the other categories in terms of intensity or frequency. However, a non-significant trend was shown in relation to the frequency with which participants experienced the fourteenth category. This category relates to feeling *"agitated, aggressive."* These results indicate that the music of Bach, Mozart and Beethoven had a statistically significant effect on the intensity and frequency of felt emotions within the fourth, fifth, and seventh categories of the GEMIAC scale, and on the frequency of felt emotions within the eighth and ninth category of the GEMIAC scale.

3.3.1. Intensity of affect

Post-hoc analysis was conducted using Tukey's honestly significant difference (HSD) test for multiple comparisons (see Table 5). The intensity with which participants experienced feeling inspired or enthusiastic was significantly lower when listening to Bach's music ($M = 2.84$, $SD = 1.14$, $p = 0.013$) compared to that of Mozart ($M = 3.58$, $SE = 0.99$) and this intensity was also significantly higher when listening to Mozart compared to music by Beethoven ($M = 2.74$, $SD = 1.36$, $p = 0.036$).

Energetic and lively feelings were also experienced with significantly less intensity when listening to Bach ($M = 2.29$, $SE = 1.45$, $p = <0.001$) compared to Mozart ($M = 3.73$, $SD = 1.04$), and likewise when listening to Beethoven ($M = 2.48$, $SE = 1.56$, $p = 0.005$) compared to Mozart.

Participants experienced powerful and strong emotions with significantly less intensity whilst listening to Bach's music ($M = 2.23$, $SE = 1.15$, $p = <0.001$) when compared to music by Mozart ($M = 3.65$, $SE = 1.06$). This intensity was also significantly lower when listening to Beethoven ($M = 2.83$, $SE = 1.40$, $p = 0.047$) compared to Mozart. There was no statistically significant difference between the intensity of felt emotions in any of these categories between music by Bach and music by Beethoven.

3.3.2. Frequency of affect

Tukey's HSD test was again used to examine the relationship between composers and the frequency with each emotion category was experienced by participants. Table 6 shows that the frequency with which they reported feeling inspired or enthusiastic was statistically significantly higher when listening to music by Mozart ($M = 3.76$, $SE = 0.78$, $p = 0.001$) compared to Bach ($M = 2.68$, $SE = 2.68$), and also when compared to Beethoven ($M = 2.77$, $SE = 1.27$, $p = 0.008$).

There was a statistically significant increase in the frequency of energetic and lively emotions felt by participants when listening to Mozart ($M = 3.88$, $SE = 0.88$, $p \leq 0.001$) compared to Bach ($M = 2.39$, $SE = 1.38$). This frequency was also statistically significantly higher when listening to Mozart compared to Beethoven ($M = 2.50$, $SE = 1.50$, $p \leq 0.001$).

Powerful and strong emotions were experienced at a statistically significantly lower frequency when listening to music by Bach ($M = 2.06$, $SE = 1.21$, $p = 0.047$) compared to that of Mozart ($M = 3.68$, $SE = 0.988$). There was a further statistically significant increase in the frequency of these emotions when listening to Mozart compared to Beethoven ($M = 2.86$, $SE = 1.25$, $p = 0.047$), and also a statistically significant difference in the frequency of such emotions when listening to Bach compared to Beethoven ($p = 0.040$).

Participants reported a statistically significant increase in the frequency with which they felt full of tenderness or warm-hearted when listening to Bach (M = 3.10, $SE = 1.14$, $p = 0.016$) compared to Mozart ($M = 2.24$, $SE = 0.88$). A non-significant trend was also shown in this regard between music by Beethoven ($M = 3.00$, $SE = 1.35$, $p = 0.061$) and music by Mozart.

A statistically significant difference was also found in the frequency with which participants reported feeling relaxed or peaceful. This

TABLE 6 Tukey's HSD *Post-hoc* analysis of the relationship between composers and mean scores for frequency of six GEMIAC categories.

Composer	Comparison	Mean difference	*SE*	Sig. (*p*)
Category 4				
Bach	Mozart	−1.08	0.296	*0.001*
	Beethoven	−0.10	0.307	0.948
Mozart	Beethoven	0.99	0.322	*0.008*
Category 5				
Bach	Mozart	−1.49	0.345	*<0.001*
	Beethoven	−0.11	0.358	0.947
Mozart	Beethoven	1.38	0.375	*<0.001*
Category 7				
Bach	Mozart	−1.62	0.310	*<0.001*
	Beethoven	−0.80	0.322	*0.040*
Mozart	Beethoven	0.82	0.337	*0.047*
Category 8				
Bach	Mozart	0.86	0.303	*0.016*
	Beethoven	0.10	0.314	0.949
Mozart	Beethoven	−0.76	0.329	0.061
Category 9				
Bach	Mozart	1.34	0.328	*<0.001*
	Beethoven	0.56	0.341	0.239
Mozart	Beethoven	−0.78	0.357	0.079
Category 14				
Bach	Mozart	−0.72	0.303	0.052
	Beethoven	−0.50	0.314	0.261
Mozart	Beethoven	0.22	0.329	0.779

Category 8 is concerned with feeling "full of tenderness, warm-hearted." Category 9 refers to the "relaxed, peaceful" emotion category. Category 14 is the "agitated, aggressive" category. Refer to Table 5 for other category definitions. Significant results are shown in italic font. Results are significant at the 0.05 threshold ($p \leq 0.05$).

frequency was statistically significantly higher when listening to Bach ($M = 3.42$, $SE = 1.26$, $p = <0.001$) compared to when listening to Mozart ($M = 2.08$, $SE = 1.16$). There was no further statistically significant difference shown between music by Bach and music by Beethoven ($M = 2.86$, $SE = 1.39$), or between music by Mozart and Beethoven.

Finally, a non-significant trend was shown in the frequency with which participants reported feeling agitated or aggressive. The largest difference was between music by Bach ($M = 1.32$, $SE = 0.87$, $p = 0.052$) and music by Mozart ($M = 2.04$, $SE = 1.31$), with Beethoven in between ($M = 1.82$, $SE = 1.22$).

There was no statistically significant difference in the frequency of felt emotions during music by Bach or music by Beethoven, with the exception of the seventh emotion category, as detailed above. This relates to participants feeling powerful or strong.

3.3.3. Valence and arousal

An analysis of variance (ANOVA) was carried out to examine the relationship between music by specific composers and the overall valence scores awarded to their music by participants. Bach's music scored the highest on average ($M = 8.19$), followed by Mozart ($M = 7.92$), and Beethoven ($M = 7.30$), although none of these means were statistically significantly different.

A further ANOVA, however, revealed that music by specific composers did have a statistically significant effect on the overall arousal scores awarded to the music by participants, $F(2, 77) = 6.48$, $p = 0.003$. *Post hoc* analysis was again carried out using Tukey's HSD test, which showed that mean arousal scores were statistically significantly higher for music by Mozart ($M = 8.08$, $SE = 2.40$, $p = 0.002$) compared to Bach ($M = 5.52$, $SE = 2.93$). There was also a non-significant trend, with overall arousal scores awarded to music by Beethoven being higher than those for Bach ($M = 7.30$, $SE = 2.91$, $p = 0.055$). There was no statistically significant difference between mean arousal scores for music by Mozart and music by Beethoven.

3.3.4. Familiarity and Enjoyment

Two final analyses of variance (ANOVA) were performed to investigate the relationship between music by specific composers and overall scores for both familiarity and enjoyment. No statistically significant difference was shown in either instance.

3.3.5. Confounding variables

Multi-factorial analysis of variance was carried out to determine whether participants' gender, musical training or nationality had any significant effect on their enjoyment of the music. No statistically significant effect was found from any of these variables, although a significantly positive correlation was shown between participants' age and their overall enjoyment of the music used in this research ($r = 0.24$, $p = 0.039$). A moderation model was subsequently conducted to determine whether this relationship pertains to either Bach, Mozart or Beethoven in particular. No significant effect was found, indicating that a person's enjoyment of Western Art Music in general may increase with age.

4. Discussion

A cursory appraisal of the current examination syllabi for three popular musical instruments was carried out, revealing a higher number of required works by J. S. Bach than the other two composers being investigated herein. This could be indicative of an implicit preference for his music among educators, although a similar appraisal of the required repertoire within the syllabus for all other instruments would be required before any definitive conclusions can be reached. Clearly, it is improbable that Bach's music would feature very often in the syllabus for instruments such as the clarinet or trombone, since he does not appear to have composed very much music at all for those instruments. Moreover, some of the instruments that are synonymous with Western Art Music today had not yet been invented during Bach's lifetime, and so Baroque repertoire in general does not exist for them (Wainwright, 2017). That said, several of his most popular works, including the lute suites and "cello suites, have been rearranged and adapted for performance on other instruments, and this too could point to a fascination with Bach's music in pedagogical circles.

Interviews with music educators were conducted. The main findings of the reflexive thematic analysis are discussed in greater detail above, according to convention (Braun and Clarke, 2021). There was an overall tendency to acknowledge the inherent objective qualities of Bach's music, and the themes of historic context, musical content and its malleability to a range of pedagogical approaches were postulated in

support of its prevalence within the field. However, given that Western Art Music in general is not considered mainstream, there is a need to temper this with source material that is more accessible in an effort to dispel the perceived hierarchy of musics within mainstream education.

Listeners' responses to selected works by Bach, Mozart and Beethoven were analysed. In almost all cases where a significant effect was shown, Mozart's music elicited higher mean scores for both intensity and frequency of felt emotions. This is noteworthy when one considers the intention of musical study: If music is capable of provoking a range of powerful emotional responses, as shown by Juslin et al. (2013), one may question the rationale behind placing so much pedagogic value on a composer whose music appears less able to do so than others; clearly there is more to musical endeavour than the acquisition of technical skill and harmonic knowledge. In line with the findings of Hayes et al. (2021), the objective quality of Bach's music does not correlate with people's enjoyment of it. One finding that may be of particular interest is that, in the majority of cases, no statistically significant difference was found in listeners' responses to music by Bach and music by Beethoven. The reasons for this require further investigation, but it is possible that Mozart's music makes more regular use of some musical parameters that are known to elicit certain emotions in listeners (Sloboda, 1991; Kellaris and Kent, 1994) when compared to the music of Bach and Beethoven. Interdisciplinary research encompassing musicological analysis and emotion measures may offer some insight into this phenomenon.

4.1. Possible interpretations of the findings

The primary measure used during the listening study was the GEMIAC scale (Coutinho and Scherer, 2017), which measures both the intensity and frequency with which participants experienced each emotional category. Results indicate that Mozart's music causes listeners to feel inspired and enthusiastic with greater intensity and greater frequency when compared to the other composers being investigated. The same is also true for energetic and lively feelings, along with emotions relating to participants feeling powerful and strong. The predominantly positive valence of these emotion categories lends support to the YouGov survey (Anon, 2022a), which found that Mozart is the most popular composer of Western Art Music in the United Kingdom, since it stands to reason that listeners enjoy these feelings. However, it is peculiar that Bach's music was awarded the highest mean score for overall valence in spite of this, although the differences here were admittedly not statistically significant.

The music of Bach was shown to cause a statistically significantly higher frequency of tender and warm-hearted emotions, as well as relaxing and peaceful emotions. This could be due in part to the ostensibly more accessible sound of traditional Baroque instrumentation (Dannenberg, 2010), but his unique compositional style is undoubtedly an important contributing factor. It could be argued that the musical parameters employed in the three pieces were the true predictors, since all three utilised a major tonality and a moderate-to-fast tempo (Kellaris and Kent, 1994). However, if that were the case then one might also expect to see a statistically significant decrease in these emotion categories when listening to Beethoven, since the three works of his used in this research are all in a minor key. Yet such a difference was not found.

The non-significant trend towards Mozart's music causing feelings of agitation or aggression more regularly than other composers is also surprising when considered in the light of Kellaris and Kent's (1994) research into the effects of tempo, tonality and texture. Their findings suggest that Beethoven's combination of minor harmony, dissonance and staccato rhythms ought to have provoked a higher frequency of this emotion category among listeners. The fact that Bach's music scored lowest in this category is consistent with their findings, but the combination of these results does seem to imply that a composer's individual style is another genuine predictor of emotional response in a complex melange of variables.

The mean scores for overall valence were highest for Bach, as has been outlined above, although it is important to emphasise again that the difference here was not statistically significant. This is perhaps surprising when his popularity in the United Kingdom is the lowest of the three composers (Anon, 2022a), but the fact that the frequency with which listeners experienced the eighth and ninth emotion categories—"*full of tenderness, warm-hearted*" and "*relaxed, peaceful*," respectively—was statistically significantly higher for his music may go some way to explaining this. It may also be reflective of the major tonality and mainly legato phrasing employed by Bach in the three compositions used in this study (Kellaris and Kent, 1994).

Mean overall scores for arousal were statistically significantly higher for Mozart's music, with Bach receiving the lowest mean scores in this area. On the one hand, this is consistent with other findings of this research, which suggest Bach's music is more relaxing and peaceful for listeners. However, much of it is written for the express purposes of dance: he wrote numerous minuets, gavottes, gigues, sarabandes and the like, and some musicologists claim that many of the stylised rhythms of these dance forms have pervaded his other work as a result (Little and Jenne, 2001). It might therefore be reasonable to expect the overall arousal scores of his music to be at least similar to that of the other composers investigated herein.

The positive correlation between participants' age and their overall enjoyment of Western Art Music is consistent with the findings of previous research (Bonneville-Roussy et al., 2013). The absence of any moderating effect on this correlation by specific composers provides further support for the hypothesis that some composers are more able to bring out specific emotional responses than others, since the increased enjoyment appears to be universal in this case. If people's enjoyment of one particular composer increased with age, then it would be inaccurate to attribute causation to the music itself; rather, the statistically significant effects found throughout this research appear to be regardless of age. The same could be said of gender, nationality, familiarity and musical training, since no significant effect was found from any of these variables. As a result, it can be asserted with some confidence that the unique characteristics of each composer's work can be a reliable predictor of the intensity and frequency with which listeners may experience some emotion categories, and that this is independent of the listeners' age, gender or nationality.

4.2. Limitations and suggestions for future research

The limitations of qualitative data have already been alluded to above (see sections 2 and 6), but the use of interviews is nothing new and the findings of this element of the research cannot simply be dismissed because of their qualitative nature. Conducting more interviews would have potentially allowed different themes and patterns to emerge, especially if such interviews focused on a broader range of instrumentalists, such as those not often associated with the Western

classical tradition. However, it is hoped that the mixed-method approach employed in this research offers a broad and comprehensive array of insights, and that it is precisely this breadth that enables reliable conclusions to be drawn.

A fundamental limitation of the listening-based portion of this research is that of music selection. Were the study to be repeated with three different pieces of music to represent each composer, it is perfectly possible that the results may differ. In fact, even the same pieces of music distributed differently across the same participants may lead to some disparity. Further research might consider utilising a test–retest method to strengthen the validity of any findings.

In a similar vein, some of the works used in this study are very long—particularly those by Beethoven. This caused the survey to be rather longwinded for participants, which may have resulted in a loss of interest as time went on. Some responses may be rushed and subsequently inaccurate. Additionally, the relatively small sample size investigated here means that the test power is not as high as it might otherwise have been. Several participants reported technical issues with the online survey platform, whereby they could not play the audio examples, or certain questions failed to load, and they unfortunately either gave up after partial completion, or else their responses were rendered altogether invalid anyway (there were 127 attempts at participation, including the 31 analysed in the results section of this report). Nevertheless, statistical significance was still found in several instances, so it would be unreasonable to discount these results in the absence of a larger sample size.

There was a large majority of British participants in the listening element of this study (74.2%). No statistically significant relationship was found to exist between nationality and overall enjoyment scores, but it is worth noting that most participants were also musicians (67.7%). Viewed through the lens of other findings presented, this may mean that their enjoyment of the music is at least partly caused by musical training. No statistically significant effect was found in this case either, but the uneven distribution between musician and non-musician groups may have skewed the data. Some further investigation is therefore recommended into the role played by musical training, if any, in a person's response to music by specific composers. For example, the higher scores for mean overall enjoyment awarded to Bach's music could perhaps be explained by the number of musicians in the sample—it may be possible that they are more able to discern some of the less explicit musical qualities referred to by interview participants as a result of their training, and that this contributes to their overall enjoyment of the music. Similarly, had there been fewer participants with musical training, then it is possible that a relationship between nationality and overall enjoyment might have been present.

Statistically significant results notwithstanding, the relatively small sample size in both elements of this study could cast into doubt the generalisability of the findings. This is perhaps especially true in terms of nationality, owing to the overrepresentation of British participants. A larger sample size would almost certainly have yielded a wider variance of data which, in turn, may have affected the results of the final analysis.

Finally, although justification has been provided for the decision to focus on Bach, Mozart and Beethoven specifically, future research may choose to investigate other composers as this could be of interest to individuals across a range of disciplines, and could serve to provide a holistic view of the ways in which listeners respond to music by certain composers. Similar studies may also wish to consider investigating other genres.

5. Conclusion

It has been shown that a specific composer's compositional style can have a significant effect on the emotional response of its listeners. Whilst only three composers were investigated as part of this research, this finding nevertheless extends the current understanding of the potency of musical parameters. Whilst they are known to be effective predictors of emotional response in isolation, the fact that this is not representative of how the majority of people listen to music means that the findings presented here may enable listeners to make informed decisions relating to the use of music as a means of emotion regulation.

Further, an apparent preference for the study of Bach's music has been shown to exist within mainstream music education. There is an overall consensus that his work constitutes a transition point between intermediate and advanced musicianship, from the dual perspective of technical ability and musical understanding. However, this does not seem to translate into more evocative music. Mozart's music appears to be more effective in this regard, but if the findings of Wu et al. (2015) are correct, it would be fair to say that his work would not exist as it does without the pervasive influence of J. S. Bach.

6. Reflexivity

A large portion of this research is concerned with the collection and analysis of qualitative data. Although data of this type might arguably have lower ecological validity than its quantitative equivalent (Jones and Donmoyer, 2021), it is hoped that the source of such data is sufficient to counterbalance the lack of objectivity. The value of specific insights gained from direct contact with genuine experts is difficult to overstate and, when interpreted alongside quantitative data, can serve to provide context and further support to the findings of a mixed-method study such as this.

It is from this perspective that my own position within this study design ought to be made clear. An important step in conducting research is acknowledging one's own potential biases (Šimundić, 2013), as they could cause issues ranging from flawed study design to inappropriate manipulations of the data. Although my principle role in the present study is that of researcher, it is impossible to truly separate that from my other work as an instrumental music teacher and performer of over 20 years. Indeed, many of the ideas and observations that birthed this study are a direct result of such work. References to exam syllabi and prevailing attitudes are based chiefly on first-hand experience, and interviews were secured largely as a result of my reputation within the field—this is discussed in more detail in the methodology section of this report. Additionally, as a guitarist, Bach's music has played a crucial part in my personal learning journey and occupies an important place in my own teaching practices. In light of this, it was perhaps impossible to completely avoid some assumptions throughout the undertaking of this research. However, care has been taken to mitigate against potential researcher bias by designing interview questions that did not lead the participants to respond in a certain way. In any case, the combined experience of participants in that element of the study carries with it an inherent trustworthiness, which is often viewed as analogous to the notions of validity and reliability that are so crucial to quantitative research (Lincoln and

Guba, 1986; Jones and Donmoyer, 2021). Moreover, the listening study element gathers wholly quantitative data through the use of standardised measures, and it is the findings of the combination of these two elements from which conclusions have been drawn, further strengthening the reliability of the research as a whole.

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 University of York Arts and Humanities Ethics Committee. The patients/participants provided their written informed consent to participate in this study.

Author contributions

NM was responsible for the initial concept and study design, as well as all data manipulation and analysis. KO'N offered valuable contributions towards the refinement of the study in order to strengthen its reliability and validity. This report was written by NM with guidance and editorial support from KO'N. All authors contributed to the article and approved the submitted version.

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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.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2022.1086623/full#supplementary-material

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Meaningful approaches to content selection and ways of working: Norwegian instrumental music teachers' experiences

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The Norwegian municipal schools of music and arts are publicly funded institutions which offer extra-curricular activities for children and adolescents in music and other art forms. The system is designed to ideally reach all children, but while each municipality is legally responsible for providing school of music and arts education for its inhabitants, the law does not state anything about teaching content or ways of working. Consequently, this is up to the teachers to decide. What is taught in these schools is, however, relevant to whether children feel included or excluded. This means that music teachers' beliefs and actions are among the factors that influence who will feel welcomed and who will feel alienated. On this basis, in this article we explore music teachers' approach to content-related decision-making processes by asking about their meaningful approaches to selecting content and ways of working within instrumental music teaching. To answer that question, we discuss what kinds of teaching content the teachers choose in general, as well as for beginner and advanced students, the reasons they express for selecting content, which, if any, music they find not to be suitable as teaching content, and how they work with the selected repertoire. We draw on empirical data from a survey among 151 music teachers and an interview study with 11 music teachers. Discussing results from these sources of data in relation to the Nordic and German music Didaktik theories, enables us to address meaningful approaches to selecting content and ways of working. From the analysis, we draw conclusions about what the music teachers experience as meaningful approaches. These can be summarized as (a) the centrality of the students in the process of selecting content; (b) genre versatility, meaning that students should be exposed to a broad range of musical genres and styles; and (c) that students are exposed to the "classical repertoire," or the standard repertoire within a genre or tradition. In general, what seems to be meaningful for the teachers is working "close to the student's wishes and preferences," but in ways that relate to a variety of Didaktik principles.

KEYWORDS

musical upbringing and schooling, schools of music and arts, instrumental teaching, inclusion, exclusion, sociology of music education, music Didaktik, music teaching

1. Introduction

The Norwegian municipal schools of music and arts are publicly funded institutions which offer extra-curricular activities for children and adolescents in music and other art forms. The system is designed to ideally reach all children as each municipality is legally responsible for providing school of music and arts education for its inhabitants (Norwegian Education Act, 1998, pp. 13–16). The law

does not state anything, however, about what forms of teaching content are desired or which ways of working with the musical material should be preferred. Although a detailed and quite recently updated curriculum framework exists (Norwegian Council for Schools of Music and Performing Arts, 2016), this does not provide specific guidelines for repertoire or how to go about teaching it. The curriculum framework is only advisory, hence, the schools are not obliged to follow it. Consequently, it is to a great extent up to the teachers to decide on the content and on ways of working. Since such deliberations are left up to the teacher, we took this as a point of departure for exploring which approaches to content selection and ways of working were found meaningful by instrumental music teachers working within Norwegian schools of music and arts.

