

Empathy in group musical performance: A review of the literature

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Abstract

Empathy plays a fundamental role in the prosocial development of young people today as an essential skill for interacting with other human beings. Music, particularly in a small group set up, offers a fitting context for its development. This article presents a review of the different studies and investigations that examine the effects that the development of empathic capacity can produce in small group instrumental practice, the capacity of empathy to induce modifications in the final result of a small group musical interpretation, and empathy and its relationship with small group musical interpretation from the field of education. The aim of this article is to review and analyse literature on how empathy is researched in the context of small group (between 2 and 10 individuals) music performance in order to enquire if the empathic ability constitutes a basic and decisive foundation in the development of multiple actions executed jointly with other individuals. For that purpose, different aspects are analysed: (1) definition of empathy and how it is measured; (2) the instruments used for its measurement; (3) the characteristics of the participants in the studies and their level of music experience; and (4) the type of activities undertaken. The analysis of the results indicates that defining empathy in this context is an ongoing process, and the concept is measured by standardised and ad hoc tests. It also shows that the type of studies and activities are related to the discipline in which they are carried out. Notably, there is a lack of studies regarding the field of study and the age and the level of musical experience of the performers.

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KEYWORDS

empathy, literature review, music education, musical performance

Context and implications**Rationale for this study**

Empathy is considered a fundamental social ability to communicate. This review aims to analyse how empathy is researched in the context of a small music group set up in order to explore the state of empathy in group music performance and its benefits of developing social and emotional abilities in music students.

Why the new findings matter

This review provides details of research that reports the benefits of promoting empathy in a small music group set up and presents evidence that there are no standard ways of researching empathy in this sphere.

Implications for researchers and music educators

The emerging findings of this review affirm that promoting empathy in the context of a small music group set up affects students' social and emotional abilities. However, there is still no consensus of a standardised way to research empathy. The implications extend to researchers, who need to do more investigations on empathy not only in the sphere of music performance or music education but also in other spheres in order to narrow a way of standardising methods to research empathy. Moreover, this review is a call for all music educators, to implement and develop empathy through their daily educational strategies.

The concept of empathy, commonly defined as 'putting yourself in somebody else's shoes', is a complex concept, and for this reason, its definition has evolved over time to attain the general meaning it holds today. Nowadays, scholars from different fields of study seem to agree on two perspectives regarding the variables of empathy: the cognitive perspective and the affective perspective (Babiloni et al., 2017; Iacoboni, 2009; McPherson et al., 2012). The cognitive perspective involves the imagining and understanding of what another person is feeling by taking their perspective—the so-called 'cognitive empathy'. The affective perspective, by contrast, shares the emotional experience of the other person through an 'emotional contagion'—that is, feeling what the other person is experiencing. Given the complexity of the concept, the articles reviewed in this study offered various insights into the definition of empathy, which are provided in the later sections.

In recent decades, research on empathy has acquired notable importance, especially since the publication of Daniel Goleman's 'Emotional Intelligence'. Goleman (1995) considered empathy to be one of the pillars of his theory and a key concept for people's emotional development. Soon after, in the field of neuroscience, the Italian Rizzolatti (Gallese et al., 1996) broadened the literature on empathy with a different focus when discovering, together with his team, so-called mirror neurons. His research, carried out on macaque monkeys, confirmed that a group of neurons were activated when the animal performed

certain concrete actions but also when it observed other individuals (monkeys or people) repeating the same action.

This discovery suggests that through social interactions such as imitation, certain neuronal activities in a specific brain area respond to performed and perceived actions. This fact is linked to the understanding of empathy by Iacoboni (2009), who suggested that the act of empathising is similar to the act of mimicry, since in both scenarios, an individual adopts (imitates) others' perspective (actions, intentions) in order to interact socially. Baird et al.'s (2011) review reinforced the idea that mirror neuron systems are widely involved in empathy, although the authors remarked on the limited considerations of its forms due to the different opinions and classifications on empathy and the different forms of imitation. Bangert et al. (2006) showed evidence of imitation in the field of music listening when professional pianists listen to the sound of piano music. Their brains showed more neural activity than the control group of non-musicians.

Research on perceptual–motor coordination has demonstrated that individuals often naturally synchronise and coordinate their limb and body movements with periodic environmental events via visual, haptic or auditory information (Washburn et al., 2019). Keller (2008) provided another example of behaviour in a group environment, suggesting that a group interactive behaviour is supported by three fundamental skills: anticipation, the perception of self and other behaviour in relation to the joint goal and adaptation. This suggests that a perception of a given behaviour in another individual activates one's own representations of that behaviour and further helps one to form similar feelings and thoughts of others (Knoblich & Flach, 2003).

