Research in Neurodiversity 1 (2025) 100001

Contents lists available at ScienceDirect

Research in Neurodiversity

journal homepage: www.sciencedirect.com/journal/research-in-neurodiversity

Autism, musicality, and empathy: Through the lens of first-person accounts

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ARTICLE INFO

Keywords:
Autism
Music
Empathy
Emotion
Sociality

ABSTRACT

Over the past two decades, autism research has seen a gradual shift from deficit-focused theories to models informed by the neurodiversity paradigm. Theoretical developments such as the double empathy problem, Monotropism and Autistic Flow Theories offer nuanced, non-pathologizing understandings of autistic cognition, sociality, and engagement. Within this framework, music emerges as a compelling lens through which to examine autistic experience. Empirical studies, based on first-person accounts, have shown how music facilitates emotional regulation, social connection, and personal development among autistic individuals. In highlighting the emotionally rich and socially meaningful dimensions of musical engagement this work challenges simplistic constructs of empathy and sociality in autism.

In 2014, Milton described competing discourses within autism science and the way the views and expertise of autistic people were continuing to have insufficient weight within the field. In the decade since this article was published, there has been a marked shift, with a decline in research that focused on 'deficit' theories of autism and an increase in publications resulting from the work of autistic and neurotypical scholars working within the neurodiversity paradigm (Pellicano & den Houting, 2022). Theoretical models developed in the context of this paradigm have provided new, non-pathologizing accounts of autistic styles of communication (Milton, 2012), interests, and strengths (Murray et al., 2005: Murray, 2018; Heasman et al., 2024). These models have led to a critical appraisal of past autism research (Jones, 2022) and generated important new approaches to autism science.

Within this corpus of work are studies documenting autistic people's accounts of the ways they utilise music in their every lives (Allen et al., 2009; Korosec, Osika & Horwitz, 2022; Matsuno et al., 2020, Auzenne & Chukoski, 2020; Ventner, Morelli & Erasmus, 2023; Kirby & Burland, 2022), and the personal and experiential factors they associate with the emergence of skills and talents within this domain (Bakan, 2018, Heaton, 2025). Music is a pervasive and highly salient aspect of our social world. Indeed, Clark, DeNora and Vuoskoski (2015) have described how music-related activities expose us to musical experiences that are both 'public and private, solitary and social, frenzied and reflective, technological and bodily, conceptual and immediate, calculated and improvised, and instantaneous and timeless'. This suggests that studies documenting how people engage with music provide unique insights into how neurodivergent and neurotypical people experience and navigate their social worlds.

Concepts of music and musicality developed within an ecological framework (Tinbergen, 2005) draw on research from multiple sources. These include, for example, theoretical models linking the emergence of musicality with the evolution of complex social-emotional and empathic traits in our species (e.g. Dissanayake, 2000, 2009; Mehr et al., 2021; Savage et al., 2021). The ontogeny of musicality has been widely investigated, with studies revealing an early 'readiness' for musically mediated social, emotional, cognitive and bodily engagement (Arrasmith, 2019) in human infants. These early musical predispositions are followed by an extended period during which musical development is influenced by maturation, individual differences, and experiences within musically rich cultural niches (Swanwick & Tillman 1986). Research exploring music's current utility (Bateson & Laland, 2013), or how we use it in our everyday lives, has shown that it serves both intra- and interpersonal functions. For example, the importance of music for regulating arousal and mood, and for personal development and well-being, have been emerging themes in studies of neurotypical (Schafer, Selmeier, Stadler & Huron, 2013) and autistic people (e.g. Allen et al., 2009; Korosec, Osika & Boiner-Horwitz, 2022; Ventner, Morelli & Erasmus, 2023; Kirby & Burland, 2021).

The importance of music for connectivity or social-relatedness, reported in studies of autistic and neurotypical people, resonates with evolutionary accounts linking musicality and sociality. Joint music-making has long been associated with increased social-emotional 'alignment' between individuals (Cross, 2009), and specific aspects of musical engagement associated with this effect have been identified in research. For example, Rabinowitch et al. (2013) reported that experiences of entrainment, imitation and flexibility during interactive

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https://doi.org/10.1016/j.rin.2025.100001
Received 28 April 2025; Accepted 1 June 2025
Available online 4 June 2025

musical games promoted social-emotional capacities such as empathy in pre-school children. Similarly, examples of interpersonal relatedness can be found within autistic people's accounts of their musical engagement, such as when singing in harmony with another person (Korosec et al., 2022), and/or from a shared love of a particular musical genre (Allen et al., 2009). Given evolutionary models of musicality and empirical findings linking joint music-making with increases in social-emotional alignment, it is unsurprising that scholars working in this area have long been concerned with understanding the nature of sociality and empathy as fundamental components of musicality.

In their article on music, empathy and cultural understanding, Clark, DeNora and Vuoskoski (2015) outline historical changes in the way empathy has been conceptualised and defined within the arts. They describe a shift away from a concept of empathy that related to aesthetic responses to artworks, to a psychological/philosophical concept that describes a human ability to understand that other people have thoughts, beliefs and feelings. They cite Laurence (2007) who proposed that:

> "In empathizing, we, while retaining fully the sense of our own distinct consciousness, enter actively and imaginatively into others' inner states to understand how they experience their world and how they are feeling, reaching out to what we perceive as similar while accepting difference, and experiencing upon reflection our own resulting feelings, appropriate to our own situation as empathic observer, which may be virtually the same feelings or different but sympathetic to theirs, within a context in which we care to respect and acknowledge their human dignity and our shared humanity".