The schools of music and arts are not part of the compulsory school system, rather they are music and arts centres offering voluntary arts courses. They are publicly financed, but students pay a fee set by the various municipalities. The schools have no entrance examinations. If there are not enough available places, applicants are put on waiting lists. From the very beginning of the Norwegian music and art school system's existence, popular music and folk music have been included, if not with the same self-evidence as art music/classical music. Previous research reports quite a strong classical music hegemony that has been visible, among other things, in all curriculum frameworks, including the most recent one (Ellefsen and Karlsen, 2020; Karlsen and Nielsen, 2021). However, when exploring empirically which musics are currently played and offered, we find that popular music and classical music seem to occupy almost equal space and status, both when it comes to which instruments and ensembles are taught and facilitated on the national level (Jordhus-Lier et al., 2021) and which forms of repertoire the students are expected and encouraged to play (Nielsen et al., 2022). In addition to these two most frequently occurring broader genres, certain music and art schools also teach Norwegian folk music, Sami music, and the music of some immigrant minority groups, although the distribution of such genres is geographically limited and determined (Jordhus-Lier et al., 2021).

Previous research also gives indications as to what may influence the selection of repertoire in Norwegian music and arts schools. Jordhus-Lier (2018) has shown that music teachers' own genre versatility may influence teaching content to quite a large degree. This form of versatility is also one of the sought-after competences when hiring teachers, and increasingly so. We also know that, in general, the teachers' influence is strong when musical repertoire is selected for teaching (Nielsen et al., 2022), and even more so when teaching art music/classical music than when teaching popular music repertoire. To a certain degree, instructional textbooks and other educational material also seem to set the premises for what is taught (West and Rostvall, 2001; Nielsen et al., 2022), perhaps especially at the beginner level (Blix, 2018).

The teachers' central role in selecting content and ways of working may partly be understood through a quotation from Holmberg (2010), in which she claims that music and arts school teachers in Sweden see themselves as "defenders of their own practice, the last lifeline of highbrow culture in a stormy sea of cultural relativism" (p. 196). That music and arts schools are seen by many as a site for the dissemination of highbrow culture is supported in Norwegian research as well (see, e.g., Gustavsen and Hjelmbrekke, 2009; Berge et al., 2019). This, combined with the fact that even a low-priced fee can make attendance difficult for children and youth from socio-economically disadvantaged backgrounds, plus the observation that the schools are an unknown phenomenon to a large group of the population (Bjørnsen, 2012)—to the extent that they are described as a well-kept secret (Berge et al., 2019)—make the music and arts schools arenas for quite effective cultural inclusion and exclusion, often along lines of division related to social class. Both Swedish and Norwegian research emphasize that music and arts schools are playgrounds predominantly designated and accessible to middleclass users (Jeppsson and Lindgren, 2018; Berge et al., 2019; for more information about class structure in Norway, see Hansen et al., 2009). Indeed, Finnish researchers have recently described the opportunity gap that results from the seemingly free choice of extra-curricular music activities in Finland as a form of hidden elitism (Väkevä et al., 2022).

Although the social dynamics related to extra-curricular schools of music and arts can be seen as connected to macro-scale social systems, and thus can be analyzed on the systems level of society, we believe that the everyday workings of such dynamics should also be given attention, and that they are perhaps most efficiently explored through teachers' approaches to content selection and ways of working with the musical repertoire. Here, we work from a Bourdieusian-inspired theoretical understanding which implies that we see music as the art form that most "clearly affirms one's 'class'" (Bourdieu, 1984, p. 18), and whose related patterns of taste, use, consumption, and (re) production thus also work to divide and classify people, and also that the micro and macro levels of society mutually constitute each other through "[t] he practical sense" (Bourdieu, 2000, p. 139) and embodiment of structure that is provided by habitus. As such, in this specific practice, the approaches to selecting content and ways of working qualified as necessary and meaningful to the teachers will be heavily imbued with their embodied practical sense (Bourdieu, 1990). Consequently, instrumental music teachers' beliefs and actions are, on the everyday micro level of society, among the factors that will most strongly influence who will feel welcomed and included in the music and arts school system, and who will feel alienated and excluded. On this ground, in this article we explore music teachers' approach to content-related decision-making processes by asking:

What are meaningful approaches to selecting content and ways of working within instrumental music teaching?

- What kinds of teaching content do the teachers choose in general, as well as for beginner and advanced students, respectively?
- What reasons do the teachers express for selecting content?
- Which, if any, musical styles and genres do the teachers find to be unsuitable as teaching content?
- How do the teachers work with the selected repertoire?

This study is part of a larger research project investigating the social dynamics of musical upbringing and schooling in Norway (DYNAMUS, n.d.), where the system of extra-curricular schools of music and arts was used to exemplify one vital arena (see Jordhus-Lier et al., 2021; Karlsen and Nielsen, 2021; Nielsen et al., 2022).

2. Theoretical perspectives on music Didaktik

When examining how music teachers select and decide how to work with teaching content, we find it fruitful to draw on some central elements from the Nordic and German Didaktik and music Didaktik traditions. Thus, we discuss our findings in relation to Klafki's (2006, 2011) Bildung and Didaktik theories, as well as Nielsen's (1998) five central activities. In addition, we also include Dyndahl and Ellefsen's (2009)

discussion on how the field of cultural studies might inform music education scholars' understanding of the complexities involved in Didaktik-related choices.

The word Didaktik derives from a Greek word meaning to teach/to be taught, and refers to the art of teaching (Johansen, 2007; Nielsen, 2007). Didaktik as a scientific discipline is closely linked to the tradition of German humanities of the last 200 years, including the concept of Bildung (Nielsen, 2007). Within the Nordic music educational field, Nielsen (1998) has been central in further developing these traditions. Music Didaktik as a pedagogical tradition concerns the art of teaching music and deals with the rationale for upbringing and music education; that is, *why* students should learn music and *what* they should learn (Nielsen, 2007; Johansen, 2017). It includes all the decisions that teachers have to make, as well as the rationale behind such decisions. Didaktik connects theoretical and practical considerations, and Nielsen claims that

> a widespread understanding of the object of study of Didaktik can therefore, conditioned by the specific Didaktik concept, be summarized in the following definition: Didaktik deals with the theory and science as well as the planning and decision-making of the content, aim and rationale of teaching/learning (Nielsen, 2007, p. 267).

A narrow understanding of Didaktik is common within the Danish music Didaktik tradition represented by Nielsen (1998), focusing on the aims and content of the teaching. In Norway, however, a broad understanding, in which the methods or methodology are included, is most common (Nielsen, 2007; Hanken and Johansen, 2021). This is also reflected in the present study, where we focus on which content the teachers select, their reasons for selecting the content, and also how they work with the selected content. Klafki originally focused primarily on content-and curriculum-related issues, but later used the term Didaktik for both the dimensions of objectives and content and the dimension of methods (Klafki, 2006). He asserted, however, that method planning can only take place after Didaktik analysis because methodological steps are "governed by practical considerations, whereas the order of Didaktik reflection follows theoretical-systematic norms" (2006, p. 130). In other words, the "pedagogical significance and structure of which have been established by Didaktik analysis" must be the base from which one can find the ways that lead to "the fruitful encounter between the children and the content" (Klafki, 2006, p. 129). Catering to this encounter constitutes the purpose of instructional preparation, according to Klafki (2006, 2011). Within Klafki's ideas of categorical Bildung, exemplary teaching, and critical-constructive Didaktik, we can find answers to how one can work toward achieving such goals.

To develop his theories, Klafki analyzed the history and development of the concept of Bildung. He found two main understandings of the concept, namely material and formal Bildung theories (Nielsen, 1998; Klafki, 2011; Straum, 2018). Within material Bildung, the acquisition of the content is the goal, either as "objective knowledge," in which the students are introduced to the society's knowledge, ethics, and so forth (objectivism), or as the classical content within a culture, defined by what dominates or has achieved status (classical Bildung) (Nielsen, 1998; Klafki, 2011, p. 15; Straum, 2018; Hanken and Johansen, 2021). Within the tradition of formal Bildung, the student is the central element, and the focus is either on developing the student's inherent abilities (functional Bildung) or on the process of learning methods to achieve strategies to master life (method-based Bildung) (Nielsen, 1998; Klafki, 2011, p. 15; Straum, 2018; Hanken and Johansen, 2021). Hanken and Johansen (2021) see these different Bildung theories in connection with upbringing toward music (material Bildung) and upbringing through music (formal Bildung). Nielsen (1998) asserted, however, that it is seldom a matter of upbringing toward or through music, but rather a combination of both. This is in line with Klafki, who argued that neither material nor formal Bildung theories can stand on their own; when focusing on the content one needs to see it in relation to the student and the society, and focusing on methods without any relation to content is neither productive nor even possible (Straum, 2018). Instead, Klafki argued in favor of combining these theories, in which Bildung happens in a dialog between the teaching content and the student, where the object and the subject are inextricably linked in a dialectical unity (Nielsen, 2007; Klafki, 2011; Straum, 2018). This is often referred to as a "double unlocking"; the content is "unlocked" for the student and the student is "unlocked" to the content and its relation to the surroundings (Klafki, 2011, p. 17; Straum, 2018). This Bildung theory is what Klafki named categorical Bildung. A central element within categorical Bildung is exemplary teaching, which, in short, refers to the idea of enlightening abstract, general, and fundamental principles by focusing on a few concrete (and good) examples, which are, or can be, connected to the students' world outside the school (Johansen, 2007; Klafki, 2011; Straum, 2018). An element of critique is at the core of Klafki's later Didaktik theory which he denotes critical-constructive Didaktik (Klafki, 2011), where students' self-determination as well as exemplary teaching are central. The main goals for teaching within critical-constructive Didaktik are self-determination, co-determination, and solidarity, which can be achieved through exemplary teaching (Klafki, 2011).

Within the art of teaching, Didaktik analysis is crucial, according to Klafki (2006), and the focus should be on what is to be taught: the content. The teacher's task is thus "to elucidate which aspects of the content contribute to Bildung, to explore what it contains that can or should comprise education, Bildung" (Klafki, 2006, p. 117). Klafki (2006, p. 118) also emphasized the importance of the teacher adopting or representing two positions: (a) the "lay-person" the student will become; for instance, "the democratic citizen," and (b) the young person the student is, with his or her capacity for understanding where the teacher "explore [s] them for their deeper educational potential." Within the first position, Klafki (2006, p. 118) emphasized the relevance of teachers to be "willing to be moved by the subject matter during preparation." Connected to this is the importance of selecting content that is relevant to the students. This is important in at least two ways: (a) as a connection to the society and to activities outside the school (where the students are now), and (b) as significant for the students' future (Klafki, 2006).

The connection between content and activity is illustrated by Nielsen (1998), who exemplified how a song as content (the song the students should learn) could be selected based on either the song itself (as from a specific period, from a certain country, etc.), or on the activity of singing. Nielsen (1998, 2007) also described five subject-related forms of activity which should be "understood as a way the student can engage (be 'actively' involved with) the medium and the object area in question" (2007, p. 273). The five central activities are *reproduction*, *production*, *perception*, *interpretation*, and *reflection*, where the first four imply being in direct contact with the music and the fifth means reflecting about music (Nielsen, 1998, 2007). These central activities are intertwined, as elements from other activities will be present, although one form of activity is central. In the central activity, *reproduction*, to perform and reproduce existing music, either by singing, playing an instrument, or leading others, is central. This implies the need for a representation of

the music; the music needs to be written down or recorded, or handed over orally. A central element within this activity is the implication of the idea of an existing musical "piece" with an identity that is maintained (or at least attempted to be maintained) from one performance to another (Nielsen, 1998, 2007). The development of musical skills is fundamentally connected to playing existing music, according to Nielsen (1998), and this activity has historically been central to content selection in music education.

Production is connected to creating, composing, and improvising music, and *perception* concerns listening to music, representing a receptive relation to music (Nielsen, 1998, 2007). Nielsen (1998) underlined, however, that the activity of perception cannot be understood in isolation because all musical activities imply listening at some point. With *interpretation*, Nielsen (1998) referred to the activity of analyzing and interpreting music and expressing its understanding and interpretation in a non-musical medium, which is to say an analytical and hermeneutic form of interpretation. The last central activity, *reflection,* concerns thinking about music, where considering, investigating, and seeing music in historical, sociological, and psychological perspectives are central (Nielsen, 1998, 2007).

Another approach to music Didaktik can be found in Dyndahl and Ellefsen's (2009) exploration of how perspectives from cultural studies can inform music education scholarship, and in particular the subfields interested in the Didaktik-related "aspects of teaching and learning music" (p. 9). These contributors lead a discussion mainly on didactology as a meta-level, and demonstrate how the identity of the subject of music itself is "complex, contingent and culturally contextual" (p. 9). However, they also put the students' identities at the forefront when discussing how various ways of facilitating music education might offer different subject positions:

> How does the school subject music work as a field of education where pupils and students negotiate, renegotiate and identify with narratives of themselves as male/female, straight/queer, white/black, native/foreign, local/cosmopolitan, young/grown-up practitioners and participants in musical activities and communities … and for that matter experience a sense of belonging to high/low social class and/or culture as well? (p. 16)

In our opinion, this multifaceted understanding of the experiential and existential negotiations taking place within the frames of the music subject is not only valid for the context of (compulsory) schooling. It is also highly relevant when considering how content selection by instrumental music teachers may, or may not, interplay and create meaningful connections with their students' various identities.

3. Materials and methods

The present study has a multi-method approach (Creswell and Plano Clark, 2007), combining data from interviews and a survey questionnaire, both conducted among music teachers in schools of music and arts. Multi-method studies are studies in which multiple types of qualitative or quantitative data are collected, and are distinguished from mixed methods studies collecting *both* qualitative and quantitative data (Creswell and Plano Clark, 2007, p. 273). In the present study, we combine the survey's open-ended questions with interview data. We thus let two types of qualitative data inform each other: the survey adds rigor to our data from the interview study, and the interviews add depth.

3.1. The questionnaire and the interviews

The questionnaire was distributed electronically among 902 music teachers at 70 schools of music and arts between October 2019 and May 2020. The schools were selected using a quota sampling strategy (De Vaus, 2013) based on geography (18 counties in 2019)[1] and municipal size.[2] We received 151 responses, with good geographical and size-related dispersion: the music teachers were from all 18 counties; about half of them were from medium-sized municipalities, about a quarter from small municipalities and a quarter from large municipalities (see also Nielsen et al., 2022). Encouraged to choose two music examples from their most recent teaching day, the teachers described, among other things, these examples in terms of title, composer or artist, and how they worked with them as teaching content. In addition, they were asked to share an example of other pieces of music they preferred to use in their instrumental or vocal teaching, and which they thought worked well in this context. They were also asked to describe how they usually worked with this music. All these questions were open-ended, and in this article, we mostly draw on the data from the teachers' answers on how they worked with the music examples provided.

In the semi-structured interview study (Brinkmann and Kvale, 2015), 11 music teachers at five different schools of music and arts participated. The teachers belonged to five strategically sampled schools situated in different parts of Norway. The selection of these schools was based on results of a study by Jordhus-Lier et al. (2021), which mapped Norwegian schools of music and arts' offerings in terms of musical genres and related instruments and ensembles. We were thus able to choose our five schools according to variation in geographical location, size of municipality and musical instruments and genres. The 11 teachers were selected to represent the schools' various profiles and variations in instruments and musical styles taught. The interview guide consisted of four topics: (a) the teachers' background; (b) their choice of teaching content; (c) their views on the school of music and arts; and (d) their experiences with involving parents and keeping in contact with their students. In this article, we focus on what the teachers told us about their choice of repertoire for beginners and advanced students, respectively, focusing both on repertoire choices and the reasons behind them. We also asked the teachers if they found some musical styles or genres not suitable as teaching content for these groups of students.

3.2. Participants

The survey teachers and the interviewees had musical backgrounds from diverse musical genres, such as folk music, art music/classical music, popular music, wind band, and other genres.[3] The survey teachers

1 Oslo is both a county and a municipality (and thus has one school of music and arts), and was therefore combined with Akershus when drawing municipalities for reasons of anonymity.

2 Municipalities were classified as small (up to 9,999 inhabitants), medium-sized (10,000–74,999 inhabitants), or large (more than 75,000 inhabitants).

3 Other genres included *American and Irish folk music*, *cross genre projects*, *Sami music*, *Scandinavian dance band music*, and *atonal/experimental music*.

taught a wide range of instruments (for detailed information, see Nielsen et al., 2022), while the interviewees taught piano, singing, string instruments, popular music instruments, folk music instruments, and wind band instruments. Of the survey respondents, 142 teachers (94%) had formal music education, and 127 (84.1%) had formal pedagogical qualifications (Nielsen et al., 2022). Of the interviewees, all but one had formal education in music, and 9 of 11 were educated as music teachers with formal pedagogical training. Three of the interviewees were educated as school music teachers and also taught music (or other subjects) at primary and lower secondary schools as part of their jobs in the municipalities. The interviewees also differed with regard to their level of education in music. One teacher had completed two out of three years as part of a bachelor's degree in music, while others held a bachelor's, master's or doctorate degree in music. The interviewed teachers had been working at their respective schools of music and the arts for between two and almost 30 years. Most of their students were between year 6–15, which is the school of music and arts' main target group. The least experienced teacher taught folk music instruments, while the two most experienced teachers taught string instruments, working mainly within the classical music genre. Only two of the teachers were not expected to include ensembles as part of their work, while others taught and conducted wind bands, string ensembles, popular music bands, and choirs within the schools. All but one teacher were active performing musicians, playing solo concerts, participating in Kappleik,[4] conducting or playing in amateur ensembles (choirs, wind bands), or playing in professional ensembles (symphony orchestra, popular music band), composing and recording records or being studio musicians.

3.3. Analysis

All the data material was analyzed qualitatively, using thematic analysis, as it "can be applied *across* a range of theoretical and epistemological approaches" (Braun and Clarke, 2006, p. 5). The interviews were first transcribed and then anonymized. Then, the data material, both the interviews and the open-ended questions from the survey, were coded separately using NVivo. The codes were built from the material during the coding process, according to the principle of open coding (Kvale and Brinkmann, 2009; Tjora, 2018), in combination with organizing the codes into categories connected to the research questions. While coding was done by only one researcher, the categories constructed were discussed with the other two researchers during the process of analysis so as to strengthen the reliability of the findings. The original language of the data is Norwegian. The coding was done in Norwegian, and later translated into English by the researchers.

We draw on both the interviews and the survey in order to answer our research questions. When answering *what kinds of teaching content the teachers choose in general, as well as for beginner and advanced students*, we use data material from both. To give answers to *which reasons the teachers express for selecting content*, as well as to *which, if any, musical styles and genres the teachers find unsuitable as teaching content*, the interviews are the data source. Finally, we use data from both the survey and the interviews to provide answers to *how the teachers work with the selected repertoire*. These answers will be discussed in relation to previous research and music Didaktik traditions (Nielsen, 1998, 2007; Klafki, 2006, 2011; Dyndahl and Ellefsen, 2009) in the discussion chapter, where we will answer our main research question: namely, *what are meaningful approaches to selecting content and ways of working within instrumental music teaching?*

3.4. Ethical consideration

Both the survey and the interview study were submitted for ethical evaluation to the Data Protection Service of the Norwegian Agency for Shared Services in Education and Research, and subsequently approved. All informants were given ample information about the research prior to the interviews, and they also signed an agreement giving their informed consent. The interviewees and their schools have been given fictitious names. The schools are named after where in Norway they are located: North, Middle (in the middle of Norway), West, South, and East, and the teachers are referred to by their school and a number.

3.5. Limitations

Our analyzes are based on data from a relative small sample of music teachers in the Norwegian schools of music and the arts, and thus, the results are only to a limited degree generalizable to how other music teachers work. Another limitation is that part of our analyzes is based on fill in-questions in a questionnaire that provided less detail on repertoire and ways of working than the interviews did. Nevertheless, the detailed analysis and theorizations may prove relevant to other music teachers working in the schools across musical genres as well as for other studies on decisions music teachers make in their classrooms.

4. Results

4.1. The chosen teaching content

The analysis of the interviews with the music teachers provided us with answers about (a) what kind of teaching content the teachers choose in general, as well as for beginner and advanced students, (b) which music, if any, they find not suitable as teaching content, and (c) reasons they might have for selecting the content. First, we asked the teachers to give examples of teaching material they used in general. Most central here was that the teachers not only allowed their students to come up with suggestions of songs and pieces to play, but that they encouraged them to do so. This view was expressed by teachers within the classical genre as well as teachers within the genres of popular music and Norwegian folk music. Some of the teachers also talked about how they wanted their students to express their musical preferences:

> If the students wish to play something, I believe one ought to stretch far to make it happen (North, teacher 2).

> After one year, I am concerned about the students having their own musical preferences. … The most fun is when the students come up with suggestions of what to work on. But they need help acquiring it (Middle, teacher 1).

4 Kappleik is a competition in Norwegian instrumental and vocal folk music and village dance.

> I usually ask them [the students] if they have a song they like. We try to play things they actually listen to, which they could have sung in school. … I make some easy versions of the riffs or the chorus so that they can play it. I think that is a way to become interested in the instrument (South, teacher 2).

One of the teachers gave a reason for asking students to bring in songs they want to play: namely, that playing these songs is a way into an interest for the instrument. Some of the teachers also emphasized the importance of students becoming independent, and to be able to choose music to play could be seen as part of that independence.

When asked to give examples of teaching content, several teachers mentioned folk music, especially from Norway, Sweden, and Ireland. One of the Norwegian folk music teachers also used Irish folk music, while some of the classically trained teachers often used folk music from Norway and other countries. One of them explained that using folk music as teaching content leads to the students establishing a different relationship with their body and their way of playing music; they "become more relaxed and less stiff." Examples that only a few of the teachers mentioned are music from films, ear training exercises, and "local things." Some emphasized that they advised their students to listen to different things, while others often used music they are used to from when they were students themselves. Some of the teachers also expressed that it is challenging to find repertoires that the students are interested in. This shows the importance of students liking the music when teachers are selecting content. Another element visible through the analysis is the idea of selecting repertoire based on what the student "needs," which relates to the student's progression and development.