The perception and execution of actions are associated with the neurophysiological bases for empathy (Gujing et al., 2019). Although recent studies have facilitated empirical evidence of correlations between parts of the human brain and the empathic ability of an individual, there is still much more to learn about what specific regions of the brain are related to sensorimotor processes and empathy. Several studies, such as Babiloni et al. (2012) and Greco et al. (2018), investigated the alpha desynchronisation of the frontal Brodmann areas BA 44/45 and the empathic ability of individuals, whereas Gujing et al. (2019) focused on correlating the insula with empathic ability. In these studies, empathy seemed to be positively related to the neuronal activity of these parts of the brain.

Starting from the premise of considering empathy as a social skill, numerous studies have revealed that it plays a fundamental role in the interaction between human beings. Many authors have shown how empathy can improve people's social skills, both at an early age and with adults, along with the influence it exerts over processes of learning (Cross et al., 2012; Goleman, 1995; Iacoboni, 2009). Others, such as Robinson (2017), explain that empathy, as well as the ability to affect the social ability of human beings, also influences individuals' emotional states, affirming that empathy has a direct effect on the behaviour of human beings.

Peters (2015) touched on this affirmation in his observation of the many powers that can be attributed to music, highlighting its capacity to affect the emotional state and behaviour of human beings. One historical antecedent that indicates that music has this inherent power is the doctrine of affections of the Baroque period, the tireless search for rhetorical tools for the expression of affections in music (Páez Martínez, 2016). By approaching music from this perspective, we can find a link and draw a connection between empathic ability and music in the capacity of both to play on emotions. This link suggests that both worlds share a particular function in the development of communication between human beings.

Justin and Västfjäll (2008) underscored the power that music has in influencing people's emotions and social behaviour by presenting a theoretical framework of the mechanisms through which music listening may induce emotions. In a subsequent study, Justin et al. (2008) explored emotions to music in relation to several factors in the listener, the music, and the situation using the experience sampling method, concluding that the music affects the listener's emotional behaviour through mechanisms that are not unique to music. These results were reaffirmed by Clarke et al. (2015), who demonstrated that listening to

the music of an unfamiliar culture can change the cultural attitudes of listeners with high empathic ability.

Considering this connection between music and emotions, the context of music education provides a fitting space for the study, promotion and development of social and emotional learning. In a school context, Ansari and Rizvi (2023) underline the existence of school-based interventions developing social capabilities. Jeremić et al. (2015) investigated the effects of music on the socio-emotional competencies of pupils in infant education, using a learning method for vocal performance based on learning songs by ear. The results showed that the participants of the experimental group achieved a significant increase in socio-emotional skills in comparison with the control group. Recently, Bolden et al. (2021), in their review about the worldwide renowned 'El Sistema' music education programmes, emphasise the potential of these programmes for positively impacting students' social-emotional development.

The increasing interest in investigating empathy within different fields of research, as presented in the literature above, has led us to conduct and present a review of the literature that proposes a selective approach to the research, within the musical sphere, concerning whether there are mutual influences between small group (between 2 and 10 individuals) musical activity and the empathic capacity of its members. The aim of this article is to conduct a literature review on the research on empathy in the context of small group music performance. The review intends to respond to the following research questions:

RQ1: Does the empathetic ability constitutes a basic factor in the development of multiple actions executed when performing jointly with other individuals?

RQ2: How is 'empathy' defined in the different studies?

RQ3: How is 'empathy' researched in studies on music making?

RQ4: What are the main instruments to measure the empathetic development when making music?

RQ5: What are the principal characteristics of participants in research on music performance and empathy (age, gender, which musical instruments are played and level of musical experience).

RQ6: What kind of musical activities are undertaken in studies researching music and empathy?

These analyses may expose current gaps in the literature and provide insights into exploring future research scenarios to address these gaps. We also consider the option that group music practice may be a fitting scenario to promote development, mutual and bidirectional knowledge among the social skills of its members and their different musical perspectives. Thus, this review offers an instrument to enable an approach to this research, as we elucidate the potential connection between the empathic capacity of the members of a small music group and the performative quality of the group.

METHODS

The following review began with a systematic search of three databases that have great scientific renown internationally in the field of education: *Web of Science* (WoS), *Scopus-Elsevier* (SCOPUS) and *Education Resources Information Center* (ERIC). As a first step, we carried out a search of articles whose title, keywords or summary included the terms *empathy* and *music*, connected through the Boolean operator "and". Subsequently, with the aim of eliminating any items related to this terminology but not fitting the purpose of this study, we applied the following criteria for inclusion or exclusion:

1. We specified the languages of the publications, choosing only those edited in English and Spanish.
2. Following the criteria of efficiency and relevance, we used the 'type of document' filter to limit the search to articles, books and book chapters.
3. The results were filtered according to 'area of knowledge' to remove any research that dealt with concepts related to the search but from other perspectives.
4. We included articles that evaluated empathy using methods of empathic ability, excluding those that evaluated other social skills.
5. We excluded articles that approached music from a therapeutic perspective within the sphere of music therapy.

By applying the above criteria, the results obtained were greatly reduced. We then applied the so-called 'snowball' strategy, which consists of analysing additional studies identified through references in the sources of the initial search.

RESULTS

Despite the diversity of the fields of investigation that this subject brings together, the existing bibliography that fits these parameters is scarce. Given the interdisciplinary character of the material gathered for this review, it is acceptable to find articles that may be contained in more than one section. To structure the review in a reasonable way, we have divided the studies into three sections: (1) empathy and group musical performance in the sphere of neuroscience; (2) reflections of the performers themselves on their empathic relation in the context of joint musical performance; and (3) the development of empathic ability in music education. In each section, a table is displayed with relevant information of each article included in the review, showing different variables across studies in how empathy is defined and measured, type of study undertaken, participant's characteristics, and their levels of musical experience.

Empathy and group musical performance in the sphere of neuroscience

Music and its capacity to affect the behaviour of the human brain are, today, so broad a research field that the study has taken on multiple disciplines. In this first section, we will focus on neuroscience, dealing with a discipline that, applied to education, seeks to integrate neuroscientific knowledge about how the brain works and learns in the educational sphere. In the field of social skills, neuroscience has seen a growing interest in the phenomenon of empathy in recent times.

Music provides a suitable framework for studying cerebral synchronisation among two or more subjects (Acquadro et al., 2016). As observed in other areas, such as sport, when an activity is performed by various individuals, they have to attain a degree of mutual understanding that allows them to reach a common objective for which their brains interact and, in some way, align (Omigie, 2016). This is further supported by Astolfi et al.'s (2011) findings in their study of a pilot and a co-pilot flying a plane. In that high-risk, maximum-responsibility situation, the pilots showed high signs of cerebral connectivity in the front part of their respective brains, especially during take-off and landing. Today, it is possible to realise this type of study in a more rigorous manner, given the technological advances made in recent years and, especially, due to the possibility of using a technique called hyperscanning (EEG), which enables the measuring of cerebral activity in two more subjects simultaneously. Various studies have linked the sphere of neuroscience with that of group

musical performances. For example, Sanger et al. (2012) conducted an experiment using this technique, in which two guitarists played a near-identical melody at the same time. The results indicated that a clear correlation existed between the two performers' interpersonal coordination and their brain frequencies. Muller et al. (2013) went beyond using the hyperscanning technique to analyse the brain functions of two guitarists who improvised for 2 min at the same time. The results showed an increase in low-frequency cerebral connectivity between the performers, which could indicate the existence of mechanisms that allow people to interact in a coordinated way when doing temporary tasks together.

Despite the interest roused by research in this field, when we looked for a more specific correlation between the cerebral connections and empathic ability of performers, we observed a clear scarcity in the literature (see Table 1).

Babiloni et al. (2011) presented a proposal based on the use of a methodological focus that allows for, on the one hand, the obtaining of data online by registering certain cortical responses characteristic of sensory-motor and emotional processes, where empathy is included, and on the other hand, the synchronic simultaneous recording of high-quality EEG data from various subjects. The study was carried out, in this case, on a quartet of professional saxophonists who performed the same piece of music all together. In a subsequent study, Babiloni et al. (2012), focusing more on empathy, investigated whether specific parts of the brain are involved in performers' empathic capacities. In both studies, empathy was assessed with the aim of simultaneously gauging the potential value of the online data gathering of certain parts of the brain from various individuals. The results showed a relationship between motor performance and the empathy quotient through the overall amount of alpha desynchronisation (cortical activation) in the brains of musicians during their musical performances.

Greco et al. (2018) offered new findings in the same direction from their EEG analysis of a quartet of saxophonists who simultaneously observed their own performances in a concert. They aimed to understand the properties of the neural connectivity between the members of the quartet, and the results showed differences in the connectivity between the members of the quartet: the alto, baritone, and tenor saxophonists showed significantly greater connectivity with the soprano, who was the lead voice of the group, thus corroborating the existence of a leader and their leadership during performances in music groups. However, we should highlight that the findings did not find correlations between musical performance and the empathic level of the quartet.