When asked about the selection of teaching content for *beginners*, the teachers' most prominent answers were beginner books/tutor books and "songs the students have heard before." Some of the teachers also highlighted ways of working with beginners when asked about teaching content; namely, that they focus on the students getting to know the instrument and playing by ear. Famous children's songs were also emphasized. Regarding the *advanced* students, the teachers accentuated the importance of the students themselves choosing the repertoire. They also emphasized group/ensemble playing as important for advanced students. Some of the teachers chose mostly various classical repertoires and etudes/studies as teaching content for advanced students.

We asked the teachers whether they found some musical styles and genres *not suitable* as teaching content. Only one of the teachers mentioned a style/genre, namely "death metal singing," which she "stays away from because it may not be very suitable for lessons." A string teacher highlighted the difficulties of playing some of the pop songs that her younger students sometimes bring into class, because "the melody only uses one note" and they are "only rhythmical." She found these songs meaningless and "musically unattractive." One teacher emphasized that she avoids songs with "not suitable lyrics," even though she teaches an instrument and not vocal. Other than these examples, the teachers asserted that there is no music that is not suitable as teaching content, or that what is not suitable for the specific instrument is what is not suitable as teaching content. Some of the teachers also admitted that music they do not use as teaching content is connected to the limitations of their own competence.

When giving reasons for selecting specific content, about half of the teachers expressed variation and genre breadth as goals, and thus provided their reason. One example of this is a teacher who was teaching her piano students to play both chords and classical sheet music:

> I believe that most of the students think it is okay to play a lot of different things, getting used to playing chords, using your ear and so on. In addition, they should be trained in technique. Then it works best to use more traditional piano music that leans towards the classical. I find variation to be important (Middle, teacher 2).

Other reasons mentioned by some of the teachers are goals such as the students becoming independent, broadening the students' horizons (which is connected to variation and genre breadth), experiencing the joy of music, forming a relationship with the music, feeling mastering, and progression.

The survey participants, 151 teachers, were asked to provide two examples of music used as teaching content during their most recent day of teaching. From this, we found that *popular music* and *art music/classical music* predominated and were almost equally represented. Less-frequently mentioned examples included music from *films and TV series*, *educational material*, *Christmas music*, *folk music*, and *children's music*. It is also notable that only one of the teachers reported to have used the *student's own composition* as teaching content. In addition to describing the music the teachers used on their last day of teaching, we also asked them to list examples of music they *preferred* as teaching content. These examples show, maybe to a larger degree, which teaching content they find to be meaningful. From these answers, we found *popular music* and *educational material* to be most favored, followed by *art music/classical music* and music from *film/TV series/game tunes*. Seeing these results together, we find that *popular music* is both most used and preferred as teaching content, and that the teachers expressed a greater preference for *educational material* than what was revealed in their accounts of the previous day of teaching, while *art music/classical music* was less favored (see also Nielsen et al., 2022).

4.2. Ways of working

To answer how teachers work with their selected repertoire, we lean on both the survey and the interviews as data material. In the interview material, the teachers focused on ensemble playing, but also that they adapted how they work with the repertoire to the various students. They also expressed expectations they have toward the students between the lessons. The most prominent expectation is that the students should practice. Quite a few of the teachers, however, also stated that parents should facilitate practice at home, especially parents of the youngest students. Some of the teachers emphasized the importance of practicing a little bit every day, while others expressed that practicing should happen when the students have the desire to do it. Connected to this is also what should be the driving force for practicing. The teachers emphasized first and foremost a desire to play as the driving force, but also progression:

> I believe it [the desire to practice] should come from the inside. So when I make rules for controlling it from the outside, it feels wrong. Because I believe that when the students get inspired, that force is much stronger than me telling them how much they should practice (North, teacher 2).

Related to what the students do at home between lessons is the contact and dialog between teachers and parents. About half of the teachers in the interview study reported that contact consists mostly of both parents and the teacher making contact if something requires it,

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TABLE 1 Categories of *Ways of Working*, constructed through analyzing the data material from the teacher survey.

	Main categories	Subcategories
Ways of working	Educational aims	(a) Established musical goals
		(b) Open-ended musical goals
		(c) Students' independence as goal
	Working forms	(a) Digital tools
		(b) Playing together
		(c) Representation of the music
	Focus areas	

although one of the teachers made contact with the parents on a weekly basis. The teachers accentuated the importance of dialog with parents. However, the teachers did not necessarily want the parents to be present in the lessons. Some of the teachers preferred that parents be present when the students are new and young, while others specified that they did not want parents to be present during the lessons. One teacher experienced that contact with parents was better after the digital lessons they were forced to have during the COVID-19 pandemic because of more meetings with the parents when "you [*via* the internet] show up in your students' houses."

In the survey, we asked the teachers to give two examples of music they used on their last day of teaching at a school of music and arts. One hundred and fifty teachers provided two examples each, and one teacher only one. Thus, we have 301 examples of teaching content. In addition to writing down the name and composer/artist of the music, the teachers also described how they worked with the specific repertoire. Second, we asked the teachers to give us one example of music they *prefer* to use as teaching content, and how they usually work with that content. One hundred and forty-seven teachers gave us one example each of their preferred repertoire. During the analysis, three main categories emerged from the material, namely (a) *educational aims*, (b) *working forms*, and (c) *focus areas*. Some of the categories also include subcategories, as shown in Table 1 below.

4.2.1. Educational aims

The category *educational aims* is divided into three subcategories: (a) *established musical goals*, where musical results are of importance, (b) *open-ended musical goals*, where the process is the main focus, and (c) *students' independence as goal*, where neither musical results nor the musical process is most important, but rather the students' musical independence. First, we present results from the 301 examples of teaching content from the last time of teaching, starting with the subcategory *established musical goals*. Here, the idea of "rehearsing" ("innstudere" in Norwegian) a musical piece is most prominent. Some of the teachers used that exact word,[5] while others wrote that they "worked with the song piece by piece," "worked with learning the parts," or "worked through the repertoire slowly in order to help the students to learn it." A commonality is that there is "something" that needs to be rehearsed; there is a musical piece already existing that the students ought to learn. "Imitation where the teacher demonstrates" and merely "teacher demonstration" were also reported by the teachers. There were also a few utterances pointing to an understanding of the repertoire as something that is pre-fixed and connected to the way it is supposed to sound. These utterances are "correcting mistakes the students make," "practicing difficult parts," and "working thoroughly and carefully with the piece." Some of the teachers also wrote that they used the master-apprentice model.

The subcategory *open-ended musical goals* is a smaller category, with only a few of the teachers reporting to work with the repertoire in a way where the final musical product is not set from the beginning. These ways of working involve student engagement and creativity, focusing on the students' own expression, creative abilities, and the process. It involves "improvisation," "exploring the instrument," "students making a variation of the piece," and "making and/or working with accompaniment/chords." "The students finding their own expression" was also reported by a few teachers. This could be understood as both a way of working in which the musical product is not pre-fixed, and also as a way of working in which the student's independence is the goal. Within this final subcategory, *students' independence as goal*, the teachers reported that they "guide the student into becoming her own teacher and being able to practice well at home," and that they are "working on getting to know the piece and, together with the students, planning how to play it."

Which music the teachers prefer to use as teaching content and how they usually work with it (150 examples), in many ways resemble how they work with the teaching content from the last time of teaching. Within the subcategory *established musical goals*, "rehearsing" (in Norwegian: "innstudere") is also here most central, followed by "teacher demonstration," "practicing difficult parts," and using the master-apprentice model. In addition, a few of the teachers reported a focus on sight-reading. Within the subcategory *open-ended musical goals*, improvisation is more central here than it appeared in the teachers' reports from their last day of teaching. "Making and/or working with accompaniment/chords" is also mentioned. Educational aims connected to the last subcategory, *students' independence as goal*, are not frequently mentioned. Only a couple of the teachers reported to work with "students finding their own expression," and one expressed that encouraging the students' critical thinking about the repertoire and music in general is the main focus when working with musical pieces. There is, however, one thing that varies from how the teachers worked with music on their last day of teaching and which do not fit within any of the subcategories—namely, the idea of "working according to what the student needs." This could be connected to the fact that the teachers did not necessarily report on what one student played at a specific time.

4.2.2. Working forms

The category *working forms* is also divided into three subcategories: (a) *digital tools*, (b) *playing together*, and (c) *representation of the music*. We start with the results from the 301 examples of teaching content from the last time of teaching, focusing on *digital tools*. In more than one-third of the examples, the teachers reported the use of *digital tools* in one way or another. The ways they use them are primarily to listen to recordings, and secondly as play-alongs. Also mentioned were the use of YouTube, recording the lesson, finding sheet music or chords on the internet, and "learning by ear from recorded music." In only two of the examples was a laptop reported as the actual instrument. *Playing together* is also a common working form in our material, with ensemble playing (playing with other students) as the main activity, followed by the teacher and student playing together, and the teacher accompanying the student. The most common *representation of the music* reported by the teachers were

5 The Norwegian equivalent of "innstudere."

"using sheet music" and "working on reading the music," followed by "using tablature" and "playing by ear." A few reported the use of a combination of sheet music and playing by ear. How the teachers usually worked with their preferred teaching material essentially resembles how they reported working with it the last day of teaching.

4.2.3. Focus areas

Connected to the last category, *focus areas,* the teachers reported focusing mostly on technique when working with the selected repertoire the last day of teaching. In addition, musical expression and dynamics, to play or sing the piece through, and rhythm and pulse, are also prominent in the data material. Some teachers focused on music theory, such as, for instance, analysis of chords and scales. Other areas of focus mentioned only by a few teachers were intonation, fingering, sound, and text, content, and interpretation. When asked how they usually work with their preferred repertoire, the teachers reported much as they did for their last day of teaching—namely, technique, musical expression and dynamics, rhythm and pulse, and music theory. What differs, though, is that focusing on text, content, and interpretation is more prominent.

5. Discussion

From the analysis of the survey and the interviews, we learn what music teachers in Norwegian schools of music and arts experience as meaningful approaches to selecting content and ways of working within instrumental music teaching. These can be summarized as: (a) the centrality of the students in the process of selecting content; (b) genre versatility, or that the students should be exposed to a broad range of musical genres and styles; and (c) the students being exposed to the "classical repertoire" within a genre or tradition, or its standard repertoire. The latter could be seen as part of a *material classical Bildung* tradition, where the goal is the acquisition of classical content within a culture, defined by what dominates and has status.

The centrality of the students is related to the importance of the students' co-determination in the selection of teaching content, but also to the importance of the students being familiar with, and liking, the music that is taught. While this could be two sides of the same coin, the second could also imply that the teachers talk to the students and try out different musical pieces in order to find something the students enjoy playing. The idea of co-determination is even more explicit in the selection of content for the advanced students. The importance of co-determination could be seen in relation to the Scandinavian tradition of student involvement, where inclusion, individualization of teaching, and adaptive learning have for several years been prominent within educational contexts (Arnesen and Lundahl, 2006). Another finding from the analysis is that genres and musical styles within popular music are as common (actually, slightly more common) as classical music in Norwegian schools of music and arts. We suggest that there might be a connection between the focus on students' co-determination and liking the music and popular music's space in a school, which rests heavily on the long traditions of classical music (Karlsen and Nielsen, 2021) because more children are familiar with the popular music tradition than the classical. Other possible connections to the centrality of the students and the students' independence are the emphasis on inner motivation for practicing, which several teachers spoke of, as well as the teachers' utterances about parents not needing to be present in the lessons. The students' co-determination is, however, emphasized more in the interviews and the survey question about preferred content than in the survey questions about content selection on the last day of teaching. From this, we can ask, does this imply that the teachers want to involve the students more in content selection than they actually do?

The emphasis on students' co-determination and excitement for the music and its recognizability could be seen in relation to Klafki (2006, p. 129), who speaks of "the fruitful encounter between the children and the content," which constitutes the purpose of instructional preparation. Co-determination and self-determination are central elements in Klafki's (2011) critical-constructive Didaktik. The relevance of the teaching content for the students is also an important part of Klafki's (2011) Bildung theory of *categorical Bildung.* Here, the content should be connected to the students' world outside the school, both as a connection to the society as it is now and as significant for the students' future. The teachers in our study coped with the latter issue in different ways: (a) by working toward the students' independence and becoming their own teachers, (b) by teaching the standard repertoire within a genre so that the student will succeed if auditioning for higher music education; and (c) by presenting to the student a variety of genres and musical styles so that she has a broad ground on which to build her musical future. Combining these different approaches with content selection and ways of working could be difficult; it could also, however, be seen as a way to incorporate what Klafki named *exemplary teaching*; namely, the idea of enlightening abstract and fundamental principles by focusing on a few concrete examples that are connected to the students' world outside the school (Johansen, 2007; Klafki, 2011; Straum, 2018). The importance of connecting to the world outside the school could also be seen in relation to Dyndahl and Ellefsen (2009, p. 9), who claim that the subject of music itself is "culturally contextual" and an arena for students' identity constructions.

Although the students are central in the processes of choosing teaching content, findings from this study indicate that there are other areas of focus in the ways that teachers work with the content. This first and foremost concerns the centrality of established musical goals, both related to educational aims and working forms, among others, as most of the ways that teachers reported using digital tools are connected to established musical goals. This implies that acquisition of the content is central, which connects to the tradition of *material Bildung* (Klafki, 2011; Hanken and Johansen, 2021). It also relates to Nielsen's (1998, 2007), central activity, *reproduction*, where performing and reproducing existing music is central. This does not have to conflict with emphasis on the student and her co-determination, but the idea of the student learning something that is "already there," and working toward a musical goal set by others, could create tension toward students' self-determination. Although the activity form *reproduction* is the most central one in our material, there are examples of teachers focusing on composing and improvising music in which the musical goals are open-ended. This connects to *formal Bildung* (Klafki, 2011; Hanken and Johansen, 2021). There are also a few examples in the data material of students' independence as a goal, which could be understood within the *method-based formal Bildung* tradition, but which is also connected to Klafki's (2011) critical-constructive Didaktik. The two activity forms of *interpretation* and *reflection*

(Nielsen, 1998) are represented only to a limited extent in the data material.

6. Conclusion

Summing up, this study has demonstrated that various approaches to selecting content and ways of working with musical repertoire, as well as the use of diverse musical genres as teaching content, have been qualified as meaningful by the music teachers in the schools. As such, this exploration into what these music teachers construct as necessary didactical actions in their practice also show us what they view as legitimate ones produced by their *practical sense*. Further, although the teachers seem to some degree to be working by different logics of practice, the mere presence of such a variety of generated practices could to some extent be seen as contributing to making the schools of music and arts more accessible for a wider selection of people in terms of social class, musical preferences and so on, and thus facilitate cultural inclusion in a broader sense (see also Dyndahl et al. (2020) on the connection between musical genres and socio-cultural dynamics). What seems to be meaningful for the teachers in general is working "close to the student's wishes and preferences," but in ways which relate to a variety of Didaktik principles. In this way, one could say that the teachers understand their teaching in relation to the students' world, vary their didactical strategies according to the students, and accommodate students' negotiations and identifications. Thus, the teachers participate in constructing and reconstructing the "didactic identity" (Dyndahl and Ellefsen, 2009) of the music subject in schools of music and arts; they negotiate the teaching content according to their students and the cultural context in general.

Data availability statement

The raw data supporting the conclusions of this article may be made available by the authors, under the reservation that the anonymity of the participants are upheld.

Ethics statement

The studies involving human participants were reviewed and approved by NSD-Norwegian Centre for Research Data. The participants provided their written informed consent to participate in this study.

Author contributions

The qualitative analyses were mainly carried out by AJ-L, but checked and discussed with all authors. All authors contributed equally to collecting the survey and interview data utilized in this publication.

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

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Expression in popular music singing as embodied and interpersonal

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This article presents theoretical viewpoints for considering and understanding expression in popular music singing and pedagogy from the perspective of embodiment as outlined in Merleau-Ponty's phenomenological philosophy. In our study, we apply his interpretations of such notions as intentionality, body schema, gesture, reversibility, and intersubjectivity to bring forth and discuss the holistic, embodied, and interpersonal nature of voice expression in singing. We argue that expression should be viewed as an intentional activity, based on the body's innate mindful functioning as a whole, and in singing guided by the lyrics and emotions to be communicated. We propose that this requires a "free voice", based on healthy vocal production, that also allows for the immediacy of expression as and through gestures that bring the meaning into existence. We further argue that expression is an interpersonal, interactive, and intersubjective process in which the performer and listener influence each other in many ways. The reversibility of perception in expression means that perception and the object perceived are intertwined and action and perception are interconnected. There is also a gap in reversibility, which implies that the perception of (one's own) expression is never complete. In addition to our theoretical arguments, we make pedagogical suggestions, such as that the body itself has a lot of understanding of *how* and should be trusted in singing, both in terms of voice production and expression. The expression should not be primarily approached as a technical issue but taught in connection with and through expression. The expression should be viewed *from the inside out*, not the opposite. This means that expression builds on one's personality and (emotional) experiences.

KEYWORDS

expression, singing, popular music, voice pedagogy, embodiment, phenomenology, Merleau-Ponty

Introduction

The singing of popular music[1] (hereafter PM) has recently received a lot of attention, partly inspired by the various TV formats associated with it. There is also a growing availability of PM singing instruction—on the internet, through private coaching, training courses, and training programs at various levels of music institutions. Singing, in general, is a trendy hobby today, as it is seen as a meaningful and holistic practice that promotes wellbeing (e.g., Grape et al., 2003;

1 Popular music is here used loosely to refer to nonclassical music genres, such as pop, jazz, rock, gospel, rhythm and blues, soul, hip hop, rap, country, folk, music theatre, and experimental.

Gick, 2011). Indeed, it is a highly embodied activity and experience. As the singing voice comes from the body, singing requires "a coordinated integration of the whole body" (Bunch, 2005, p. 13), and the voice–the primary source of human communication (Gilman, 2018, p. 62)–functions best when it is treated as an integral part of the whole human being, as a *voice-body* (Tarvainen, 2019). Singing is also an embodied way to interact, to connect with others and even the world. "There is no other way to be as intimately involved with the world as singing," as Finnish philosopher Varto (2001, p. 124) describes it.

This article examines expression in singing and builds a theory of expression in the context of popular music from the perspective of embodiment. It also brings forth related pedagogical aspects. The motivation for this examination arises from the second and third authors' experienced difficulties of verbalizing, assessing, and teaching expression in PM voice pedagogy. Technical requirements (such as sound quality, register shifts, range, and dynamics) are easier to assess and are more often defined in performance examination requirements (see, e.g., Uniarts, 2022) which then guide not only assessment but also the contents of teaching. Thus, the teaching of expression is often relegated to a secondary in relation to teaching vocal technique, and singers have a habit of valuing technical expertise over other parts of performance (Grape et al., 2003; Rodrigues et al., 2009). This may complicate voice students' overall progress as future professionals (Miller, 1996, p. 247). Furthermore, the technique is often regarded as teachable whereas expression is often considered intuitive and inborn (Rodrigues et al., 2009). Naturally, vocal technique is essentially interconnected with artistic expression: a major lack of technique or preoccupation with it can inhibit or complicate musical expression (Miller, 1996; Hoffmann, 2016, p. xvi).

Another observation of the two authors is that popular music voice pedagogy often addresses expression as a technical activity: it is suggested that a certain expressive voice quality can be achieved by manipulating the sound (examples of these pedagogical approaches can be found in Sadolin, 2000; Steinhauer et al., 2017; regarding actors, Hakanpää, 2022). In research, expression is often approached as an object by examining observable musical qualities through acoustic measurement and technology. For example, when examining emotion in expression, researchers have approached expression in terms of temporal structures and acoustic correlates and features (e.g., Juslin, 2003; Juslin and Laukka, 2003; Laukka et al., 2005; Eyben et al., 2016; Scherer et al., 2017; Hakanpää et al., 2019). For instance, Juslin and Laukka (2003) state, "there are emotion-specific patterns of acoustic cues that can be used to communicate discrete emotions in both vocal and musical expression of emotion."

Expression is a challenging term. While it is widely used and discussed when talking about performance, it is difficult to explain. Within Western classical music, Holmgren (2022) views expression as a performer's interpretation of composed music, in which the performer uses his freedom within the composition. The performer is expected to consider the composer's intentions as the authority (Holmgren, 2022, p. 47; Leech-Wilkinson, 2012, p. 2). Within PM, in which aural traditions are more prevalent than interpreting a score (Hughes, 2014), the performer has and is expected to use more freedom in interpretation. In classical music, a performer expresses artistry, knowledge, or personhood through a series of decisions within specific parameters such as tone, dynamics, tempo, or intonation (Holmgren, 2022, p. 46; also Sell, 2003, p. 207). In PM singing, the individuality of voice as sonic and timbral uniqueness–a recognizable sound–is valued highly, even to the extent that individual sound is required to "stand out" from others in the same genre (Hughes, 2014; Johnson, 2019; Kobel, 2020). Furthermore, while stylistic integrity is considered important, singers are expected to demonstrate originality and creativity in (lyrical) interpretations (Hughes, 2014, 2017) and individuality is also considered to correspond to the believability of expression (Hughes, 2014). As Hughes (2014) suggests, artistic manifestations are often more explicit than the processes that enable or underpin them. "Often inherent artist traits are intangible and difficult to define, and consequently, are even more difficult to address pedagogically" (Hughes, 2014, p. 288). Analyzing expression through the singing voice becomes more complicated as the artistic medium is the artist him/herself, and "the artistic instrument, the singing voice, is physically embodied" (p. 288). This becomes even more complex when considering a "para-linguistic dimension" (Middleton, 2000, p. 29) of voice, emotion, and song lyrics; when the meanings, resonances, and sound-shapes of the words are integrated with the melody, rhythm, tone quality, and articulation (Kronengold, 2005). Other performance characteristics and subtleties, specifically related to musical styles and the use of technology, are present in PM singing (Soto-Morettini, 2006; Stephens, 2008).