Gujing et al. (2019) supported these findings with their study on the fundamental neural mechanisms shared in the insular cortex using students of music and dance. Across an academic year, 21 dance students and 24 music students were evaluated as they performed various tasks. On the one hand, the dancers were evaluated on three tasks: (1) flexibility, (2) imitation and (3) improvised dance. On the other hand, the musicians were evaluated on two tasks: (1) performance of a selected piece of music and (2) a sight-reading test. The results were compared with the functional magnetic resonance imaging (rs-fMRI) of 24 healthy students used as a control group. In the groups comprised of the dancers and musicians who had performed the tasks described, their insular connectivity appeared much stronger than among the participants of the control group. However, while these results bolster the view that sensory-motor and emotional processes are activated in certain parts of the brain in the moment of carrying out an action together, such as performing a piece of music with two or more individuals, the results provide no illumination of whether the empathic ability of the performers affects the configuration of these neural connections.

One way of focusing research on the function that empathy can play in cerebral connections during a musical performance is to deliberately alter the performance to create a context of high uncertainty in which the sensory-motor ability of the performers is more decisive. Huberth et al. (2019) achieved this by determining how the expectations of the outcome and

TABLE 1 Neuroscience article's relevant information.

	Definition of empathy	How empathy is measured	Type of study	Type of activities undertaken in the study	Participants	Level of musical experience
Babiloni et al. (2011)	Emotional and cognitive empathy	Empathy Quotient Test (EQT)	Experimental study	Music group performance recording and its observation	3 saxophone quartets (12 men)	Highly international credentials
Babiloni et al. (2012)	Emotional and cognitive empathy	Empathy Quotient Test (EQT)	Experimental study	Music group performance recording and its observation	A quartet of saxophones (4 men)	Highly international credentials
Greco et al. (2018)	Does not specify	Empathy Quotient Test (EQT)	Experimental study	Music group performance recording and its observation	A quartet of saxophones (4 men)	Highly international recognition
Gujing et al. (2019)	Does not specify	Chinese version of the Interpersonal Reactivity Index (C-IRI)	Cross-sectional experiment	Music group performance recording and its observation	24 dancers and 23 musicians. College students majoring in modern dance and Western string	Students (college level)
Huberth et al. (2019)	Does not specify	Empathy Quotient Test (EQT)	Experimental study	Music duet performance recording and its observation	24 pianists (12 pairs)	13.7 years of musical experience
Washburn et al. (2019)	Does not specify	40-question Cambridge Empathy Scale or Empathy Quotient (EQ)	Experimental study	Music group performance recording and its observation	24 pianists	Students: Stanford University

empathy interact during a piano duet. The pianists memorised and performed pieces that contained a sequence that was either similar or different to that of their partner, playing alternative sequences of six notes. During the performances, the tone of a note was changed in the score of each performer in order to provoke a feeling of negativity (a mistake) and to give the chance to observe the reaction of each of them towards both their own mistake and that of their colleague. The cerebral activity of the performers was registered using an electroencephalogram (EEG), and their empathy was measured using the empathy quotient (EQ). The results of this work revealed no significant correlations between their empathy scores and the extent of the musicians' negativity in response to their colleagues' errors. However, a positive and highly significant correlation was found between the empathy score and the extent of their negativity in response to their own errors. Moreover, the results revealed that people with greater empathy are capable of processing changes with more calmness and less anxiety.

Washburn et al. (2019) provided more evidence in this respect by studying communication between performers of a duet, evaluating patterns of behavioural and neural activity in asymmetrical conditions among the performers, and evaluating the empathic ability of each performer by introducing three different irregularities to a task. The results showed a pertinent correlation between the instability caused by a lack of synchrony and the empathic ability of the performers, thus suggesting that if a person has a high degree of empathy, the capacity to put themselves in another's place comes more naturally. The results also converge on the fact that deliberately amending a musical performance emphasises the possible relationship between empathy and the musicians' ability to interact during the performance.

Regarding how the literature in this section defines empathy, most of the articles did not offer a definition of empathy, and only two of them defined the term, differentiating between cognitive and affective empathy. However, there is more uniformity when evaluating empathy using the Empathy Quotient Test (EQT). Other measures used are the Interpersonal Reactivity Index (IRI) and the Empathy Quotient (EQ). The type of study used in all these studies is experimental in nature, and all of them collected data using the hyperscanning (EEG) technique. Lastly, the participants used in these studies were all adults: professional musicians or college seniors.

Summarising, the literature presented in this section evidence the activation of brain areas related to the ability of socio-communicative ability of musicians while performing a joint musical performance. However, few investigations show negative results on the correlation of empathic ability of the members of a music group while playing together and its cerebral activations.

Reflections of the performers on their empathic relationship in the context of the joint musical performance

This second part of the reviewed studies focuses on the analysis and understanding of the behaviour of mental processes experienced by musicians and music groups during the learning, preparation and performance of group music pieces. In this process, it is natural and necessary for performers to show a reflective approach, constantly evaluating themselves and reviewing their performance—both their own and that of the whole group. The performers offered their opinions on what they rehearsed and brought their ideas, communicating them to their fellow members with the shared objective of improving performance and obtaining the best results possible. In this context, empathy can be a decisive factor (see [Table 2](#)).

TABLE 2 Reflective article's relevant information.

	Definition of empathy	How empathy is measured	Type of study	Type of activities undertaken in the study	Participants (age)	Level of musical experience
Cho (2019)	'Empathy is a multifaceted construct, involving three specific dimensions: affective sharing, or "the capacity to share or become affectively aroused by others' emotional valence and relative intensity without confusion between self and other" empathic concern, or "the motivation to caring for another's welfare"; and perspective taking or the cognitive aspect of empathy' (p. 2).	The Empathy Quotient (EQ)	Survey study	Responding Questionnaires	165 students	Undergraduate music performance majors in their senior year in 4-year music colleges/universities in the United States
Haddon and Hutchinson (2015)	'Empathy can be evidenced in various ways. Cognitive empathy, involving "the ability to engage in the cognitive process of adopting another's psychological point of view," may include verbal empathy, created through "the affective sharing of self" and maintaining self-identity while adopting the other's perspective' (p. 141).	Reflective writing	Study case	Rehearse and perform a piano duet while writing a descriptive and a reflective diary of the process	Two pianist researchers	Piano professors
Waddington (2017) ¹	'Empathy research now spans many disciplines in the arts, humanities and sciences, and each discipline has its own definition, or definitions, of empathy. In addition, the concept of empathy seems to overlap with other similar and related concepts, such as sympathy and emotional contagion. There are now many conflicting and overlapping definitions of all three concepts' (p. 230).	Self-report measure	Focus group study	Recording and questionnaire: questions were based, on existing studies on empathy in performance (Myers & White, 2012), peak performance (Privette, 1981) and SEM (Gabrielsson, 2001).	19 (10 males, 9 females) of a mean age of 43: a wind quintet, a vocal duo, a contemporary woodwind trio, a mixed piano trio, and a string quartet.	Professional and semi-professional musicians

(Continues)

TABLE 2 (Continued)

Definition of empathy	How empathy is measured	Type of study	Type of activities undertaken in the study	Participants (age)	Level of musical experience
Waddington (2017) ² 'Empathy research now spans many disciplines in the arts, humanities and sciences, and each discipline has its own definition, or definitions, of empathy. In addition, the concept of empathy seems to overlap with other similar and related concepts, such as sympathy and emotional contagion. There are now many conflicting and overlapping definitions of all three concepts' (p. 230).	Self-report measure	Observational study	Recording: a code-specific video recall method was used in which participants were asked to identify and comment on three different kinds of moment in the video recordings	19 (10 males, 9 females) of a mean age of 43; a wind quintet, a vocal duo, a contemporary woodwind trio, a mixed piano trio, and a string quartet.	Professional and semi-professional musicians
Waddington (2017) ³ 'Empathy research now spans many disciplines in the arts, humanities and sciences, and each discipline has its own definition, or definitions, of empathy. In addition, the concept of empathy seems to overlap with other similar and related concepts, such as sympathy and emotional contagion. There are now many conflicting and overlapping definitions of all three concepts' (p. 230).	Self-report measure	Observational study	Observational study: code-specific video recall to identify moments of self-reported empathy	2 professional violinist	Professional musicians

Note: The meaning of the superscript numbers is that this specific reference, Waddington (2017), presents 3 different studies that are analyzed separately. Abbreviation: SEM; strong experiences with music.