This article aims to animate discussion about expression in PM singing and suggests an embodied approach to its examination, by using a phenomenological theory of embodiment as a framework. Our examination is based on viewing singing as an embodied, holistic activity that depends on the body's innate capability and the reciprocal integration of physical, mental, and emotional processes (Paparo, 2016; Juntunen, 2017). In our understanding of embodiment, we mainly draw on Merleau-Ponty's (1962, 1965, 1968) phenomenological philosophy. In his philosophy, the notion of embodiment refers to the integration of the physical body and the lived, experiential body suggesting a network that integrates thinking, being, doing, and interacting (Varela et al., 1991, p. xv). In line with Merleau-Ponty (1962, 1968), we view that the mind (including emotion) and body are essentially integrated in singing. There is a unity of behavior, action, and interaction. Parallelly, we approach expression in singing as experienced both from the first- and third-person perspectives. Although phenomenological approaches do not ascribe noteworthy significance to the role of art (Levin, 2016, p. 191), we will nevertheless apply Merleau-Ponty's philosophy since it unravels the mindful skillfulness of the moving body, which is also pertinent to singing. We apply Merleau-Ponty's interpretations of such notions as intentionality, body schema, gesture, reversibility, and intersubjectivity to bring forth and discuss the holistic, embodied, and interpersonal nature of voice expression in singing, regarded both from the performer's and listener's perspectives.

Merleau-Ponty's embodied ontology and epistemology as a theoretical frame

The concept of embodiment is theoretical-philosophical, and its definition varies from discipline to discipline (for example, ecological psychology, see Gibson, 1977; linguistics, Lakoff and Johnson, 1980, 1999; theoretical biology, Maturana and Varela, 1980). Embodiment

is the study and theorization of the relationships among the human body, mind, and world (Schiavio, 2014). In his phenomenological philosophy, Merleau-Ponty (1962) rejected the dualistic conception of the human beings - the dualistic distinction between mental interior/physical exterior - and replaced it with a new concept of the subject that is essentially physical, or rather, psychophysical. He regarded the distinction between mind and body as the result of thinking and reflection, rather than as a result of immediate lived experience. This means that although physical and mental worlds exist, intuitively or pre-reflectively, we are not aware of living in two worlds, one inner and mental and the other, external and physical. Likewise, there are no psychophysical, causal relations between the mind and body (Merleau-Ponty, 1962, 1965, pp. 407–408; pp. 188–189). "Naive consciousness does not see in the soul the cause of the movements of the body, nor does it put the soul in the body as the pilot in this ship" (Merleau-Ponty, 1965, p. 188). Therefore, there is nothing mental that, so to speak, resides "in" the body. Rather, pre-reflectively, we understand and experience that we humans act holistically as fully embedded in the world (also Priest, 1998, pp. 68, 71). Nevertheless, Merleau-Ponty accepts the Cartesian thesis that, qualitatively, consciousness and physical objects are radically distinct. There is therefore a common sense and compelling gap between the physical and psychophysical (Priest, 1998, pp. 54, 226). In this light, it is possible to talk about duality without dualism in relation to the mind–body (Levin, 2016, p. 182; Juntunen and Westerlund, 2001).

Although Merleau-Ponty writes about "one's own body" (*corps propre*), he does not only refer to the first-person perspective. The notion of the lived body refers to subject and object, the first-person and third-person perspectives alike; it includes intellectual cognition along with visceral and sensory-motor capacities. By this notion, Merleau-Ponty avoids the dualistic opposition not merely between mind and body *per se*, but also between *Leib* (living body) and *Korper* (physical body)—the distinction in the German language is often employed by philosophers (Leder, 1990, pp. 5–7). In fact, as Zahavi (2004, p. 32) notes, he "asks us to reconsider the very opposition, and to search for a dimension that is beyond both objectivism and subjectivism."

Based on this understanding of human beings, Merleau-Ponty constructed his theory of human embodied knowing. For him, experience is the primary way of understanding oneself, others, and the world. In line with Merleau-Ponty's phenomenology, the embodied cognition approach describes the relationship of the body to cognitive processes (Johnson, 2007; Shapiro, 2010; Leitan and Chaffey, 2014). These theories explain how the sensorimotor system is linked to our cognitive system and how thinking and conceptual understanding are based on embodied experiences. Perception and behavior, action, and cognition are seen as interdependent and deeply integrated, and the body is understood to play a central role in understanding the world, hence music, and in shaping meaning (Leman and Maes, 2014). Increasingly, the perspective of an embodiment is considered also in learning and teaching (e.g., Stolz, 2015), and has influenced a broad set of pedagogical fields from music and dance to mathematics and foreign language learning (e.g., Anttila, 2018; Flood et al., 2020; Juntunen, 2020a,b; Jusslin et al., 2022). One way to strengthen embodied learning is to integrate movement into teaching. Research has shown that integrating whole-body movements, gestures or just movement perception and imagination supports learning (Johnson-Glenberg et al., 2014; Skulmowski and Rey, 2018).

Singing as an expression of emotions

Our first argument is that expression in PM singing should be considered primarily as an expression of emotions. One of the key features of music is that it expresses and evokes emotions (Juslin and Laukka, 2004). Expression is an important aspect of any music performance but singing can be viewed as an enactment or expression of significant human emotions (Thurman, 2000). It is regarded essentially as an outward manifestation of emotions and feelings (Hoffmann, 2016, p. 14). Great singers are in fact expected to connect with their audiences through vocal emotion and expression (LoVetri et al., 2014, p. 57), and the voice technique is expected to support, not inhibit, the expression of emotions (Laukkanen and Leino, 2001, pp. 19–20).

Singing, as music in general, has a lot of potential to arouse strong emotions, both in the person making the music and the listener. However, it is only in the last decade that researchers have begun to study more systematically how emotional expression is achieved in performance. Yet, the precise nature of this process remains somewhat elusive. Research evidence from psychology suggests that the emotion induced in the listener is the same as the emotion expressed in the music, which is "consistent with the notion that music may induce emotions through a process of emotional contagion" (Lundqvist et al., 2009, p. 61). It is often debated whether the emotional expression should be "real" or "as-if." Thurman (2000, p. 162) argues that the audience does not distinguish between so-called real feelings and "as-if" feelings which both enable the listeners to "empathically engage with what is being expressed." The factors that influence musical expression and experience, in addition to the broad scope of variables in music itself, include cultural background, situation, musical training, previous life experiences, personality, as well as psychological and physical circumstances (Nielzen and Cesarec, 1982).

In the following section, we will discuss how the expression of emotions in performance is realized and achieved from the embodied perspective. As we see it, orientation toward expression in singing can be viewed as an intentional activity. First, we will examine what intentionality means for Merleau-Ponty, and how that understanding can be applied in the context of expression in singing, and then, how the lyrics of a song can guide that kind of intentional activity. We argue that focusing on "what to say" is enough to guide the voice-body to carry out the intented expression. To further understand *how* the body parts function in a meaningful way without having to be controlled by thought, we apply Merleau-Ponty's understanding of the notion of *body schema* (Merleau-Ponty, 1962).

Expression as an intentional activity

To better understand the body's mindful functioning, we can apply Merleau-Ponty's notion of intentionality. Intentionality is a decisive feature of consciousness that clarifies the relation between the subject's mind and the world in the first-person perspective (Gallagher and Zahavi, 2008, pp. 110–112). It manifests orientation and consciousness toward an object outside the mind.

Motor intentionality has often been considered one of Merleau-Ponty's most important concepts, to whom intentionality is not only

formed by acts of thought but can already be found on an embodied level (Morris, 2014, p. 115). For him, the subject's embodied orientation toward the world, i.e., intentionality, is an ability to connect with and act on the world before consciously identifying the goals of action. For Merleau-Ponty, we are initially immersed in the world through the functions of the body, and only quietly do we understand their realization (Rouhiainen, 2011, pp. 77–79). By applying his notion of *intentionality* to singing, expression can be viewed as an intentional activity, in which the intention to express an emotion or a storyline directs and informs the activity of the mind–body in a functional manner without the need to consciously guide that action and make it happen.

In musical expression, both *what* and *how* matter. Although it can be discussed whether the esthetic value (*what*) is more or less important than the artistic value (*how*), in creative acts both matter and are related to intentionality (see Plavša, 1981). Not all music aims to express human emotions, yet vocal music can be considered "intentional music" (Plavša, 1981) in the sense that both the composer and/or the author of the lyrics have suggested a certain program for the music. Therefore, singing is not essentially only an act of producing musical sounds with the voice but rather about communicating with the audience through the song—telling a story and engaging a listener and thus evoking emotions and thoughts. It can even be argued that the expression of lyrics, which in themselves can evoke powerful emotions (Yang and Lee, 2009), is the core task for singers (LoVetri et al., 2014, p. 56). This in turn, as LoVetri et al. (2014), p. 57) state, requires one to connect emotionally with the song, either by using one's life experiences, empathy, and/or imagination.

We argue that when concentrating on "what to say," the voice-body knows "how" and carries out the intention without the necessity of guiding and controlling the muscular work. Focusing solely on vocal technique takes the focus away from expression, and manipulating the sound may interfere with voice production and prevent the voice-body from functioning in its most effective and economical ways. Moreover, a voice expression that comes from a person freely is more believable and attractive, and reveals "who you are" (also Johnson, 2019). It is natural both for the singer and the audience.

In stage music, the expression also includes communicating the character (LoVetri et al., 2014, p. 56). This requires from the singer a textual comprehension that can frame vocal qualities (Johnson, 2019), including digging deep into the content, meanings, and emotions embedded in the song, including how the music shapes the meaning of the words, and so on. According to Varto (2001, pp. 162, 180, 187), people have a special capacity for grasping the "mind of the text" comprehensively. This includes approaching the text as autonomous and external without preconceptions, on the one hand, and viewing the reader as an active interpreter, on the other, which results in the recreation of meanings. One or the other can be emphasized, and in music, it depends on the context and musical style how much freedom the interpreter may have. For singers, this process often implies understanding, interpreting, and internalizing the text and the embedded emotional state. As Carter (2005, p. vii) notes, "[t]he collective audience can only be moved deeply if the singer's connection to text and music is compelling and complete." When the expression is believable, the audience will engage through emotions and empathy, in which case, they respond with their feelings and become "moved" (Carter, 2005).

Many authors, such as Thurman (2000), Ostwald (2005), Olson (2010), and Coutinho et al. (2014) suggest that singers express emotions and characters embedded in the music in similar ways that actors do. For both, expression is tightly connected with and guided by the intention of communication. Then, one does not need to think and consciously manipulate voice to sound angry, for example, but should rather focus on what to communicate, which additionally promotes and requires the skill of being present (Olkkonen, 2013). According to Olkkonen (2013), this approach to expression creates a theoretical starting point for understanding sound as a form of communication, interrelated with human subjectivity. When able to communicate from oneself, from the inside out, leaning on one's sensitivity, vulnerability, and strength, and avoiding adopting "a role" during a performance, a performer creates an impression of presence, joy, and power. This also brings out the positive qualities of the performer (Olkkonen, 2013, p. 122). The human voice as such can be viewed not as a verbal vessel of meaning but the expression of "the speaker's atmospheric presence", which implies that voice creates an emotional colour and atmosphere for the communication space (Böhme, 2014, p. 54). But what kind of voice technique is required for communicating "from the inside out"? This will be discussed next.

Free voice as a starting point for expression

As argued above, expression is more than and different from a technical craft. From the embodied perspective, in singing, expression is essentially about trusting your body's ability to act according to your intentions. However, this requires that you allow your voice to function freely as part of healthy voice practice, free from inhibitions and acquired bad habits (see Brown, 1996). This also implies a balance between the functioning of the mind and voice-body. For instance, if the body position is not ideal and the voice production requires extra muscle work, the voice-body's intentional and mindful activity is inhibited.[2] As Oren Brown states (1996, p. xiii), when your voice is free, singing is not so much a matter of making sounds as it is a matter of letting sounds happen. The voice that comes out freely has been compared with "the truth" and is considered attractive in performing (Johnson, 2019).

In our understanding, when one has a "free voice" and focuses on "what is to be expressed," the body-voice realizes the intention and functions according to its best ability without conscious technical effort "to make it happen." By this view, we do not dispute the importance of technical training of the voice. On the contrary, the development of a singer's artistry requires a foundation in the vocal technique that includes appropriate posture, breath management, articulation, and free vocal production (e.g., Hughes, 2014).

2 Somatic approaches, such as Body mapping, Alexander technique, Feldenkrais method, Trager approach, and Pilates, are increasingly applied to improve ease and freedom of movement as well as to gain balance, support, and coordination in artistic actions by practicing ways to become aware of and change non-functional, unfavorable bodily habits. Additionally, breathing and meditation exercises are used to help to reach a state of active and open attention and presence.

It may also take much practice to free the voice from learnt habits that incorporate unnecessary muscle work and tensions, and to achieve an efficient and economic voice use. Yet, the technique does not have to be considered external to musical expression but can be taught in connection with and even through expression. The technique should not be viewed either as an active instrument to manipulate expression but rather as a matter of devotion and taking risks, of seeking existential experiences, connected to something of emotional or musical character (see Nerland, 2007). Indeed, technology plays a big role in and has many possibilities for manipulating the sound quality in PM singing and singers need to have knowledge and critical understanding of it (Hughes, 2015, p. 591). Despite this, there is a need to first consider the embodied quality of the vocal instrument and the body–mind connection of the "neuropsychobiological" self (Thurman, 2000, p. xxiii). This is in accordance with the research that has identified the need for PM singers to find and develop their own individual vocal sound before being able to understand how their individual voices may be manipulated, altered, or processed by using technologies and effects (e.g., Hughes and Monro, 2014; Hughes, 2015).

Body schema: the intentional functioning of the body as a whole

To further understand *how* the body parts function in a meaningful way without having to be controlled by thought, we can apply Merleau-Ponty's understanding of the notion of *body schema* (Merleau-Ponty, 1962). Body schema is a concept used with varied meanings in several disciplines, including psychology, neuroscience, philosophy, sports medicine, and robotics. Merleau-Ponty's interpretation of it includes two aspects: "the close-to automatic system of processes that constantly regulates posture and movement to serve intentional action" as well as "our pre-reflective, proprioceptive and non-objectifying body-awareness," neither of them needing "a constant body percept that takes the body as an object, to the extent that one does become explicitly aware of one's own body in terms of monitoring or directing perceptual attention, movement, posture, kinaesthetic experience, and so on" (Gallagher and Zahavi, 2008, p. 146).

Body schema also refers to the body's skill overall. Before we start thinking and making scientific accounts, we already have a pre-theoretical familiarity with the world (Gallagher, 2005). Some philosophers after Merleau-Ponty have described this as a difference between *knowledge that* and *knowledge how* (see, e.g., Pavese, 2021). *Knowledge that* means that you know something very well in theory. *Knowledge how,* on the other hand, means that you know how to do something in practice. For example, if you want to sing a high note, one does not have to think about the muscle work included in the process, the body knows how to do it. There is the required "knowledge how." For Merleau-Ponty, knowing *how* is always more fundamental. So, the body schema is a set of possible movements that you can do, without consciously thinking about and controlling them. In singing, the voice-body knows, pre-reflectively, how to produce the sound that carries out the desired expression. When an action is brought under conscious control, it may even complicate the action (also Kross, 2021). This comes out amusingly in the story about the centipede (see Heuer and Wing, 1984, p. 184), who was asked how he managed to coordinate the movements of his legs while walking. The centipede paused to think about an answer… and from then on was incapable of walking.

To sum up our line of argument so far, we can state that expression of PM singing is primarily about expressing emotions, guided by the lyrics and music. Expression in singing can be viewed as an intentional activity from the inside out. The intention is carried out through the mindful voice-body without conscious muscular manipulation but requires a "free voice" and the capability to be present, which implies both physical and mental presence (see Symonds, 2007). In what follows, we will apply Merleau-Ponty's notion of gesture to understand the immediate and embodied quality of expression as and through gesture.

Embodied expression as and through gesture

The concept of *gesture*, as discussed by Merleau-Ponty (1968), brings forth the immediacy of expression. Merleau-Ponty contested the paradigm of a stimulus–response connection between the mind and body, which means that the thought of expression precedes the action. Instead, he views expression, such as speech/language but also physical gestures (movement, facial expression), as a completed thought. In line with Merleau-Ponty, Johnson (2006, pp. 8–9) states that the function of languages and gestures is not to present already experienced meanings, concepts, or thoughts, but to present and enact the meaning. Gestures "are not uses of bodily motions to express some preconceived thoughts. Rather, the gesture itself brings the meaning into existence. Gesture is the very incarnation of meaning-making" (p. 9). This underlines the embodied nature of expression. Based on these views we argue that, in expression in singing, there is no thought (or emotion) first which is then expressed, but that a thought or emotion is completed only when expressed through the words, sounds, and voice (including breathing or pauses). The physical gestures alike are created at the moment.

Singers as performers communicate with their audience not only through their voices but also through facial expressions and gestures (Hoffmann, 2016). These movements aim to embody the expressive character perceived in the musical and textual features of a musical work. Thus, engaging musical, textual, and visual presentation as inter-linked modalities is considered essential for an expressive performance (Hoffmann, 2016; also Rodger et al., 2012).

Psychologist David McNeill (1992, pp. 78–80), also in line with Merleau-Ponty's ideas, has further identified three different qualities of spontaneous (bodily) gestures: *beat* gestures, *iconic gestures*, and *metaphoric* gestures. *Beat gestures* "help parse, give emphasis to, or provide the rhythm of our thinking" (Johnson, 2006, p. 9). *Iconic gestures* "structure is isomorphic with some pattern or contour of some other part of our experience or perception" (Johnson, 2006). For example, one can give directions to the nearest hospital and accompany the verbal directions with hand motions. *Metaphoric gestures* are the ones where we can use our bodily movements to present images of abstract concepts (McNeill, 1992, p. 80; Johnson, 2006, pp. 9–10). Johnson (2006, p. 10) concludes, based on McNeill's video material, that gestures often appear several milliseconds before the verbalizations.

So, bodily gestures are essential elements of expression and enact the meaning. They are not consciously realised, but are essentially

immediate and embodied. Yet, expression is not only a one-way process "from the performer to the listerner," but in expression, the expresser her/himself is also the receiving party—both the subject and the object. Additionally, in expression, one can sense being perceived by others. These issues will be discussed in the following section.

Reversibility of expression

When making music, we also simultaneously perceive it. We feel the music as it resonates through the whole body (e.g., Bowman and Powell, 2007). In singing, we can also sense and become aware of the body making the music, to become sensed. A singer can even sense different vowels and pitches in different ways and different places of the body (Tarvainen, 2019, p. 10). Thus, the performer is both the subject and object in singing, which resonates with Merleau-Ponty's notion of *reversibility of perception*. For Merleau-Ponty (1962), both the first-person and the third-person perspectives are present in perception. The body is two-dimensional; it is simultaneously a sensuous body that perceives itself and the world and a thing-like body that is sensed or perceived as an object. For example, when my right hand touches my left hand, I am touching and being touched, thus giving me "double sensations" (Merleau-Ponty, 1962, p. 93). The practical, action modes of the body-subject are inseparable from the perceiving (or reciprocally in-formed [*sic*]) body-subject. Hence, perception involves the perceiving subject in a situation, rather than positioning him as a spectator who has somehow extracted himself from the situation. Action and perception are therefore interconnected (Merleau-Ponty, 1962, p. 153). However, the reversibility is never realized as such; only one of the two states occurs at a time (pp. 136, 147–148, 263).

Furthermore, this reversibility exists between the action of perceiving and the action of expression (Parviainen, 1998, p. 65). Usually, musicians make further adjustments in their actions based on listening to (perceptions and observations of) the music they make. However, singing is problematic since the singer hears herself differently than others. For example, high notes for the singer herself may sound thin and weak while for the listeners they may sound clear and strong. Therefore, it is better to focus on expression and trust your body in the making rather than adjust your expression by listening to the quality of your sound.

For Merleau-Ponty (1968), the phenomenon of reversibility occurs within one sense at a time but also between different senses and the senses and the world. In addition, there is the reversibility of speech (or gesture) and its meaning, based on the mute world of sensing (Merleau-Ponty, 1968, pp. 154–155). Furthermore, sensory experiences are interrelated. In voice performance, the singer perceives herself but can also sense being perceived by others. Expressions of human feeling states are perceived by others not only auditorily but also visually and kinesthetically (empathic as-if feeling states) (Thurman, 2000). For example, visual perception–seeing how others respond to our expression, for example–may remarkably influence our listening and experience (Schutz, 2008).

So far, we have concentrated on expression as an individual act. Expression is often also viewed and assessed as the performer's (in this case the singer's) individual activity and achievement. In the following section, we argue, however, that expression is in fact a reciprocal, interpersonal, interactive, and intersubjective phenomenon. It happens between people and the performer and listener influence each other in many significant ways. Furthermore, the perception of expression is never complete; it never captures all of it.

Intersubjectivity in expression

It is easy to agree that the listener's experience is shaped both by the properties of the music as well as those of the actual performance (Gabrielsson and Lindström, 2001). Music performance is to a great extent an interpersonal and interactive phenomenon in which everyone involved influence each other, even the absent composer. The performer can also actively build connections with the audience. For example, Thurman (2000) advocates creating rapport between performer and audience, which he defines ideally as "empathic, respectful, and comfortable human communication" (p. 162; see also Juslin et al., 2018). From a wider perspective, expression as well as the music itself can be considered a way of initiating and influencing relationships between people (and their environment) rather than producing sounds for some listeners in the audience to perceive (Brown, 2006). However, philosophically, we can dig deeper into this relationship, which can be associated with the "mysteries of expression," also referred to as "performance magic" (Steinhauer et al., 2017, p. 26; Tobolski, 2002, p. 19). For Gallagher (2005), the mystery of expression is related to the embodied primacy of intersubjectivity (Levin, 2016).