Cho's study (2019) investigated the existing link between musicians' experiences with their respective groups and their empathic abilities. Information was gathered about each member of a group of university music students: their individual histories, participation, communication, and the behaviour they adopted within the group. The results demonstrated an important link between the personal traits of each performer, their empathic ability and, curiously, the area of study to which they belonged—for example, classical music, pop music or jazz. It also revealed that students who began learning music before the age of five showed higher levels of empathy than those who had begun later. These results concur with McDonald and Messinger's (2011) study on the development of empathy, corroborating that at the age of five, there is an acceleration in the development of children's cognitive empathy.

Haddon and Hutchinson (2015) gathered data on the role or function of empathy during rehearsals by a piano duo. A reflective diary written by the performers offered a detailed view of the entire learning process and its evolution. The results of their reflections showed that on certain occasions, the performers found themselves in what they described in the diary as a 'safe space' in which they would constantly try to understand their colleague's musical suggestion/proposal for a performance, producing a cyclical process in which both performers simultaneously expressed their own musical ideas, responding to those of their partner through the performance itself, facial gestures or subsequent written communication.

Waddington (2017) followed a similar line of research to explore the reflections of the members of expert groups on chamber music through three studies that deeply investigated the concept of 'peak performance'—that is, the optimal experience of performing music in a group—and the possible correlation with the empathic ability of their co-performers. The first study examined how the musicians themselves who belong to the groups described their experiences of working and performing together, emphasising their best experiences of performing and empathy with their fellow performers. The second study proceeded to record a string-quartet performance in order to gather, individually, the opinions of the participants with respect to the best experiences of playing in that performance and then link them to the empathic ability of each performer. In the final study with a violin duo, beyond describing the best experiences of performing, the performers reflected on the two types of reactions—expected and unexpected—which occurred during their performance and their possible relation to each performer's empathic ability. According to the results of this research, the performers' musical experiences revealed that empathy with a fellow performer consists of three main components: (1) a shared focus on the performance and work together; (2) an intentional awareness of how the other members are working, both on the theory side and the practical side; and (3) a reciprocal complicity among the performers, which facilitates a greater capacity for reacting to what happens during a shared music performance. Moreover, it was found that empathy for a fellow performer can lead a group to achieve spontaneous performative flexibility while playing.

Regarding how the studies in this section define empathy, all are aware of its complexity. It should be noted that Waddington (2017) posited that due to its complexity today, the definition of empathy depends on the field in which it is studied. Other studies have defined empathy according to different dimensions, such as affective and cognitive. Regarding the measures of empathy, all but one that used Empathy Quotient, used ad hoc measures. Lastly, three types of activities were undertaken in the studies reviewed in this section—observational, reflective diary and questionnaire. The participants were professional or semi-professional musicians and college seniors.

Summing up, during the different investigations presented above, the empathy has been displayed as a component that has a positive influence on the progress of studying and performing a joint musical piece, suggesting a possible correlation between the empathic ability of the performers and their joint performing capacities.

Developing empathic abilities in music education

The existing literature in this section, for the most part, evaluates empathy in an indirect, generic way as simply a part of a wider group of emotional competencies. For example, Campayo-Muñoz et al. (2020) explored through three case studies the possible link between the emotional abilities and music performance of three piano students in a conservatory. The results of their studies showed that their learning of the instrument produced a slight improvement in connecting their emotional skills through instrumental education. However, there are studies that examine empathic ability and the potential influence of carrying out musical group activities on it (see Table 3).

Kalliopuska and Ruókonen (1986, 1993) and Kalliopuska and Tiitinen (1991), performed a series of studies that assessed empathy and its development in group musical activities using test groups and control groups. They carried out sessions based on musical activities, such as singing, playing instruments, listening to music and painting. The results of the studies indicated a higher average score for empathy among the trained group than among the control group.

More recently, Rabinowitch et al. (2013) carried out a group music activity that focused on the interaction between participants and the development of their empathic abilities. The activities programme, titled Musical Group Intervention (MGI), was undertaken across a full school year and involved a 1-h class delivered every week for 9 months. A total of 52 children aged between 8 and 11 years took part, with test and control groups set up. The participants carried out different musical tasks in the form of prearranged musical games. As with Mirja Kalliopuska and Inkeri Ruókonen, the results of the study showed that the youngsters who participated in the MGI obtained higher scores for emotional empathy after the activity than they had at the start, and their scores were higher than those of the control group at the end of the study. These findings suggest, on the one hand, that through group musical activities that promote interaction between the participants, it is possible to develop children's empathic abilities. On the other hand, the fuller and more prolonged the period in which the activities unfold, the greater the progress of those taking part regarding the empathic abilities acquired.