Intersubjectivity, in its simplest sense, refers to awareness of others and understanding of others' actions and experiences in the same world. Merleau-Ponty (1968) draws his interpretations of intersubjectivity on Husserl's ideas of "pairing" and "appresentation." While Husserl focused from the subjective awareness of others, Merleau-Ponty shifts the focus of discussion toward intersubjective relationships between persons in a shared embodied existence (Sanders, 2014, pp. 142–144; Tiili, 2011, pp. 95). He views humans as each other's mirrors: a person becomes visible to oneself through another person: "...through other eyes we are for ourselves fully visible; that lacuna where our eyes, our back, lie is filled, filled still by the visible, of which we are not the titulars." (Merleau-Ponty, 1968, p. 143.) Thus, another person's actions are not understood in a separate "understanding" but immediately and bodily. We understand directly what the other means through our embodiment. In Reynaert's (2009), p. 17) words, "everything we do has immediately intersubjective signification" (see also Gallagher and Zahavi, 2008, pp. 171–196).

Hence, Gallagher (2005) connects expression with intersubjectivity. He suggests that expression cannot be viewed as a purely subjective act issuing from interiority launched into the exterior world. Rather, in expression, innate motor and communicative capabilities are integrated. Here, communication does not suggest, however, that expression would imply communicating and transmitting something internal, mental, or already thought. As Levin (2016, p. 189) writes, "expression is considered a fundamental condition of possibility for communicative action – the enacting of an intercorporeal and intersubjective world of meaning." For Gallagher (2005), the body generates a gestural expression in a self-organizing manner but only "if there is another person"; it is *the other* who moves, motivates, and mediates the process (p. 42, italics original).

Subsequently, we can argue that artistic expression comes into existence through an intersubjective process. Another way of

understanding the intersubjective "becoming" of artistic expression, as Levin (2016) argues, would be

> "to state that art creates or captures expressions available for subjective sense experience and, perhaps more importantly, teaches us that sensation can never be considered a given, but must be genuinely created in the concepts that want to capture the infinite movement of a particular becoming-body" (p. 200).

Therefore, the expression always entails a difference in the ways it is perceived—both by the performer her/himself and the audience—it is never "complete," and always includes potential for change. This difference, a separation, is what Merleau-Ponty (1968) calls divergence, or a gap (*écart)*. Using touching as an example, it means that a touched thing is "separate from, independent of, more than the touching reveals its presence and conceals what lies beyond its touch" (Dillon, 1997, p. 163). When the reversibility occurs between two bodies, "neither body need be reduced to what becomes manifest to one at the moment of contact" (p. 164). The body-subject tacitly understands that it does not perceive the entirety of the phenomenon it reveals (Merleau-Ponty, 1968, pp. 126, 135, 147–148).

The very reversibility of perception suggests the intersubjective nature of music-making and perception. As discussed earlier, reversibility occurs between senses as well as between action and its perception but it also exists among sensing people. In Merleau-Ponty's words, it "makes the organs of my body communicate and finds transitivity from one body to other" (Merleau-Ponty, 1968, p. 143). Just like when I touch my hand, I can sense both the touching and being touched, when I "touch" another person with a musical expression, I can experience both the touching and how the other is being touched (which in turn informs my further action). In expression and perception, the intersubjective, reciprocal processes are intertwined. As Levin (2016, p. 187) notes: "The embodied subjectivity in all art is to be found in the 'chiasm' (the intertwining) of the body as sensing and being sensed. In other words, the work of art reveals self and world as irreducible to each other but intertwined or passing into each other in perpetual movement" (see also Merleau-Ponty, 2007).

The intersubjective experience is also a shared experience of being bodies (the notion of *flesh*, Merleau-Ponty, 1968). Within the music domain and related to artistic expression, Brown (2006, p. 8) interestingly writes about this:

> Music makes a prolongation of our own sounding bodies: when we see it in action, the visual experience reminds us that our body – itself an object of vision – can take a share in the same kind of physical, sonic experience. We see ourselves sounding by attending to the "textures" of musical movement, aural and visual. What we behold is of both general and particular significance. For we are all in possession of a body with which we might move, the consequences of our embodied actions forming the particular materiality of sound, which in some way instantiates the concept of our having made a prior action-performance.

This capacity to immediately, effortlessly, and bodily understand other people and their actions and emotions, which in phenomenology is explained through intersubjectivity is in neurosciences explained through Iacoboni's mirror neuron theory. According to Iacoboni and Lenzi (2003), studies among monkeys and humans support a model of empathy which suggest that "there exists a shared code between perception and production of emotion" (see also Gallagher, 2005). A very often cited example of this is that when you see someone smiling, your own mirror neurons for smiling fire up, too, initiating a feeling we typically associate with a smile. This does not require any inference or analysis. The mirror neuron system is involved in both visual and auditory action recognition (Buccino et al., 2004) as well as in understanding the intentions of other people's actions (Iacoboni et al., 2005).

Yet, in the music domain, little attention is paid to the intersubjectivity between the listener/audience and performer and the ways it shapes both the expression of a piece and how it is received. The audience affects the performer on many levels, i.e., on psychological, physical, and social levels, that are, however, impossible to separate from each other (Studer et al., 2014). Some of the effects can be experienced as positive, supporting the performance. For example, the presence of the audience may motivate the performer to concentrate better than when rehearsing (Ford, 2013, p. 160). But, the effect can be also negative, especially if the performer is excited about or even afraid of the responses of the audience (p. 161).

So, both the expression and receiving it are intersubjective and intertwined. Performers have a crucial role in shaping the listeners' experience, but also vice versa. What often matters for the listener's experience (as audience), is how much the performance succeeds in "moving and touching" the listener, discussed earlier in the text. The touching quality of musical performance is often understood as "expression of emotion." Music affects us, evokes images, and activates memories, emotions, and feelings (e.g., Juslin and Sloboda, 2001), and builds new meanings. Based on intersubjectivity between people, the expression of emotion is understood immediately through the body. This immediate experience and understanding can later be set as an object of reflection.

To date, there has been little research on how the listener's embodiment and previous experiences shape listening, and the interpretations made based on it (Tarvainen, 2018a,b). The Finnish researcher Tarvainen (2008), who has examined singing from holistic perspectives has identified different overlapping phases or dimensions in (embodied) listening to vocal performance. The first one implies tuning up to the singer's expression, which means experiential and empathic listening; the second one implies analytical listening, and the third one integrates these two aiming at a comprehensive understanding of the various meanings of expression (Tarvainen, 2008, p. 32). Indeed, it would be interesting if the embodied and experiential dimensions in listening would be seriously considered, for example, when passing judgement on musical expression and performance overall in educational settings.

Discussion

In this study, we have discussed expression in PM singing and voice pedagogy from the perspective of embodiment, mainly as depicted in Merleau-Ponty's phenomenological philosophy. We have presented both theoretical and pedagogical arguments. First, in line with Hughes (2014), we suggest that teaching vocal techniques should be based on healthy vocal production. Second, we assert that expression should not be primarily approached as a technical issue (also Hughes, 2014) but should be viewed as emerging with the performer's intention and—including facial and bodily gestures—can be considered a completed thought that brings the meaning into existence. Third, with the notion of body schema, we want to point out

that the body itself has a lot of *knowledge how* and should be trusted in singing, both in terms of voice production and expression. Trusting the body's ability to act according to intention also releases unnecessary muscular tension and enables efficient and economic use of voice. Fourth, we state that there is a reversibility of perception in expression. Thus, perception and the object perceived are intertwined. In singing, the performer is both the subject and object of the expression (yet only one of the two states occurs at a time). Therefore, action and perception are interconnected. There is also reversibility of perception between people: we sense and become sensed by other people, and we can even sense the sensing of us by others. This brings us to our final argument regarding the interpersonal quality of expression. Expression in PM singing happens between people, and our bodies have an inherent capacity to immediately understand other bodies, which in phenomenology is referred to as intersubjectivity. In singing, this reminds us that we do not only listen and receive expression through our ears and mind but perceive through the whole body which can sensitively understand the expressed emotions. As we see it, this bodily - in Merleau-Ponty's term pre-reflective - understanding could be considered more explicitly in voice teaching and assessment of expression.

Pedagogical implications

Taking embodiment as a starting point in PM vocal pedagogy incorporates many aspects. One of them is that expression should be taught *from the inside out*, not outside in (see also, Gilman, 2018). By that, we mean that expression builds on one's personality and (emotional) experiences. It also means considering student's own experiences, emotions, and bodily sensations as relevant to learning and teaching. In PM voice teaching, singers are often guided to listen to recordings and pay attention to how emotion and expression are created vocally by varying the dynamic, coloring the tone, and adding "vocal stylisms" typical to a certain musical style; to how the singers use slides, word painting, consonants, tone color, "bend" notes, and "swing" the rhythm to reinforce expression, for example (LoVetri et al., 2014, p. 59). In music theater, the voice production, for the clarity of text, may even imply using muscular efforts that close off the vocal mechanism altogether (Johnson, 2019, p. 484). This approach easily directs the singer to rely on "technical methods" to strengthen the expression. Listening to references and imitating good singers can demonstrate expressional possibilities, provide inspiration, and encourage new ideas. Still, in our view, pedagogy should not be based on imitating others by manipulating the sound, but rather on finding the core elements of expression inside the student, counting on intuition, and allowing the student's individual sound to develop gradually and naturally. In education, problems often arise when a student's/singer's individual sound is not allowed to develop gradually and naturally but is sought after by manipulating the production of voice.

To be able to trust completely the skillfulness and mindfulness of one's body in music performance, be willing to express from the inside out, and feel comfortable with communicating with the audience, naturally requires preparation. This could mean an embodied approach to PM voice pedagogy that would incorporate aspects from embodied learning theories—highlighting, for example, the use of body movement and the importance of integration of perception, action, and thinking in learning–but also from body awareness techniques and healthy/free voice vocal pedagogies. Additionally, an embodied approach could exploit exercises (from Mindfulness, for example) to practice presence and concentration. Regarding expression, what matters most is to view and teach voice technique and expression as integrative and inherent elements of singing. The technique should not be separated from musical expression but taught in connection with and even through expression. We believe that this perspective supports the meaningfulness of singing practice and the wellbeing of singers and students. However, the details of an embodied approach to learning and teaching PM singing are beyond the scope of this article and will be discussed elsewhere (Arlin, Liira & Juntunen, in process). In any case, to further advance embodied practices in vocal pedagogy we need more studies drawing on theories of embodiment of musical (inter)action, perception, cognition, experience, and learning, as well as pedagogical materials and methods that are based and drawn from these theories and studies.

Data availability statement

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

Author contributions

M-LJ is responsible for the logic of argumentation, expertise on phenomenology, and most parts of the text of the article. EA and KL are experts on popular music vocal pedagogy and responsible for the arguments related to vocal pedagogy. All authors contributed to the article and approved the submitted version.

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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.

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Facilitating collaborative professional development among instrumental and vocal teachers: A qualitative study with an Austrian Music School

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This case study provides an in-depth investigation in a professional development project about facilitating collaborative reflection. This was led by a research team from the university with 13 instrumental music teachers from one music school in Styria (Austria) during 2019–2021 (including the initial COVID-19 pandemic). Research questions considered (1) the participants' descriptions of the collaborative professional development, (2) participants' uses of reflection tools and indications of their identification with workshop interventions, as well as factors responsible for the outcomes from the reflection tools; and (3) ways participants' thinking and attitudes may have developed through the workshops, how they defined themselves as a group (if they did), and how they might have gained trust in one another. Inspired by the design-based research approach, practitioners and researchers worked closely together to enhance teaching and learning implementing interventions with collaborative reflections tools. While the first phase (11 workshops) was primarily led by the project-team, the second phase (7 workshops) was participant-led. Data included focus groups and discussion transcriptions from 18 workshops. The impetus of the study included the role of the director and the participants dealing with the interventions, and finally the participants' descriptions of their experiences in the professionalization process. Literature included collaborative professional development, community of practice, learning communities, self-determined learning, reflective practice, and ethical considerations. Data were analyzed based on thematic analysis and gave rise to five following themes: forming group cohesion, inspiring and appreciating collaboration, bridging theory and practice, identifying deeper thinking and teachers as learners, addressing challenges and potentials during the COVID-19 pandemic, and finally finding the music school's own identity and sense of importance. Findings highlight the importance of establishing meaningful collaborative reflection through appreciative communication and an atmosphere of trust and respect. To be able to make change in and with an institution, leadership members must be engaged as collaborative stakeholders on an eye-level; collaborative professional development can be used as a resource toward rethinking and reworking the identity of one's music school and of teaching and learning. Institutions should provide space and continuity for such development. Finally, the study highlights that a collaborative reflective approach can contribute to professional and social growth.

KEYWORDS

instrumental music teachers, collaborative reflection, professional development, empowerment, professionalization, facilitation, teaching and learning enhancement, music school

1. Introduction

This qualitative case study investigated 13 instrumental and vocal music teachers from a public music school in Styria, who collaborated with a research team in collaborative reflection. First, we provide the background and theoretical framework of the study. Second, we outline the design of the workshops. In the method section we describe our analytic approach before presenting and discussing results. Finally, we suggest professional development projects how to focus on collaborative professionalization.

The rationale and background of this study reference a longstanding problem in music pedagogy. The terms theory and practice are often used dichotomously, reflecting a complex tension (Vogt, 2002; Lehmann-Wermser and Niessen, 2004; Niessen and Richter, 2011; Kruse-Weber, 2018). Newer paradigm shifts that consider a broad view of societal and political issues only slowly take root, hindering development and professionalization (Kruse-Weber, 2018). Gaunt (2016) and Westerlund et al. (2019) point out that society, music-making, and educational institutions undergo dynamic changes, while instrumental and vocal teaching often continue along traditional paths. Bransford et al. (2005) noted these traditions affect teaching decisions and should be examined. Therefore, in instrumental and vocal teaching, there is increasing need to develop reflective and lifelong learning to respond to social changes in flexible and collaborative ways (Shuler, 1995; Smilde, 2009; Westerlund et al., 2019). Relatively few studies—specifically in the German-speaking context—have systematically examined professional development activities from experienced instrumental/vocal teachers (Bauer, 2007; Conway, 2007; Conway, 2008; Reynolds et al., 2010). Brewer and Rickels (2014) provide an overview of extant research on the professional development of music educators from Hookey (2002) and the Journal of Music Teacher Education, which devoted a special issue to the topic (Conway, 2007). Mostly studies on professional growth focused on how technology and the Internet can be used to improve music-teaching practices. The study from Brewer and Rickels (2014) about professional growth opportunities of music educators within an online social media community are aligned with communities of practice that exhibit common characteristics. New studies, such as Westerlund et al. (2019), Gaunt and Westerlund (2022), Westerlund (2020), and Westerlund et al. (2021) about professionalism in music (education) argue that music schools as social-ecological spaces ought to develop *institutional resilience* (Senge, 2006; Westerlund et al., 2019). The resilience of music schools as social-ecological systems is important toward renewal, re-organization and development of social structures to generate new values and enhance sustainability through innovations (Westerlund et al., 2019). Clear connections should exist between initial professionalization in terms of teacher education, and continued development for in-service teachers. Therefore, our study, while focused on professional development, may also have implications for teacher education.

In this study, we consider that professionalization involves a process of defining group norms and purpose, not only day-to-day decisions, but also a greater sense of cultural and societal purpose, as well as ethics by which to guide one's practices. Related to Gaunt and Westerlund's (2022) concept of professionalism, our view comprises music teachers' senses of agency, position in relation to a wider society, and resilience. We consider that through professionalization, one may claim belonging and expertise as a bound group. Society, too, may come to recognize the group as professionals (in recognition of expertise unique to them) and music teachers can come to therefore feel respected and appreciated for their work. This can lead to a sense of confidence, camaraderie, skills, and expertise, furthering satisfaction in one's work.

Along these lines, and with intentions to bridge a gap between innovations in pedagogical theory and practice, in 2016–2018 we worked with colleagues in the project *Network IGP*[1] from the University of Music and Performing Arts Graz (KUG), Austria on collaborative professional development (CPD; Kruse-Weber, 2018). In order to expand on the teachers' experiences of CPD, and also to bring it to music schools, we initiated a follow-up project called *Reflective Practice in Innovative Music Schools*.[2] We intended to establish a group of teacher-learners, to expand their teaching expertise, and to empower them to take on new perspectives. These include the awareness of understanding teaching and learning in a broader context of social systems and as a constitutive issue of social justice and "politics of memory" (Bowman, 2006; Odendaal and Westerlund, 2022).

Our rationale for this study can be framed as shown in Figure 1.

This CPD project occurred over two periods: The first Phase (*IGP-Go,*[3] with 11 workshops from January 2020 to January 2021) involved facilitated meetings, use of reflection tools and group discussion. The collaborative reflection of these workshops led to the idea of forming a task force, which developed in a Second Phase (*A Music School Speaks,* with seven work meetings from May to October 2021) and involved a shared vision for innovative and contemporary music school work. This concept was presented at the conference *Challenge Accepted 4.0,*[4] aimed at music school teachers' collaborative exchange (Tumler and Kruse-Weber, 2022).

The purpose of this study, was to deepen our understanding of instrumental music teachers (referred herein as instrumental teachers, also implying vocal teaching): of their work, teaching approaches, attitudes, experiences and receptiveness to potential change or growth, and their perspectives on problems, barriers and potentials of knowledge transfer with their students. As authors have noted, collaborative reflection and facilitation is important as an integral part of building group cohesion (Kruse-Weber, 2018; Kruse-Weber and Tumler, 2020; Tumler and Kruse-Weber, 2022).

Before proceeding, some terms require explanation. In this study, we discuss professional development as a continuation of professionalization, indicating further growth in articulating one's purpose and goals, gaining support, and refining one's practice. Drawing from the work of other researchers (e.g., Hakkarainen et al., 2004; Hakkarainen, 2013; Timonen, 2021), we regard

Abbreviations: CPD, Collaborative professional development; CoP, Community of Practice; CR, Critical Realism; CRP, Critical Response Process; DBR, Design-based research approach; SDT, Self-determination theory.

1 This project in 2016–2018 was funded by the Austrian Federal Ministry for Education, Science and Research and the Austria Wirtschaftsservice.

2 The project was embedded in a cooperation project involving several Austrian universities called *Connecting.Ideas4Research—participative, inter- and trans-disciplinary knowledge transfer processes between Research and Communities of Practice* (Kleinberger-Pierer et al., 2022).

3 The term emphasizes that the project started to move outwards—from University to Music Schools. IGP is the German short cut for instrumental- and vocal Leerzeichen statt Bindestrich pedagogy.

4 The conferences *Challenge Accepted 1.0–4.0* were organized by the team from instrumental and vocal pedagogy at the University of Music and Performing Arts Graz, Austria in 2016, 2017, 2018, 2021.

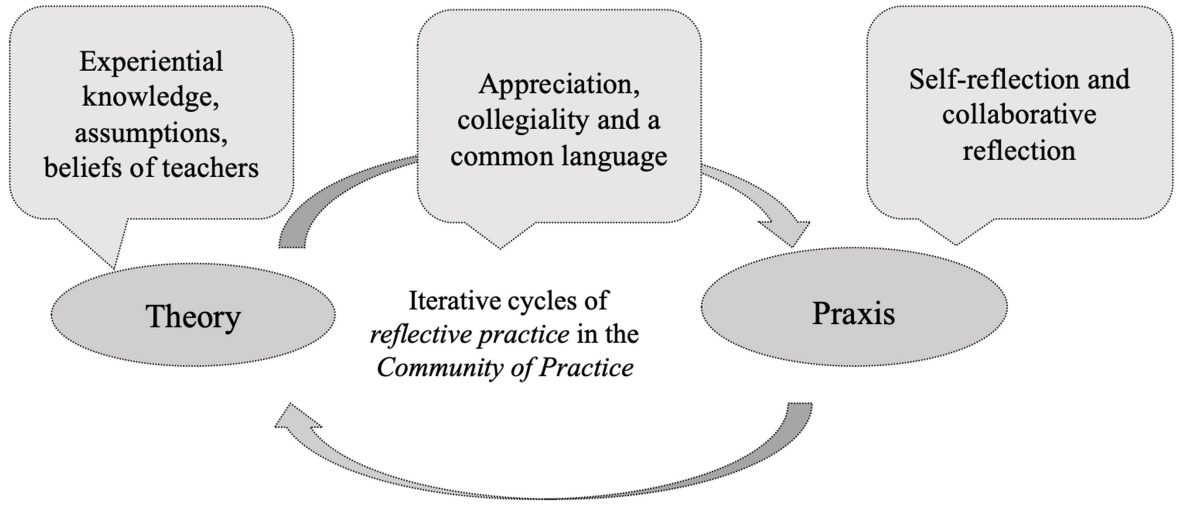

FIGURE 1
Learning as co-construction in social interaction—reflection principles, bridging theory and practice, adapted from Gaunt and Westerlund (2013) and Kruse-Weber (2018).

professional development as purposeful and curiosity-driven interactions between individuals and groups, in order to develop new knowledge and learning. As Darling-Hammond et al. (2005) noted, CPD is necessary in that teaching itself is a complex act in which one must integrate different knowledge and skills in order to make decisions about how to achieve goals with diverse learners. Reflection processes (both collaborative and self-reflection) played important roles in this study. We regarded reflection as on-action, rather than in-action, as participants viewed their own teaching recordings and considered them after some time and within a new context (Schön, 1983). Deep learning outcomes, as discussed by Marton and Saljo (1976), can be defined as those that collectively comprise understandings, and one's ability to apply those understanding (as opposed to simply memorizing or imitating information). Lifelong learning involves curiosity and motivation to seek growth in one's life, including professional life. Bucura (2020b) noted the importance of continued learning for music teachers in terms of support, balance, and sustainability. Music teachers' professional knowledge is related to professionalization explained earlier, including defining group norms and a sense of purpose and ethics. In this study, self-determined learning involves an application of learning in practical contexts, which necessitates that the learner (or in this case teacher-learner) is flexible, resourceful, and can make needed adaptations, even when transferring to varied and changing contexts (Bucura, 2020a). Collaborative professional learning included delineating tasks that collectively seek a common aim, defining roles in relationship to one another, and reflecting on these processes toward cohesion as community and personal and group growth.

Online learning and collaboration were not originally intended as an aspect of this study, and therefore, are not explicitly outlined as a research goal. Yet, due to the unanticipated outbreak of the COVID-19 pandemic, six of the 18 workshops were held online and hybrid. Changes necessitated by the pandemic emerged as an important aspect of participants' (and our own) experiences. Which gives information about the participants in the phases. For an overview of the project phases, see Figure 2.