Finally, Novembre et al. (2019) studied empathy and prosociality. They correlated taking an empathic perspective with interpersonal coordination and analysed how this happens in a combined activity of creating music on a computer in pairs. The results confirmed a close and bidirectional link between coordinated behaviour and social cognition. Taking an empathic perspective was found to be sufficient for improving a person's accuracy in interpersonal co-ordination by specifically improving their accuracy in predicting the behaviour of others without affecting their aptitude for co-operation. Consequently, this study closely links empathy with the ability to communicate in a joint musical activity, suggesting that this capacity is based on a sensory-motor mechanism responsible for simulating the actions of others in advance. This creates behavioural advantages that can affect social cognition in general.

In the studies in this section, the definition of empathy is understood on the one hand as holistic, encompassing four dimensions—physiological, kinaesthetic, affective and cognitive—and on the other hand, as the ability to share and respond to emotional experiences. However, they all differed in their evaluation of empathy, with none repeating the others' measures. This suggests an evolution of the same measure. Regarding the type of activities undertaken in the study, all of the studies also differed but were case studies. The participants of most of the studies, except Novembre et al. (2019), were young people between the ages of 6 and 11, and in all the studies, they hardly had any musical knowledge.

TABLE 3 Empathy in music education article's relevant information.

	Definition of empathy	How empathy is measured	Type of study undertaken	Type of activities undertaken in the study	Participants	Level of musical experience
Kalliopuska and Ruokonen (1986)	'Empathy is considered to be a holistic process of the human organism, in which the physiological and kinaesthetic aspects and the cognitive and affective aspects of the reactions of the human organism can be separated' (p. 187).	Feshbach and Roe Empathy Scale	Study case	Musical programme for development of empathy was done	30 day-care centre children participated	None
Kalliopuska and Tiitinen (1991)	'Empathy is considered to be a holistic process of the human organism, in which the physiological and kinaesthetic aspects and the cognitive and affective aspects of the reactions of the human organism can be separated' (p. 323).	Feshbach and Roe empathy slide series	Study case	The empathy programme, which included activities such as music, physical exercise, and drawing, role-playing, acting and stories	62 preschool age children (26 girls and 36 boys) 6 and 7 years old	None
Kalliopuska and Ruokonen (1993)	'Empathy may be assumed to be a holistic process in which various components (affective, cognitive, kinaesthetic, and physiological) can be differentiated. The process of empathy reflects several dimensions, as empathy may function on both physiological and kinaesthetic levels as well as on cognitive and affective levels simultaneously' (p. 131).	Feshbach and Roe Empathy Test	Study case	Holistic Empathy Education Program with Music: the programme consisted of singing, playing instruments, listening to music, music exercise, music painting, dramatising music fairy tales, and discussing with the children the feelings and the situations they had just experienced.	32 children at a day-care centre	None
Rabinowitch et al. (2013)	'It is noteworthy that understanding the emotional state of the other is a hallmark of empathy, the ability to produce emotional and experiential responses to the situations of others that approximate <i>their</i> responses and experiences, as well as an awareness and identification of their emotions' (p. 485).	Empathy was evaluated using three independent measures: Index of Empathy, a self-report questionnaire, Matched Faces and 'Memory' Task.	Study case	MGI Programme: This is a novel programme in which the children perform various musical tasks in the form of pre-arranged musical games.	Children (28 girls, 24 boys, $M_{age} = 10.3$ years, age range: 8–11 years, $SD = 0.64$ years) from four UK primary schools	None

(Continues)

TABLE 3 (Continued)

	Definition of empathy	How empathy is measured	Type of study undertaken	Type of activities undertaken in the study	Participants	Level of musical experience
Novembre et al. (2019)	'Empathy, which is generally defined as the human capacity to respond to—and share—experiences of others' (p. 2)	Interpersonal Reactivity Index (IRI)	Study case	Joint musical task: pairs of participants rotated electronic music-boxes, producing two streams of musical sounds that were meant to be played synchronously	58 individuals 39 female, age mean± std = 25.64 ± 8.54 years)	None

Summarising, the literature presented in this section show that participating in group music making has a direct relationship with the positive development of the empathic ability of individuals, suggesting that a correlation between joint musical activity and the empathic capacity of those doing it, might exist.

CONCLUSIONS

This review examines the literature that exists on the possible link between empathy and musical performances when music takes place in groups. From each section described above, the literature reveals that from a neuroscientific perspective, the hyperscanning technique, which allows for the simultaneous recording of the cerebral activity of two or more individuals, has made it possible to verify the existence of temporary cerebral connectivity between subjects when carrying out a joint activity. There is a mutual understanding and an implicit connection between the members of a small music group during the execution of a piece of music. Based on the observations of the members of the small music groups themselves, we can deduce that empathy is an element that favours the positive development of studying, preparing and performing a joint musical piece. In the sphere of music education, we can conclude that the different studies that confirm that the empathic ability of the participants improves slightly are those involving educational sessions based on musical activities.