Following research questions were considered:

1. How can the professional development process of the participants be described?
2. How did participants collaboratively discuss using the reflection tools and how did they indicate their identification with workshop interventions? What factors supported the outcomes from the reflection tools? Which problems, barriers, and potential benefits of the interventions did participants describe?
3. How and why might participants' thinking and attitudes have developed through the workshops? How did they define themselves as a group (if they did)? How did participants describe viewing themselves professionally?

In the following we unfold a theoretical framework for the study. Participation in the workshops changed over time. Workshops began with time to visit socially. Enhanced perhaps by significant time (length of workshops and amount of workshops over time), we felt participants formed what became a community of practice (CoP; Wenger, 1999). They reflected on the interventions that included talks from the first author and her facilitation of the reflection tools. We define intervention as the implementation of innovative (reflection) tools for learning and teaching, which as opposed to interference can be regarded as a positive challenge to one's thinking in becoming intentionally involved in order to improve it.

The CoP supported a shared interest in teaching practices, allowing them to create new knowledge to advance professional practice personally and affecting the music school. While we later reference overlapping aspects of the group with what could also be considered a professional learning community, goals of improving students' learning were only tangential to the group's purpose and rather focused more explicitly on their own growth. Therefore, we regard participants as a community of practice.

Literature involving themes of identity and value specific to music schools and private instrumental (and vocal) teaching are lacking, but some points are noteworthy. In some countries, music teacher education tends to focus squarely on school music teaching, sometimes neglecting

			Timeline	*Participants* rt	n	mst
	Network meetings	9	12/2019–01/2021	3	7	-
Data collection	**Project presentation**	1	01/2020	3	3	18
	Workshops *IGP-Go*	10	03/2020–01/2021	3	5	13
	Work meetings ***A music school speaks***	7	05/2021–10/2021	3	-	7
	Presentation *A music school speaks*	1	10/2021	-	-	7

FIGURE 2
Overview of the project *Reflective practice in innovative music schools*. The CPD then evolved five colleagues from the university (*networkers*) who had participated in the previous project 2016–2018.

practices specific to instrumental and vocal teaching (Bucura, 2013; Bucura, 2022), and sometimes failing to provide meaningful professional development and support for practicing instrumental teachers (Bucura, 2020b). Programs have been criticized for lacking a clear connection among required coursework as well as shared values and conceptions of teaching music among faculty (e.g., Darling-Hammond et al., 2005; Hammerness, 2006a). According to Darling-Hammond et al. (2005), the content of coursework matters less than a focus on *how* one learns. These inconsistencies may contribute to a lack of cohesion and vision among instrumental and vocal teachers in music schools, as well as underdeveloped senses of professional identity among them, perhaps without a unifying vision (Hammerness, 2006a). Some programs may offer only what Darling-Hammond et al. (2005) referred to as disjunct, piecemeal domains of the curriculum.

As Grossman et al. (2009) stated, foundations and methods courses should be aligned, bridging theory and practice, and encouraging cohesion between university preparation programs and music schools, as well as encouraging development of not only knowledge and skills, but also professional identity. Other policy areas are also important in order to support good teachers, which—specifically related to this study—include professional development, mentorship, and feedback, along with others like thoughtful retention, preparation, induction, and career development (Darling-Hammond et al., 2017). These areas may contribute to a teacher's educational vision, which Hammerness (2006b) notes is lacking in education widely, and when present tends to articulate only institutional hopes rather than to guide decisions in personal ways. In fact, according to Hammerness (2003), teachers' own visions may help one understand not only what and how one teaches, but their likelihood of staying in the profession.

In this study, collaboration was important. Gaunt and Westerlund (2013) noted the ways in which it might promote innovation and negotiation of cultural differences and meanings, which seemed to be the case in this study. According to Gaunt and Westerlund (2013), collaboration promotes innovation and the ability to negotiate cultural differences and meanings. Creech and Hallam (2017) point out that it is "interdependence, interaction and mutuality that undergird the creative potential of groups" (p. 58). As Niessen et al. (2014) stated, music pedagogy research can actually promote institutional teamwork, broadened perspectives, and challenge individuals to question themselves. The relationship of the research study to the professional development workshops appeared to facilitate such an exchange.

Collaboration is accompanied by the view that individual learning is regarded as socially situated (Lave and Wenger, 1991). Teachers are thereby regarded as facilitators and co-learners, empowering learners to take ownership of their learning. As Renshaw (2009) describes, "Facilitating is a dynamic, non-directive way of generating a conversation aimed at enabling or empowering a person(s) to take responsibility for their own learning and practice." (p. 3) In the context of lifelong learning, CPD efforts are increasingly meaningful and successful. In addition to our own experiences from the first project 2016–2018, we ground our project on research-based indicators for effective CPD (see Figure 3), described next.

Stanley et al. (2014) pointed out, one component of CPD consistently identified as meaningful by in-service teachers is collaboration. Since the field of instrumental and vocal education is dynamic, teachers' careers increasingly become portfolio careers (Polifonia, Erasmus Network for Music, 2010), necessitating such reflection across settings and roles. Feiman-Nemser (2001) stated that

> By engaging in professional discourse with like-minded colleagues […] teachers can deepen knowledge of subject matter and curriculum, refine their instructional repertoire, hone their inquiry skills, and become critical colleagues (p. 1042).

Despite value, music teachers in school settings may lack meaningful collaboration, feeling they must simply "sink or swim" without support (Ballantyne, 2007, p. 184). One indicator for effective collaboration in CPD is the ability to empower the teacher-learners not only to expand their expertise but also to empower them to make change. Kirkman and Rosen's (1999) investigation of work teams in organizations indicated that empowered teams became more productive and proactive than less

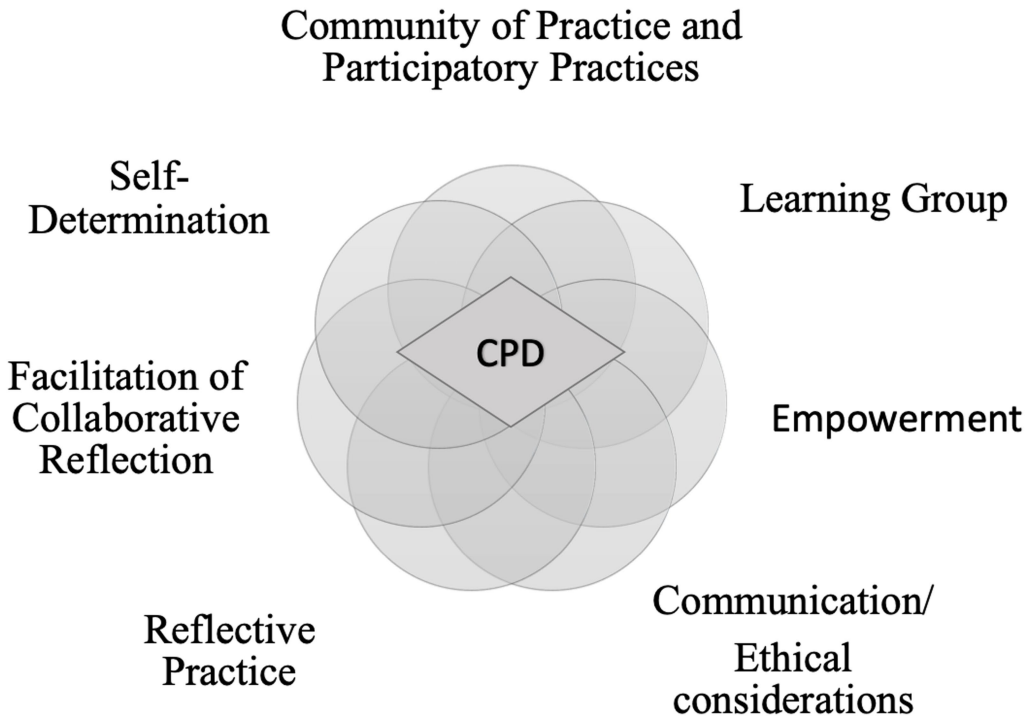

FIGURE 3
Theoretical framework of the case study *Collaborative Professional development* (CPD).

empowered teams, and had higher levels of job satisfaction and organizational and team commitment. According to them, empowerment comprises (1) self-efficacy of the group with the belief to perform well; (2) meaningfulness, a belief that a group performs important and valuable tasks; (3) autonomy, having independence and discretions in work; and (4) impact, experiencing a sense of significance in the work and goals achieved. Similarly, in CoP, people "share a concern or a passion for something they do and learn how to do it better as they interact regularly" (Wenger, 2006, p. 1). Over time, these individuals develop a shared repertoire of practices "in the form of experiences, stories, tools, and ways of addressing recurring problems" (Miksza and Berg, 2013, p. 7–8).

Highly relevant to the topics of empowerment, CoP and learning groups, are studies of self-determination theory (SDT), which examine the extent to which one meets or frustrates three basic needs: (1) *autonomy*, experiencing interest and values. (2) *Competence*, "feeling of mastery" and that one can succeed and grow, which is best satisfied within "well-structured environments that afford optimal challenges, positive feedback, and opportunities for growth." (3) *Relatedness* involves a "sense of belonging and connection" (Ryan and Deci, 2020, p. 1).

In addition, reflexivity and reflection are key competences in professional pedagogical action. They can be acquired and provide opportunities to further develop teaching. The attitude of the "reflective practitioner" (Schön, 1983, 1987) ideally describes pedagogical action as an interaction of planning, analysis of situational demand and adaptation to the given teaching situation, and allows reciprocity of theory and practice. Reflective practice allows one to become aware of their strengths through a resource-oriented, reflective attitude (Kruse-Weber and Hadji, 2020). Related, Westerlund (2020) emphasized the importance of reflection through narrative and story in developing senses of community identity, and ways in which narration can lead to transformative professional change.

2. Materials and methods

2.1. Facilitating the workshops for collaborative reflection

This case study (Stake, 2000) is bound by a focus on participants' attitudes, beliefs, behaviors and needs (Williamon et al., 2021). Data were generated from focus groups that provided insights about experiences, attitudes, opinions, expectations, and cultural understandings (Stewart and Shamdasani, 2015; Williamon et al., 2021)—and from the discussion of the participants in the second cycle *A Music School Speaks*. These data contributed to "community building and emancipatory effects among participants" (Bär et al., 2020, p. 215). In the following we clarify methods used to facilitate the project: See Figure 4 for the activities in professional development, we held workshops once per month, working as an intensive group on a practice-oriented topic for approximately 2.5 h.

Focus discussions needed to be carefully planned to obtain participants' perceptions, including maintaining an open tone. The interaction of respondents could have undesirable effects (a particularly opinionated member could bias results, or conversely, a more reserved group member may be hesitant to talk). We encouraged participants to share their thoughts in an established safe environment. The facilitation by the first investigator was designed to elicit the most compelling and telltale responses from the participants. We knew that the quality of learning and teaching would not be easily captured, depending on participants' conceptions of good teaching (Carbone et al., 2019).

We also were aware about the inefficiency of unfolding an "expert delivery" format, which would set narrow normative frameworks for the participants (Jørgensen, 2009). Rather, we recognized a need to discuss, explore, and reflect quality of teaching and learning mutually. Additionally, reflection was informed by research and educational theory, so our individual experiences could be "related to broader viewpoints and clarifying overviews and theories" (Jørgensen, 2009, p. 111–112).

Inspired by workshops held by the European higher music education initiative *Innovative Conservatoire* (*ICON*), reflection tools were explored with participants in focus groups and further developed in the sense of a community of practice. Based on a number of group characteristics, the group could also be regarded as a professional learning community (Mitchell and Sackney, 2011). Stoll et al. (2006) point out the characteristics of a learning group such as shared values, collective responsibility for pupils' learning, collaboration focused on learning, group cohesion and individual professional learning, reflective professional enquiry, mutual trust, respect and support. Despite these shared points, however, we regard the participants more specifically as a community of practice in that collective responsibility for pupils' learning (Mitchell and Sackney, 2011) was only a related aspect rather than direct focus of the group.

The tool *Sources* aimed to share and reflect one's own understanding of teaching and learning while upholding personal meanings, and was based on an item each teacher brought to the workshop (Duffy, 2016, p. 381). By sharing personal values, a sense of trust and awareness for diversity was intended to be built. Furthermore, participants reflected and discussed *Images* by artist Jamie Wignall (Hallam and Gaunt, 2012, 85–87), exploring their teacher-student relationships throughout their biography. We then collaboratively explored the feedback tool *Critical Response* Process (CRP) by Lerman and Borstel (2003). CRP aims at supporting the development of any form of creative work through stimulating and activating feedback, led by the presenter. To actively engage networkers from the previous project, we empowered them to facilitate this process. CRP established learner-centered approaches to reflection, feedback and growth. All participants were engaged as responders, creating an open space for diverse perspectives, along with tensions and negotiations inherent. In CRP, teachers must engage in a critical examination of alternative and innovative ways of communicating. By not allowing participants to provide judgment or evaluation, they were confronted with a challenge to revisit prior opinions and sensitively choose words. Aligned with the work of Dweck (2006), as aforementioned, CRP focuses on what one is becoming, rather than on a deficiency-model. Related to CRP, we extended the opportunity of group feedback using *InterVision*. This method of collegial consultation evaluated by ICON (Innovative Conservatoire), is inspired by health-related professions (van Zelm, 2011).

As Lipowsky and Rzejak (2015) reviewed, using video sequences as a reflection tool in teacher training is considered an effective way to examine teaching practices and to aid in evolving, scrutinizing and developing teaching-related beliefs and attitudes. The reflection tool *Videography* involved collaboratively reflecting videotaped sections of instrumental and vocal music lessons using a four-stage process (see Table 1). Aligned with the studies examining the use of video-cases to promote reflection in preservice teacher education, we hoped that video-cases would encourage reflectivity and bridge a theory-practice gap (West, 2013).

Our considerations included ethical concerns or reservations teachers and learners could have about being recorded, and the selection, use, and storage of videos (Bucura and Kruse-Weber, 2021). We observed video recorded lessons by teachers outside the group. At the conclusion of each workshop, participants were invited to share their experience of the workshop in a *flashlight Forum*.

Our research is influenced in its basic ideas by the design-based research approach (DBR; *cf.* Euler and Sloane, 2014). It implies the development of teaching designs, and a deeper understanding of associated learning processes as a theoretical goal. DBR allows the introduction of innovations and interventions in practice and to develop them in a circular process through research-based adaptation to the participants' needs. Figure 5 points out the idea of circularity in DBR in our project: a first circle of workshops (Network IGP with 12 colleagues from the university 2016–2018) and second circle (Reflective Practice in Innovative Music Schools 2019–2021) as collaboration with one public music school (Kruse-Weber, 2018).[5]

2.2. Roles of the participants, researchers, and networkers

Given the complexities of this project, we clarify the roles involved. These include the research team, who—aligned with DBR—also intersected with facilitation and participant roles, teacher-participants, and the leader of the music school.

In order to recruit music school teachers for the project, we first explored interest in the project in dialog with several Styrian music school directors. We signaled that the teachers would be valued as people and not only as research objects, and that they would be actively involved in the research process, with space to tell their own story (Lambrechts et al., 2017). We explained that the project included implementation of innovations, which we would reflect,

5 For the Austrian Music School System (see Lugitsch, 2021, chapter 4.2.1; Rehorska, 2018).

TABLE 1 Reflection tool *Videography* with its four-step process.

1. Describing/What do you see?	2. Interpreting/explaining the meaning of the information or action	3. Personal opinions/ suggestions for improvement	4. Personal implications/next steps for the presenter
The student did not talk during the lesson	The student seemed disinterested as he did not talk during the lesson.	He/She is a boring teacher as the student did not talk during the lesson.	In the future I would like to, e.g., ask more open questions to the students and vice versa so that the student will talk during the lesson.

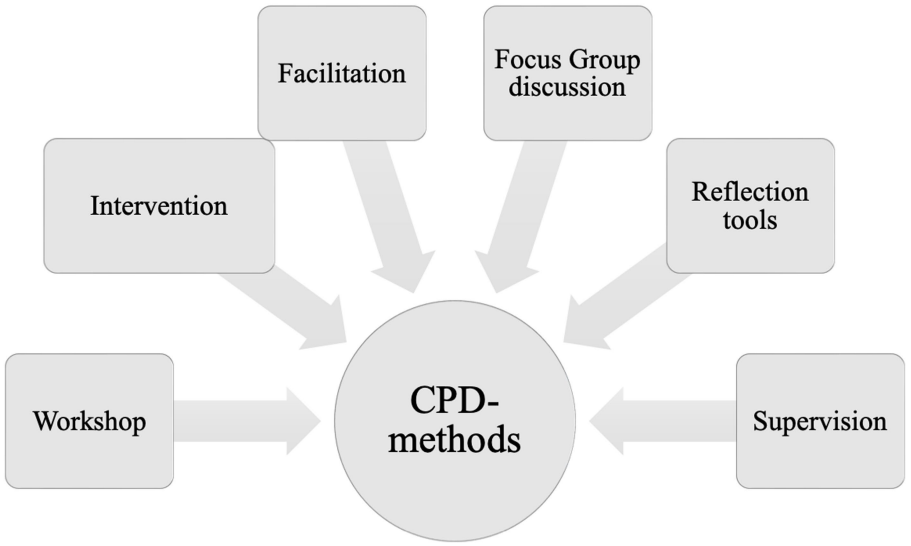

FIGURE 4
Methods for *Collaborative Professional Development* (CPD).

analyze and evaluate together. A director and trumpet teacher at a public music school in Styria (Austria), communicated openness and interest in the project. In January 2020, a project presentation took place at the music school; all teachers were invited. 18 teachers, including the director, attended the presentation as an engaged partner. We provided information about the study and protocols, and participants from the previous project described their personal experiences. Nine of the teachers, including the director, and five additional teachers that had not been able to attend, signed on. One participant held a double role: as teacher at the music school and at the university, where she had participated in the previous project. Over the course of the workshops, some participants attended regularly, whereas others came sporadically. For the seven meetings of Phase 2, a teacher that had not participated in the previous workshops joined the core group of seven teachers including the director and the double-role teacher. Demographically, teachers formed a diverse and heterogeneous group which contributed to the researchers' aim of allowing diverse perspectives.

As shown in Table 2, the majority of participating music school teachers were female and above age 40. Most had more than 10 years of experience as music school teachers, five more than 20 years. Few of the teachers had a contract of more than 20 h per week. Teaching subjects varied widely: instruments, genre and teaching settings (one-to-one lessons, partner and group lessons). The majority of teachers taught more than one subject. Participants knew each other as colleagues, but to varying degrees.

The two phases of the project (*IGP-Go* and *A Music School Speaks*) differed significantly regarding participant roles. In *IGP-Go*, researchers and networkers acted in a role Creech and Hallam (2017) described, as "midwives," who were "enabling participants to discover the content and processes for themselves" (p. 64). As the research team, we supported or scaffolded participants' learning, gave theoretical input about topics, and took into account their expressed interests. We also were careful about setting what we felt were challenging yet attainable goals when identifying/creating material and activities. In the second phase of the project *A Music School Speaks,* our roles resembled what Jones (2005) calls the "fellow traveler." Fellow travelers empower the group for:

> egalitarian relationships between leader and participants. As a result, the latter may feel more able to contribute their own ideas and sometimes will take on leadership roles within the group. The group may become a learning community, characterized by collective exploration (Creech and Hallam, 2017, p. 64).

We interacted with the group moving from cooperative (midwife) to autonomous mode (fellow traveler) in response to changing characteristics, dynamics and stages of the group experience. In the cooperative mode we guided the group by sharing ownership of decisions relating to the learning process. In the autonomous mode, we created conditions within group participants could take full ownership and responsibility for self-directed learning. Group members negotiated their own path with minimum intervention. The life experience and insights that all participants brought to the group appeared to be valued by the fellow travelers (Creech and Hallam, 2017).

In summary, the project team played several roles during the study. Influenced by DBR, we designed the workshops. As group participants, this also included contributing to group discussions, choosing and adapting material for the workshops, leading focus groups, making in-the-moment decisions about how and when to collaborate, and providing space for participants. Researchers met regularly throughout this process, discussing our roles and questions as they emerged.

2.3. Data collection and ethical considerations

Our data collection in this case study refers to the 18 workshops of *IGP-Go* and *A Music School speaks* (1/2020–10/2021). During all 18 workshops, group discussions were audio-recorded (three online and three hybrid), then transcribed, anonymizing speakers. In the first phase

TABLE 2 Music school teachers' demographics.

		Phase 1	Phase 2	Total
Gender	Female	$n = 8$	$n = 6$	$n = 9$
	Male	$n = 5$	$n = 1$	$n = 5$
Age	30–39 years	$n = 5$	$n = 0$	$n = 5$
	40–49 years	$n = 4$	$n = 2$	$n = 4$
	≥50 years	$n = 4$	$n = 5$	$n = 5$
Music school teaching experience	1–9 years	$n = 5$	$n = 1$	$n = 5$
	10–19 years	$n = 4$	$n = 2$	$n = 4$
	≥20 years	$n = 4$	$n = 4$	$n = 5$
Employment at the music school	*Duration*			
	1–9 years	$n = 7$	$n = 1$	$n = 7$
	10–19 years	$n = 3$	$n = 2$	$n = 3$
	≥20 years	$n = 3$	$n = 4$	$n = 4$
	Hours per week			
	1–9 h	$n = 5$	$n = 2$	$n = 6$
	10–20 h	$n = 5$	$n = 3$	$n = 5$
	≥ 20 h	$n = 3$	$n = 2$	$n = 3$
	*Teaching subjects**			
	Woodwinds	$n = 4$	$n = 1$	$n = 4$
	Stringed instruments	$n = 4$	$n = 2$	$n = 4$
	Voice	$n = 2$	$n = 2$	$n = 2$
	Brass	$n = 1$	$n = 1$	$n = 1$
	Drums	$n = 1$	$n = 0$	$n = 1$
	Keyboard instruments	$n = 1$	$n = 1$	$n = 1$
	Ensemble teaching	$n = 4$	$n = 4$	$n = 4$
	* > one subject	$n = 6$	$n = 6$	$n = 7$

*Note that in this table, we included the participants who participated in the entire project, and excluded the ones that only participated in the first workshop (project presentation).

of the project, we recorded the focus group discussions from 11 workshops. In the second phase we recorded all seven work meetings of *A Music School Speaks*, as it was dominantly participant-led. In addition, participants were asked to complete a demographic questionnaire. All data were saved on a university server with safety precautions, including access restrictions to only the researchers. This study was closely coordinated with and supported by our legal department from the university, including an ethics board who advised the research team. Our considerations included the videography, which was complex, given the sensitive and personal nature of recordings involving teachers and learners. We invited and consulted an expert for this topic, and along with other stakeholders, organized a symposium with a discussion directly about it. This discussion was recorded and then analyzed by thematic analysis and led to in-depth discussions of storage, use, and consent with respect for others, with videographed lessons as data and/or learning materials (Bucura and Kruse-Weber, 2021).