Furthermore, this study has analysed within the included literature how empathy is defined and measured, identified available standardised tests, discussed the characteristics of the participants and their level of music experience, and described the study type and activities undertaken in the investigations.

The results show that the definition of empathy does not have a general consensus. In the neuroscience section, most of the articles do not even mention the concept; however, in the reflective and education sections, deeper thoughts are offered on empathy. Nearly all the studies suggested that when empathising, an individual responds to another's emotional situation by identifying it, understanding it and showing awareness of it. In addition, Haddon and Hutchinson (2015), Cho (2019), Rabinowitch et al. (2013) and Novembre et al. (2019) remarked that when this happens, the individual maintains self-identity while adopting another's perspective. Recent theories include those of Coplan (2011), based on Preston and de Wall's (2002) low-level processes (such as imitation and contagion) and high-level processes (the ones that involve representations). Coplan (2011) defined empathy as a complicated imaginative process in which an observer imitates another person's situated psychological states while maintaining clear self-other differentiation. Lastly, Waddington (2017) suggested that empathy research now extends to many disciplines, and each one has its own definition of empathy. Further, the concept of empathy seems to overlap with other similar and related concepts, such as sympathy and emotional contagion. This reality is understandable in some studies, such as Baron-Cohen (2011), that describe a different approach to empathy, suggesting that empathy is a psychometrically measurable trait manifested in seven grades, starting from the zero grade of empathy of the autistic or psychopath, to the six grades of empathy of 'hyper-empathic' individuals.

An analysis of the few definitions and concepts of empathy revealed a reality: there is much confusion surrounding the definition of empathy. The problem might reside in the deep range of perspectives found when an individual empathises (Clarke et al., 2015). Further research might focus on the conceptualisation of empathy by discipline or by its specific perspectives.

The results of how empathy was measured showed that in all three sections, standardised tests were used, with the most common being the EQ, IRI and EQT. Nevertheless, in the reflective of performers' performance section, four out of five investigations used a

self-report measure. These findings suggest that there are several standardised tests to evaluate empathy. However, since empathy was investigated using different approaches, subjective data, such as reflexive descriptions, were manipulated using ad hoc tests (Haddon & Hutchinson, 2015; Waddington, 2017).

Concerning the type of investigation undertaken, the results showed similarity in the neuroscientific section, since all of them were experimental studies, and in the education section, because all of them were study cases. However, in the reflective category, the study types varied, including surveys, as in Cho's (2019) study and Waddington's (2017) first study, and observational studies, as in Waddington's (2017) second and third studies. Regarding the types of activities undertaken in the studies, in the neuroscientific section and in the section on reflective performers, a recording of a music group performance and its analysis is the activity undertaken in all of the studies. In the education category, all of the studies used a programme ad hoc in which students participated in group musical activities. These results indicate that, typically, the type of study and the specific methods used depend on the discipline in which empathy is investigated.

The outcomes of the participants' characteristics showed that in the neuroscience and reflective performers aspects, the participants were adults and professionals or semi-professional (senior student at college) musicians, and in the education section, all of the participants were children and had no music knowledge. These results show a gap in the literature regarding the field of study, the characteristics of the participants, and their level of musical experience. Thus, studies in the fields of neuroscience and reflective studies with young participants, as well as studies in education with adult participants, would expand the scope of empathy and group musical performance, offering more empirical facts with which to corroborate the possible variables between these fields of investigation.

We conclude that in the field of research that correlates empathy and group music interpretation in the different reviewed disciplines, (1) empathy does not have an exact definition, (2) validated measures have been developed that assess empathy, but the reality is that due to the subjective aspect of empathy, researchers often create their own ad hoc measures, (3) both the type of study and the activities used in this studies are related to the discipline in which they are carried out, and (4) there is a gap in the literature regarding the age of the study.

Finally, throughout this article, it has been reaffirmed that group musical performances may be a fitting scenario for promoting development and mutual and bidirectional knowledge among the social skills of its members. However, there is little evidence that correlates this fact with the musical competences of the members of a joint musical group, which offers an interesting direction for further research in this field.

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CONFLICT OF INTEREST STATEMENT

We declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

ETHICS STATEMENT

Ethics approval was not required for this research.

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