Prior to the start of the group workshops, the participants signed an informed consent document and completed a brief demographic questionnaire on the online platform. They were informed that the workshops would be recorded and the data would be anonymized and used only for research reasons in this topic. The participants were also informed that participation was on a voluntary basis and that they had the right to withdraw at any time if they were not comfortable with the study.

2.4. Thematic analysis

The aim of the study and focus group discussion data led us to employ thematic analyses (TA; Braun and Clarke, 2006, 2021; Byrne, 2022). We regard TA as a "qualitative paradigm" (Braun and Clarke, 2021), in which we actively made decisions about the data. Accordingly, we were aware that our analysis is based in Critical Realism (CR), which originates in writings by Bhaskar (2008). CR distinguishes between the "real" and the "observable" world. This is understood that a material reality, which cannot be observed, exists independent from our ideas, and that our experiences and representations of reality are mediated by language and culture (Braun and Clarke, 2021). Nevertheless, it is notable that unobservable structures cause observable events and the social world can be understood only if researchers understand the structures that generate interventions. When we conduct an intervention, this establishes the conditions to create the intervention and we observe the results. CR allows us to look under the surface to an existence of independent reality to observe the underlying theoretical mechanisms and structures (Braun and Clarke, 2021, 286).

Accordingly, using CR we generated two types of codes. First, semantic codes, and second, latent codes. At the beginning we generated more semantic codes capturing surface meanings. Later, latent codes captured assumptions. We were three coders using "Consensus Coding" by coding agreements as a key measure of coding quality. We developed "a final set of codes through discussing which codes offer a best "fit" with, or provided a more accurate interpretation of the data" (Braun and Clarke, 2021, 285). All over, we took a reflexive approach to TA to account for researcher bias. Informal researcher memos helped us in coding sessions, primarily to define codes or summarize assumptions underpinning reading of the data. At times we revisited prior codes, further discussing and deepening our articulation of them. We employed the coding phases from Braun and Clarke, (2021) freely, meaning that on one side we approached codes systematically through the coding process. On the other side, we went back and forth to recursively generate the themes with clear concepts and to provide a distinctive telling of the story by checking a close connection back to other data. In all, we ended with 3,374 coding segments and 22 main codes (see Appendix Table 1). The code system was created in an iterative process that underwent several cycles.

Using the analysis software MAXQDA, manifold codes were generated line by line (Rädiker and Kuckartz, 2019; VERBI GmbH, 2022). Later, codes were sorted and grouped; where necessary, new broader codes or subcodes were created. Codes were merged and sometimes became enveloped as subcodes (Rädiker and Kuckartz, 2019). Collaboration took place mainly over virtual conference with all three researchers, yet occasionally in-person meetings were possible. Analysis meetings were held in weekly sessions over 1 years' time, which allowed us to complete a thorough initial coding system. Afterward, we worked recursively as we reflexively considered new codes that emerged, leading us to return again and again to the first transcripts as we carefully reviewed each transcript in order to determine relevancy of new codes to all previous data.

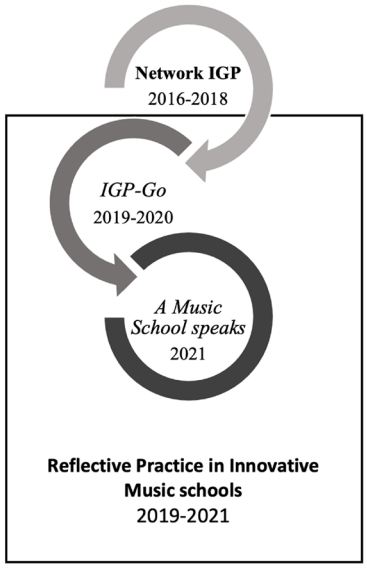

FIGURE 5
Cycles inspired by Design-based research.

We then created summary grids and summary tables using the software MAXQDA (see Appendix Table 2), which allowed us to visually depict code recurrence and relationships, as well as to document emerging insights and explanations specific to particular codes, code groups and research questions. Additionally, we used visual tools from MAXQDA (see Figure 6). Each circle symbolizes a code, with the spacing between two codes reflecting how similarly the codes have been used in the data. This image shows that codes such as collaboration and reflection are very strong and belong closely together. The more overlap in one segment, the more they tend to have been used in the data material. Strongly connected are also the codes collaboration and facilitation.

After completion of all necessary coding cycles, we generated preliminary themes that had emerged both in discussions while coding, and afterward in a review of data. This process occurred to the point of data saturation when no new themes or insights emerged.

Further analysis (summary grids) referred to the code segments of our preliminary themes. Together, we sought to consider them openly, as long as the data could have adapted or changed them. In this process we revised the themes and this enabled us to specifically articulate them, sometimes combining them. We reflected the themes as a story with coherent data. Data are presented here in order to maintain participants' voices whenever possible and contribute to study trustworthiness. Although workshops were held in German and are documented here in English, translation was carried out with care. This process was long and in-depth, often leading to rich discussions among researchers about not only definitions, but ways cultural understandings may imply specific use of a particular term or phrase.

3. Results

Upon an in-depth, collaborative coding and analysis process, we considered the literature in relationship to the research questions. As a result, the data led to five themes and several sub-themes.

- Group cohesion, inspiration, and appreciation of collaboration
- Bridging and transferring theory and practice
- Deeper thinking with teachers as learners
- Challenges and potentials during the COVID-19 pandemic
- Finding the music school's identity and value

3.1. Group cohesion, inspiration, and appreciation for collaboration

3.1.1. Appreciation of collaboration

In this study, participants expressed appreciation for the opportunities the workshop series presented them. They regarded them as important social and professional time. Participants noted the value others' perspectives brought to them, and often remarked about their own need to connect with others professionally. While the workshops indeed had a professional and purposeful tone, time was also granted during which participants informally connected, for instance at gathering times and breaks.

Participants remarked the group felt cohesive. This sense of togetherness likely provided them strength to overcome hindrances, for instance tiredness in the evenings. Furthermore, small groupwork with 3–4 people seemed to be a powerful context for learning and negotiating. They noted they felt secure. After small group work, participants shared their experiences with all.

> I came here, like many others, straight from class, tired, a bit groggy, I thought, well, but I have to say it was great, and especially the work in the small group, I enjoyed it very much (…)." (IGP-Go:1)

Participants expressed missing professional exchanges in their daily lives and noted they regretted such exchange did not occur naturally as they felt it had years prior. They stated:

> So, I find it rather tragic that we have such a workshop in order to have an exchange. (…) I'm horrified to realize that I'm about to enter my fortieth year of teaching and there have been changes … this sticking together happened automatically in the past (…). (IGP-Go:1)

Participants' interests were also social. Many commented on personal experiences and all appeared to be listening to one another with attention and respect. These factors seemed to create an atmosphere of trust, furthering social ties. The group did not know one another well, and stakeholders remarked it was "fascinating" when they got to know colleagues and their perspectives. One noted they were surprised by colleagues' choices of representative objects and by the stories behind them.

> And when I have such a short talk with colleagues today, where you think you know them, (…) and then you don't know them at all, (…) it surprises you what he has to tell and that's what I find exciting (…). (IGP-Go:1)

Participants commented on the trust they had built throughout this project. They noted that they could be vulnerable, taking risks, being "wrong," and failing together. Moreover, they missed their colleagues during the COVID-19 lockdown, and remarked that virtual meetings were valuable to them in allowing consistent professional connections

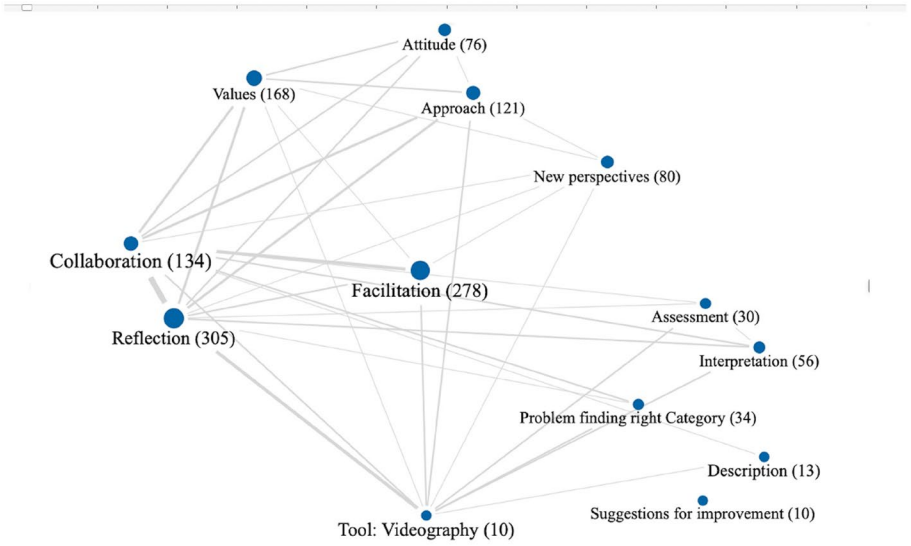

FIGURE 6
Facilitating Videography: Visual tool with relations of codes.

during an otherwise isolating time. Some even expressed pride in being involved in this project. One said:

> I'm also very happy about the project … I'm almost a little proud that we have this at the school. (IGP-Go:2_2)

The appreciative atmosphere in the meetings seemed particularly poignant when, during the project, the COVID-19 lockdown necessitated meetings be held virtually. One participant indicated that seeing one another, even virtually, was welcome amid distractions of managing their personal and professional lives during this uncertain time. They said:

> I'm trying to manage somehow (laughs) between, if I can ever get access to a computer that works, because of course everybody in our house needs one, between learning with kids, taking care of students and other stuff. Yeah, (…) glad to see you guys (laughs). (IGP-Go:3)

A driving factor that bonded the group appeared to involve quality of communication. Participants said they appreciated communication with the university. They enjoyed the dialog, specifically on "eye-level" with university colleagues. The non-hierarchical and direct line of communication between institutions seemed particularly important to participants in that they might align their values and create complementary systems. Another indicated their appreciation for the ways workshops were purposeful and facilitated, noting it created a valuable space for dialog. They stated:

> I have had such a nice group, (…) and stimulating exchange, (…) I have also led a music school for almost thirty years, and such an exchange of ideas, such an intensive engagement is simply not possible in everyday business (…) To find the time and peace where topics are given and moderated, that has a different quality. (IGP-Go:1)

The use of video reflection seemed challenging for the group. See Figure 6 with the visual tool, there was a strong tendency to interpret or even evaluate, rather than describe what they viewed. The task, however, seemed to nudge participants to think differently about the lesson they viewed. When they leaned toward evaluation or judgment, others noticed it and the group steered themselves with good humor. These challenging tasks appeared to strengthen the group. One participant described it:

> So, (…) for me it's very good that I am able to be descriptive, which I find very, very difficult. We are not trained that way. We are immediately trained to interpret. (…) Describing is, I think, a very important tool, because it helps us to look at the content. (…). (IGP-Go:2_2)

Several teachers expressed that in their daily professional work there was typically little opportunity for an in-depth exchange of professional issues. One participant stated this was exacerbated in recent years because lecturers had only part-time contracts, indicating they may not encounter colleagues as often or have the same time to build relationships.

In our analysis, a prominent code was appreciation of collaboration. As presented in Appendix Table 1, collaboration was connected to topics such as values, attitudes, approaches and new perspectives. Participants used words such as "exciting," "improvement," and "pleasant and enriching" when describing collaboration. One remarked they were affirmed when other colleagues commented in alignment with their own thinking, and others noted their views had been broadened, that they felt self-reflective, and could improve and develop their own thinking. Another emphasized the importance of trying something new. They noted, however, the difficulty of making time.

While many participants commented on the importance of growing their perspective and hearing different views, some were more specific. One participant noted that the collegial exchange provided them with a chance to view students in different ways, as well as to regard their own communication with students.

> I also really enjoy the (…) professional exchange among each other (…) that is simply an immense enrichment, (…) this is benefiting me a lot in regard to the teaching practice lessons, where you have to deal with students, (…) and where you, (…) get a different perspective on students, that has become clear to me today (…) I appreciate it very much. (IGP-Go:7_2)

In using Critical Response Process (CRP), the stages were not meant to be followed through or be used as distinct categories, but to stimulate discussions and raise awareness of different views. As noted, it seemed challenging for participants to think within categories in the four-step process (34 codes) of videography reflection (see Figure 6). For instance, describing situations seemed to be difficult (13 codes), while interpreting (56 codes) and evaluating (30 codes) appeared easier, occurring more often. The purpose of these steps is that descriptive feedback fosters learners' own interpretations. Participants commented on numerous aha-experiences to this point. After some practice we noted that the participants became increasingly careful and began to correct themselves when they felt they had interpreted or evaluated too quickly. Participants seldom gave suggestions for improvement about others' teaching videos, but they expressed appreciation for this process. One said:

> Yes, (…), interpretation of each video by (…) the colleagues is just really enriching every time that we exchange and for me especially self-reflection comes up again, where I position myself in this extreme "passive-active teacher," and how one switches back and forth at best. (IGP-Go:7_2)

3.1.2. Group decisions

The upcoming conference date with the presentation *A Music School Speaks* necessitated the group efficiently make decisions, not only on presentation content, but also practical matters of organizing themselves. Some took on leadership by organizing the group. Everyone from the task force expressed a need to contribute their own work.

3.1.3. Expanding traditional conceptions, emphasis on inclusiveness, and accessibility

Participants regarded their students not only as musical learners but also as clients seeking music therapy and wellbeing. Over time, the group began including more adults and seniors in their visionary concept. They considered methods, tools and approaches of music therapy to create learning environments and to facilitate learning for individuals with disabilities.

3.2. Transfer in bridging theory and praxis

Participants declared not only interest in applying new ideas to their teaching praxis, but had ready and willing attitudes, for instance, "I definitely will do that!" Transfer in applying a theoretical idea however, appeared to be considerably more difficult. There seemed to be a willingness to entertain new ways of thinking, yet less assertion in considering how and in what ways to apply theory to their practice. They had complex perspectives. For instance, participants remarked about bettering their understandings of the science behind music pedagogy, their interest in better understanding not only how to teach music, but why they taught the ways in which they did, and how to better reflect on their own common-sense knowledge toward a more purposeful practice.

3.2.1. Appreciating connections between theory and practice

In this study, participants expressed wanting more connection between the content at the university and their own job demands at the music school.

> And then I realized again (…) we should do more theory or less theory; I think to myself: Why do you always have to separate that so strictly (…). (IGP-Go:11)

They remarked that they tended to associate the university with theory, while to them the music school represented praxis. This dichotomous way of positioning theory and praxis appeared to be widespread among participants and they said they had neither considered the different relationships between theory and praxis, nor had questioned which might follow the other. One participant remarked:

> For me, the first question that came up was, does practice always have to follow theory, and the way you're planning on doing it now, to turn the whole thing around a bit, to actually move from practice to theory for the next generations. I find that very exciting and important for our work (…). (IGP-Go:1)

Participants expressed their interest that not only content from the university came to the music school, but that knowledge and experiences of the music school should transfer back to the university. The teachers expressed their desire to see this type of mutual exchange and told us of their appreciation for the project toward these possibilities. Participants said they valued openness in the group, having space and time for exploring new ideas, and university colleagues' willingness to learn from their experiences. One participant said:

> (…) when I came back from university, I was full of knowledge, and then the first thing I saw in class was a seven-year-old child who was learning the recorder with me, and then I said, "one more day like this and I'll quit." Because I just didn't know what to do with the child. (…) your interest is really to go to the base and see what's really happening there, and then to bring that to the university (…) students come to the music school and engage with that, because then they are close to practice, so to speak. And I think it's great that you're doing that. (IGP-Go:1)

3.2.2. Prioritization of theory and practice

One participant felt that more praxis should have been part of their university studies. Others remembered teaching practice with their own students in the higher education setting as exhausting, yet acknowledged it made the transition to professional practice much easier.

> [In music education training at the conservatory] I had (…) to prepare a lesson every week. At the university you do a sequence once a semester. (…). As a student, that was already an insane challenge for me, when you suddenly have to prepare a complete lesson, week after week. (…) Of course I was happy, after the year I was able to teach (…). (IGP-Go:2_2)

Participants interestingly noted their widespread perceptions of a gap between university preparation and the job of being a music teacher. One participant noted that the realities of their job looked different than could be replicated at the university level with preservice teachers. One said:

> (…) Well, I think, there is quite a big discrepancy between what the students hear in the pedagogical courses, for example, what we have heard (…) at the university, (…) practical life often looks a bit different, but this is a long way to go (…). (IGP-Go:4)

3.3. Deeper thinking with t(eachers) as learners

Participants appreciated gaining new ideas in the group, giving the chance to broaden their horizon and to deepen their knowledge. This point appeared to relate to all aspects of the data. One participant said:

> To get new input, new ideas, how colleagues that have been teaching for decades, still have a very fresh approach to the whole profession. I find that very impressive. At the same time, getting new ideas that broaden one's own horizon, that I found very, very good. (IGP-Go:1)

3.3.1. Reflection tools as inspiration

The workshops seemed to provide space to try ideas out, get them wrong, and start anew. Participants expressed a need to articulate and to consider what values might be important for the music school now and in the future. Thus, in this study teachers also became learners.

> But I think why the exercise [a reflection tool] does so well is to force us to think: What are our values, actually? (…) Because there are values that we might share more or less as a society and there are values that are more important or less important to us personally. And I think it's totally important that we are aware of our values, so that we can differentiate once again. (IGP-Go:8)

Participants also noted the benefit of getting to know new teaching and learning approaches, values, and attitudes of their colleagues. Participants said they sought opportunities to learn from different instrument groups as well. One said:

> It was (…) exciting to learn something about the other instruments and then to see, okay, we have basic topics, we have a lot of the same topics, where we then (see) that there are different circumstances with other instruments, but it's just exciting to get into the details in this way. (IGP-Go:1)

3.3.2. Participants' language

During data collection, participants' language appeared to converge. Some seemed to develop what we referred to as problem awareness for language and as a result, seemed to become more sensitive to concepts of teaching and learning. This included, for example dealing with students, teacher-and learner-centeredness, and mediating learning content. After repeated sessions participants began using similar language and more readily agree with one another's use of it, or in some cases assume others' meanings as agreed upon. Meanings seemed to result from their earlier discussions and use of the reflection tools. Common language also seemed to lead to a more specific articulation of themselves as music teachers, and of their profession. This point was also identifiable in the use of pictures and video, as participants noted that everyone sees and hears something unique. One reflected:

> I have to agree with (a colleague). I felt the same way, same images, same situations, but the different ways of thinking, the different ideas that everyone has about it, that was exciting. (IGP-Go:2_2)

3.4. Challenges and potentials during the COVID-19 pandemic

One big challenge for the project and participants was the COVID-19 pandemic. They expressed their experiences, both personal and professional, which included the objectives they had for online teaching, possibilities in communication, technical issues, time management, and ways they balanced the positive and negative sides of pandemic-related changes.

3.4.1. Personal situation of everyone involved (participants, students, parents)

All participants remarked that time spent on computers had rapidly grown during the pandemic. As a concept, time had eroded. Despite these challenges, participants also noted positive outcomes. People and families were brought together, for example providing time and space for making music.

Several participants experienced challenges in fulfilling different roles, such as being a teacher, parent, homeschooling their own children, and managing household tasks. Participants said they wished to separate work and private life, but could not achieve it. Several participants said they suffered from isolation during the pandemic, including in their work because they no longer were "feeling good" after a lesson with colleagues to share or discuss with, take breaks with, and in general replenish one another. Teaching without these boosts left many feeling drained.

> I think the common breaks have always been important (…) and that's all missing now. Even if some are at school sometimes, one stays just in one's room (…). One doesn't see and hear anything, and there [in the breaks] we could forge joint plans again, somehow, and new ideas could emerge. (IGP-Go:11)

The director was also challenged during this time, and said he often felt overloaded with the responsibilities to communicate official rules to the teachers and parents. He said he needed to both balance and continue to work as normally as possible while supporting the teachers, for instance by encouraging them to care of themselves.

During the time of initial lockdown in this study, teachers realized they benefitted from increased insight into students' home lives. This was helpful in understanding how the students' homes were equipped for instrumental and vocal practice (or not), possible

disruptions that might be factored into practice strategies, and so on.

3.4.2. Teaching (online) objectives

Objectives for teaching online were one aspect of their careers that participants agreed needed to be rebalanced. In this study, the general attitude of the participants was to stay in touch with students and parents during the pandemic. They valued this communication highly and as more important than improving the student's instrumental/singing skills. They encouraged their students to record videos of themselves playing or practicing to send to relatives, which they viewed as motivating.

3.4.3. Technical issues and communication

During this time an additional challenge included technical issues, such as unreliable internet connections, knowledge of equipment (hardware and software), and best practices for audio recording. Technical issues seemed like the most challenging efforts for participants. With blurred lines of home/school/music school, participants sent additional materials to students to implement in practice sessions, for instance WhatsApp and email messages, and students sent in practice videos. One participant said online teaching can be helpful in promoting increased home practice, for instance working hard to get one's recording just right. At the same time, participants recognized that online teaching lacked an atmosphere of togetherness and direct interactions (also musically). Traditional individual lessons were overwhelmingly favored by participants.

> I agree with (a colleague's statement), I miss the personal contact and so do the children. Phone calls are very exhausting in the long run because of the often poor connections. (IGP-Go:4)

3.5. Finding the music school's identity and value

When participants needed to collaboratively settle on details of their own presentation for their music school vision, they seemed to take on deepening ownership. The role of the director seemed integral to this, while members took on new perspectives. Through this process they began to articulate and contextualize their views of teaching and learning, and they were able to identify a shared philosophical rationale about the power and importance of music. One participant described new roles.

> For me, when I'm listening to you (Silke), it is a bit like supervising, because up until now we have really worked, collected thoughts, and brought in different aspects. Now we get supervision. I think that's great. This view helps us to better recognize what we are actually doing. (EMS:1)

3.5.1. Role of the director

The director walked the line between providing leadership presence, while also stepping back to maintain space for others. He claimed they had grown through the process and noted a shift in perspective. He said, "The vision *A Music School Speaks* has opened doors for us toward viewing our school in a new way, with approaches that we more or less knew before" (EMS:1). Participants hoped that their presentation would inspire other colleagues.

3.5.2. Taking ownership of new perspectives

In the second phase of the project, the task force of teachers attempted to contextualize their job and their school in relation to the broader field of education. It took much time and investment for the group to get to the point of answering their own questions. Original aims of the project involved realizing and acknowledging one another in order to agree upon a common goal. In this process, participants became more sensitive about their language, content and communication. The title and main mission for justifying their identities such as music teachers and as institution became: "that's why we are important."

Participants discussed the purpose of their music school at length, indicating their regard and value for the role it played in the social and cultural life of the greater community. While describing their visions of music school some noted the importance of the music school space as a meeting place in which to be social and neutral. They mentioned the café and performance spaces as well as art displays. One aspect of the school they felt made it unique was the flexibility of their spaces, which included moveable walls and multipurpose rooms. Ways in which the space lent itself to a variety of needs–and might even inspire them–felt particularly special to the participants.

> Our building is located near the school center as well as the cultural center. It reflects the pedagogical concept in terms of integration, inclusion, diversity, flexibility, climate neutrality, transparency and self-determination. (…) It is not quite complete, perhaps. It is a place to stay and meet, a communicative, transparent social space. (EMS:5)

When looking to the future, participants had many ideas. In general, they indicated an interest in becoming a pillar of their community's social and cultural life, thus necessitating openness and outreach to all people in the area, including and beyond those the institution already served. They hoped to expand the range of ages represented at the school with more adults and seniors, as well as young children, in order to be inclusive. One remarked:

> One idea we had was, to no longer call the school a school, but a music competence center. (…) A large reservoir with music theory, music therapy, with adult education, a library for sheet music, so that people can come here and say "I would like to have this sheet music or this song, do you have it?" (EMS:1)

As the study went on, senior citizens were discussed at length, as the group realized they could benefit much more from music-making and may have the time and inclination to become involved. One participant reflected:

> I am a folk music teacher (…). I take my guitar and then we do folk singing. Actually, they flourish. The seniors are so satisfied. You go home so satisfied when you see the radiance in their eyes. (…) That should be done much more, then people are healthier and not so alone. (EMS:1)

Participants noted that new populations of people might feel hesitant to participate. They wished to provide low-risk opportunities for people to come. They also sought to foster cooperative relationships with local clubs and to provide a range of

possible days and times to accommodate different schedules. One described the vision like this:

> There is no fear of entering our institution and people are happy to make use of the teachers' know-how. So we open our doors widely and bring people into our house. On the other hand, we also reach out and work in multiple cooperations on a network of music (teaching). Our music school is integrated into the regional education network. Teachers from the different schools work together in a spirit of mutual appreciation (EMS:5).

3.5.3. Contextualizing

Over the workshops, participants began contextualizing not only their work among and in relation to one another, but also in a broader professional sphere. This included situating themselves in their city and region, in their country, and in their language and cultural values. They began acknowledging that characteristics of the music school and students were not the same everywhere, even in their own region. We noted a growing awareness of themselves in relation to a broader, diverse field of practice. Such comments indicating a growing sense of their ability to situate themselves culturally and socially also included considering themselves among other music teachers, for instance in other music schools and those who worked in public schools, as well as their relationship to local and regional university music pedagogy programs and curricula.

When looking to the future, participants agreed on the power of music, often providing personal anecdotes to support it. They agreed on the value of music and had different rationales for why this might be so. One participant noted a refinement of humanity they felt could be enhanced through musical participation, stating:

> But I think our mission here is (…) we simply offer to young people, older people who visit our music school, that they are refined on their life path, in their thinking. That they can work creatively, can develop and live out creativity, that they are educated to be thinking people. I think that is our mission here, that they can refine their being human here (EMS:1).

4. Discussion

We examined a CPD project with instrumental and vocal music teachers. The purpose was to deepen our understanding of the situation of instrumental music teachers, including their work, approaches, attitudes, experiences and receptiveness to growth and change, as well as problems or barriers to knowledge transfer. In the following section, we discuss and interpret these questions in relation to the data, themes and literature.

4.1. Expanding professional development and participants' experience

Professionalism involves ethical questions that concern who we are and who we want to be as music education professionals in today's society (Westerlund, 2017). Together, participants reconsidered these questions in the first part of the project *IGP-Go*, and they provided a central tenant in the second part of the project *A Music School Speaks*.

4.1.1. Forming group cohesion

A major tenant in the professional development process had to do with the group coming together as a safe, trusted community. One of the ways to achieve a grassroots transformation was through careful and non-hierarchical facilitation, based on mutual communication among all. It was important that participants could tell their own stories (Miksza and Berg, 2013), and express their own thoughts in an atmosphere of trust, appreciation and openness (Williamon et al., 2021). This facilitation provided role-modeling for respectful and appreciative interactions, as well as reflection about oneself in relation to others' experiences. Participants accepted responsibility for themselves and formulated a personal, and increasingly unified professional vision for themselves (Hammerness, 2006a). This was in stark contrast to what many felt were imposing governance made by politicians (Westerlund et al., 2019).

Data suggested that reflective practice and collaboration were valuable to participants. CPD required all stakeholders engage in many ways including what Fraser (2019) describes as developing new skills and understandings, taking on extra work, risking failure and inviting possible disapproval from staff and students. Data indicated participants experienced a supportive and creative environment that enabled positive interactions and mutuality (Creech and Hallam, 2017). As Gaunt and Westerlund (2013) noted, such an environment can promote innovation and negotiation of cultural differences and meanings. This is aligned with Georgsdottir et al. (2003), who emphasized ripe situations: if "the environment is not ready for creative, innovative ideas then original thinking will not flourish" (p.184).

Participants' discussions, including verbal descriptions, reflections about experiences, attitudes, and expressed beliefs, provided insights to one another about music lessons at their music school. This made sense to us because as Jørgensen (2009) noted, teachers must discuss, explore, and reflect qualities of teaching and learning with others. We felt strongly that effective support for teacher learning was furthered by an emphasis on dialog and collaborative interactions (Reynolds et al., 2010).

The power of group cohesion in the second portion of the project made it possible that all seven participants were able to perform and present their jointly-developed vision of music school work. They did this as a team and referred to themselves as a task force. The participants' self-declared title *A Music School Speaks—That's Why We Are Important* intended to offer a fresh perspective on justifying music education in publicly-funded music schools. It implied to us the group's confidence and highlighted empowerment characteristics outlined by Kirkman and Rosen (1999). It also seemed to reflect some degree of self-determination, in particular the autonomy and relatedness participants gained through participation (Ryan and Deci, 2020). This was apparent in an identifiable flexibility and resourcefulness (Bucura, 2020a). They also appeared to gain a sense of competence as they dove into theoretical and practical discussions, fine-tuning group values and a sense of togetherness (Ryan and Deci, 2020).

4.1.2. Addressing pandemic challenges

Another aspect of the professional development process included the COVID-19 pandemic. The teacher-group had different perspectives in dealing with music lessons remotely during lockdowns. The findings complement studies, for example, of Biasutti et al. (2022), Camlin and Lisboa (2021), and Schiavio et al. (2021), regarding a range of challenges, responses, difficulties and positive experiences for instrumental teachers during this time, such as lesson planning, time management, student involvement, and communication technology.

Psychological implications of the digital "turn" were apparent in multiple roles of teacher and parent. Finally, the reflections highlight the pressures this crisis placed upon educators to adapt swiftly to technologies while maintaining high pedagogical standards (Schiavio et al., 2021). Many mentioned aspects of responding to this pandemic (and change), which can be summarized as a core competence of flexibility (Georgsdottir et al., 2003). This has a strong impact on teacher training courses as we must address and encourage flexibility for pre-service teachers.

4.2. Dealing with the reflection tools

The second research question involves ways participants collaboratively discussed using reflection tools and ways they may have identified with workshop interventions. Reflection tools seemed to play an important role in participants' abilities to embrace different perspectives. The tools provided a lateral space by which participants could lend an ear to new possibilities not previously considered. They allowed participants to be open, mediating their growth differently than hearing from someone else with a different viewpoint.

4.2.1. Bridging theory and praxis

Our intention with the reflection tools was to critically reflect their potential for teaching and learning by mediating "between experience, knowledge and action" (Gray, 2007). Critical reflection promotes consciousness and hence the potential for autonomy, allowing informed judgments, and critically examining underlying assumptions.

Accordingly, participants critically discussed both potential benefits of the interventions for reflective practice (e.g., Critical Response Process, or the video-observation phases, and potential challenges of a student-centered approach). We sought to shed light on responses to the reflection tools. With the Critical Response Process (CRP), we intended to connect ethics to practice, considering possibilities of ambiguity, empathy and diversity toward building and furthering a participation. As mentioned, in the first step of the critical response process learners expressed overall statements of meanings (Lerman and Borstel, 2003).

Feedback was presented as a "foundational aspect of meaningful reflection" (Lerman and Borstel, 2003, p. 4) The CRP allows to consider teaching from different perspectives (Legette and Royo, 2021). The biggest difficulty for all participants in the group seemed asking open questions of learners or presenters. Regarding feedback from students, they were not accustomed to it and often felt unsure how to respond. According to Sandars and Murray (2009), reflection (i.e., asking questions) can be learned. Participants suggested developing tools for pupils so that they have more possibilities to express their experiences in music lessons and ask questions.

As aforementioned, the terms theory and praxis are often used dichotomously (Niessen and Richter, 2011), but this hinders professionalization, then becoming integrated only slowly if at all (Kruse-Weber, 2018). The profession of instrumental music teaching tends to lean toward traditions like a master-apprentice model (Bennett and Hannan, 2008), unlike other types of educational institutions (Gaunt, 2016). There is a gap therefore, between educational theory and practice (Kruse-Weber, 2018). In this study, participants indeed tended to dichotomize theory and praxis, also applying institutional labels to them, for instance, university represents theory while music school is "real life" praxis. It appeared to be eye-opening to the participants in this study, however, to consider a deep, reciprocal relationship of theory and praxis and the ways it might help them not only reflect on teaching, but also express their values. These considerations can also affect institutional relationships, as dichotomizing the terms may not breed the kind of cooperations that Darling-Hammond et al. (2005) noted are lacking. Yet, participants in this study valued communication with the university and the opportunity to align values, curricula, and vision, which authors emphasize is important (e.g., Hammerness, 2006b; Grossman et al., 2009; Bucura, 2013; Bucura, 2020b; Bucura, 2022).

4.2.2. Finding a music school identity and value

We recognized the process to strengthen identity is dynamic, interactive, and ongoing. Wenger (1999) noted that communities of practice may involve people sharing concerns or passions, and that they can improve these communities through regular interactions. This seemed to ring true in our study. Participants had ample time together, not only in each workshop, but in many workshops over a lengthy period of time. The COVID-19 pandemic likely also played a role in further bonding the group as noted in the prior section. Despite moving meetings online, individuals faced new challenges like isolation, yet continued to connect regularly with one another.

Participants built a shared repertoire of not only resources and practices, as noted by Miksza and Berg (2013), but also language, agreed upon values, and group norms that seemed to not only solidify them as a group, but to provide a sense of personal and professional identity. Data indicated the group's growing sense of themselves, particularly through their language. In the beginning, it seemed participants may have been speaking different languages in that they often needed to clarify their meanings. Over time however, the group appeared to become more comfortable, better articulating themselves, and finding easier points of understanding.

4.3. Developing participants' thinking, attitudes and definition as a group

The third research question addresses participants' potentially changing thinking and attitudes, and ways they defined themselves as a group. Education should empower learners with skills and competences, particularly to address continual changes (Herodotou et al., 2019). As learning is socially situated (Lave and Wenger, 1991), workshops in this study seemed to provide Renshaw's (2009) descriptions of facilitation—as a non-directive way of engaging a conversation in order to empower others' ownership.

4.3.1. Facilitation of deeper thinking

The theme "deeper thinking" is in accordance with the studies from Lipowsky and Rzejak (2015), as the depth and quality of teachers' content-related reflections also seems to be important for their development of competencies. Deep learning outcomes, as noted, can be defined as those that collectively comprise understanding, and the ability to apply that understanding, rather than memorizing or imitating (Marton and Saljo, 1976). A change in teachers' beliefs can be predicted by the depth of content-related processing. Nevertheless, lack of time – often stated among participants – is considered as a barrier for reflection, innovation and interaction (Carbone et al., 2019, 1,358).

As Feiman-Nemser (2001) noted, professional discourse such as discussions, can help to deepen subject knowledge, refine instructional repertoire, hone inquiry skills, and build critical thinking among colleagues. Participants in this study indeed

appeared able to deepen their perspectives in these ways throughout the course of their participation. This seemed especially apparent in critical thinking, as participants questioned one another and themselves. For example, they increasingly articulated needs for adult and senior populations, as well as students with disabilities. In this way, participants took responsibility while re-thinking, re-questioning and re-positioning music school issues and challenges from politics and society. One of the tools used, a vision of a lighthouse, seemingly inspired them to "open doors" and consider the music school in a new way.

Gaunt and Westerlund (2013) refer to cooperative and collaborative forms of learning as one of the most powerful ways to constructively deal with current challenges and the dynamic developments of professional practice. As also shown in Figure 1 this is aligned with our findings and our experiences in the workshops (Kruse-Weber, 2018). Collaborative exchange among colleagues would have a great potential to drive learning and teaching in music (high) schools, which also benefits professional satisfaction. Finally, the findings of music pedagogical theory find their way into practice more easily, and vice versa, when experiential knowledge of practitioners is incorporated into music pedagogical theory (Kruse-Weber, 2018).

4.3.2. Facilitating empowerment

Verhulst and Boks (2014) emphasize empowerment as a major aspect of giving authority to a learning group; this includes power, decision-making, responsibility, and strengthening self-determination, creativity and autonomy as well as fostering (educational) knowledge and skills. Growth and motivation are supported when the leader shows engagement and provides clear accountability towards others who will be affected by change (Adams, 2003; Carbone et al., 2019).

Many participants initially contributed to group discussions with a focus squarely on practical elements of their teaching approach, and often a firm declaration of their teaching philosophy. Researchers note this is not uncommon, particularly among early career music teachers, whereas experienced music teachers may increasingly consider other factors important, like their overall impact on those they teach and their contribution to the profession (Baker, 2005). As workshops went on however, participants encountered different tools and discussions involving not only different views, but considerations for outsiders' perspectives, both colleagues and others.

4.3.3. Developing resilience and expanding inclusion

As Westerlund et al. (2019) describes, the music school developed some pathways to transformation and inclusivity in their school through the power of music. For instance, the group was expanding traditional conceptions of music therapy and music education. Westerlund spoke of these complimentary fields:

> (…)on the one hand, by setting goal-oriented music learning at the heart of music therapy, and, on the other hand, by using the expert knowledge of music therapists to make music pedagogy more inclusive and accessible (Westerlund et al., 2019, p. 21).

It is important to note that the group emphasized that *everybody* should have access to the music school—free-of-charge possibilities should be possible. In line with this, the music school presented itself with "open doors" for all people throughout the city.

5. Implications and conclusion

Conway (2008) points out the desideratum of research in professional development activities and success from (instrumental music) teachers. Therefore, this study provides only one contribution regarding professional development. We note that we did not yet have the possibility to reflect and discuss the experiences of the participants after the project. The subjective impact for each participant is yet unclear. Nevertheless, as teacher training programs mostly consist of complex components it is often not feasible to identify single features responsible for the effectiveness of a positively evaluated training program (Lipowsky and Rzejak, 2015). In further analysis we should follow the development from each stakeholder in the project. Future studies should aim to understand and sensitize for the four steps involving teaching video feedback, as our participants did not share their own videos.

Some qualifications should be mentioned. Had researchers not participated in the workshops the data could perhaps have differed, however participation roles contributed to rapport. While the project spanned a lengthy amount of time—nearly 2 years—we considered this a study strength because all data were painstakingly documented and reviewed, and time existed to reflect on data analysis.

Implications of this study indicate necessary conditions for meaningful collaboration toward instrumental teacher professional development. These include significant time and continuity over time in order for members to negotiate a group identity, along with a sense of trust and safety. Like the participants in this study, it appears important to build a sense of shared identity with collaborators as well as to contextualize one's work within a broader profession of music teaching, including other music teachers, other places, languages, cultures, and regions, as well as toward university programs with which it works. Facilitators should provide tools for thinking and re-thinking pedagogical approaches, while providing ample space for expressions of participants' own meanings, realizations, misunderstandings, questions, and discussions (including disagreements). Trust is essential for such meaning-making, and facilitators can do much to enable it by making space to talk, eye contact, nodding, and other expressions and gestures of interest and engagement. Tools can provide principles for considering new perspectives in safe ways. In this study, diverse perspectives were welcome and necessary. *Videography* served to build holistic thinking while sensitizing perception and consequences of describing, interpreting, and judging video-recorded lessons. Increasing prominence of digital content necessitates these considerations for teachers. Virtual workshops may necessitate different considerations to foster a community of practice than hybrid or in-person. Ethical considerations for video use are relevant to additional fields that use video-recordings as a didactic resource. Notably, this applies in general teachers' education, as pedagogical considerations are central, but concerns of sound quality and artistic interactions are likely lessened (Bucura and Kruse-Weber, 2021).

Similarly, it is important to recognize that video recordings offer the possibility to overcome longstanding theory-to-praxis problems that teachers face (Bucura and Kruse-Weber, 2021). We challenged group members to consider the necessity of conscious distinction between observation, interpretation and evaluation of video-recorded instrumental/vocal lessons (Rosenberg, 2016). While collaboratively reflecting videos, perception and language were refined. Participants' perspectives were also taken into account about ambiguity, complexity and diversity in interpretation of their digital content (Bucura and Kruse-Weber, 2021).

We recognize that feedback is a powerful influence on learning and achievement, whether positive or negative (Hattie and Timperley, 2007). Wilkens and Shin (2010) state that peer feedback promotes dialog,

encouraging (learners) to see others' teaching and learning approaches. This can help verbalize one's own experiences and identify unconscious knowledge, to question and reflect on behaviors and attitudes in music lessons, and to critically examine alternative or innovative ways of thinking and acting. Further considerations for the implementation of ethical principles may emerge with the use of intentional processes, such as a community of practice (Lave and Wenger, 1991). It is a collaborative endeavor, upholding group norms, which ideally facilitates the presence and expression of diverse perspectives as the group works together toward a particular goal.

Further studies should investigate the long-term implications from the workshops. What did the participants change, add, adapt or develop in their teaching and learning personally and as an institution? How did they continue to question their attitudes, values and behavior? Researchers should investigate the extent to which CPD might be compulsory or voluntary and whether it might be effective to include all colleagues in professional development programs or simply individual teachers. In line with Lipowsky and Rzejak (2015) we assume that teachers' voluntary participation initially might be "more motivated and satisfied. However, there is (still) no evidence that optional participation leads to greater change in teachers' professional knowledge or instructional quality" (p. 42).

According to Westerlund et al. (2019), we propose being proactive in developing coherent visions for CPD and music education in a sense of societal responsibility, which ought to be created by the music schools themselves, rather than imposed top-down by policy makers and politicians (Westerlund et al., 2019). Music schools should provide "experimental spaces," and time and facilitation for processes of CPD such as this one. In experimental spaces music schools ought to explore and develop new practices in instrumental/vocal teaching and learning music, "in fulfilling their societal responsibility and promise as game changers" (Gaunt and Westerlund, 2022, xiii).

Data availability statement

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

Ethics statement

The requirement of ethical approval was waived by Ethics in Research Advisory Committee at the University of Music and Performing Arts (KUG) for the studies involving humans because after reviewing the projects goals, people, and processes involved, and verifying with the first author, the advisory ethics committee determined that an official review was not necessary for the following reasons: there were no people under the age of 18 involved; all participants freely signed the approved Consent to the Experiment form explaining the use and protection of personal data, and the right withdraw; all consent forms and personal data are stored in a password-protected database accessible only to designated people working on the project. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

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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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.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.1096188/full#supplementary-material

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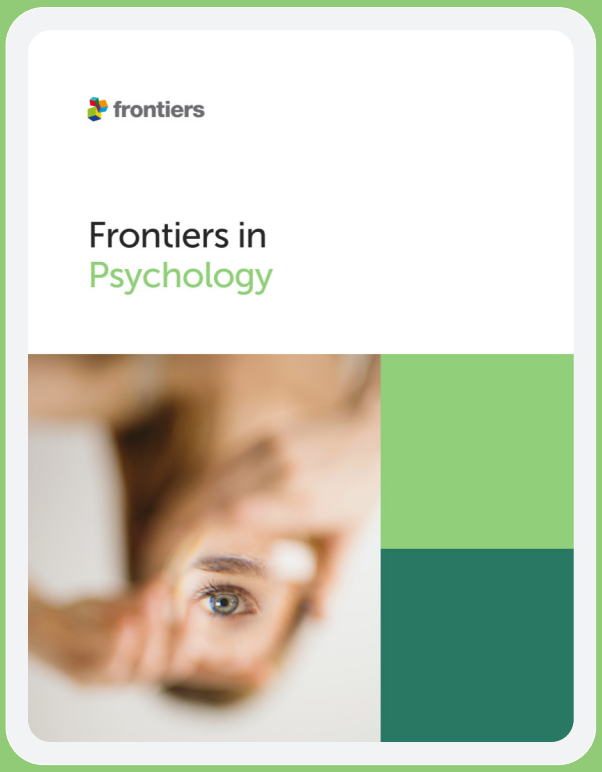

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