In this definition, empathy is conceptualised as both a social process and a social achievement. Within psychology, there is no clear consensus about how empathy should be defined (Fletcher-Watson & Bird, 2020), though methods used in empathy research suggest a stable trait-like conceptualisation. Empathy has most commonly been operationalised as a set of components and tested using questionnaire measures (e.g. Baron-Cohen & Wheelwright, 2004). Cognitive and affective components of empathy refer to an ability to recognise another person's mental state and to become attuned to their emotions, whilst a third component refers to an ability to respond to another person's empathy-evoking behaviours.

In 2009, Baron-Cohen proposed a systematising-empathising theory to explain the 'non-social' characteristics (e.g. narrow interests, a need for sameness and attention to detail) included in diagnostic criteria for autism (DSM-IV-TR, 2000) and social-emotional and communication 'deficits' described in his earlier 'mindblindness' account (1995). Within this theory, empathy was defined as "an ability to predict and respond to the behaviour of agents (usually others)" and 'systematising' was defined as "an ability to predict and to respond to the behavior of nonagentive deterministic systems, by analyzing input-operation-output relations and inferring the rules that govern such systems" (Baron-Cohen et al. (2005). The systematising-empathising theory was operationalised in research studies using psychometric measures (Baron-Cohen & Wheelwright, 2004; Baron-Cohen et al., 2003), and a person's 'cognitive style' was determined by the difference between scores on these measures. Within this account 'non-social' behaviours and cognitive strengths in autism were associated with increased systematising skills, whilst social and communication 'deficits' were associated with low empathising skills.

The negative influence of early 'deficit' models on narratives around autistic sociality and empathy are increasingly well understood (Milton, 2014: Bottema-Beutel et al., 2023). Milton's (2012) account of the double-empathy problem challenged concepts of autistic sociality in 'deficit' models, instead describing how social-emotional 'misattunement' between autistic and neurotypical people reflects differences in the way they perceive and experience the world. This results in a lack of understanding in each case by one group of the other group. The Monotropism theory of autism (Murray et al., 2005; Murray, 2018) describes an information-processing style in which attention is intensely focused on a narrow range of interests, and Autistic Flow Theory (Heasman et al., 2024) describes how monotropic focus, autotelic personality traits, and sensory experiences are linked with, and influence, experiences of flow. For some autistic people, experiences of flow are a pervasive aspect of everyday life (Milton, 2017; Rapaport et al., 2023, Claphan, Adams, Lawson, Poryska-Pomsta & Pellicano, 2023) and research has shown that multiple forms of musical engagement elicit experiences of flow (Tan & Sin, 2019). These experiences are rewarding and motivating, and Monotropism and Flow theories suggest new directions for research into musical and other talents in autism (Heaton, 2025).

In addition to theoretical models, the scientific validity of research methods used in past autism research has been brought into question (Jones, 2022). Many or most of the questionnaires used in autism research were developed without input from autistic people, and recent research has shown how autistic difficulties, not included in 'core deficit' models, can influence the way autistic people engage with research. In a study by Stacey and Cage (2023), autistic participants described how anxiety, sensory distractions, feeling overwhelmed, and other difficulties could influence the way they completed questionnaires. A specific problem identified in the study by Stacey and Cage (2023) resulted from the inclusion of "questionable questions" that were vaguely worded and/or lacked context. The authors cited an example previously proposed by Vermeulen (2014) of how an autistic person might strongly disagree with the statement "I am intensely interested in other people" because they are not intensely interested in *all* people. This lack of clarity and context sometimes made it difficult for participants to respond in ways that accurately reflected their beliefs.

Research based on first-person reports has shown that empathic experience in autism is highly diverse. For example, in a study by Kimber et al., 2024), some autistic adults reported that they didn't experience empathy, while others described experiences of empathy in their interactions with people they were close to and/or other autistic people and animals. Some individuals experienced difficulties with 'components' of empathy, describing how the process of picking up on other people's social and emotional cues could be effortful and exhausting. Experiences of hyper-empathy were described by 78 % of participants in the study, and these were sometimes associated with unpleasant or distressing feelings ("I often feel overwhelmed with anger/-grief/happiness on behalf of other people"). In a study by Korosec et al. (2022) that explored the role of music in the well-being of autistic adults, negative musical experience was an emerging theme. Whilst disturbances in sensory processing could negatively influence musical experience, autistic participants also described being overwhelmed by the emotions expressed in some musical compositions ("There were a few times when it was almost too difficult to stay at a concert because I was so moved by the music"). This suggests that hyper-empathic responses, as reported by a high proportion of autistic participants in the Kimber et al., 2024. study, extend to experiences of music.

Cognitive empathy refers to the ability to recognise another person's mental states and some participants in the study by Kimber and colleagues described difficulties in detecting cues signalling emotions in neurotypical people. However, findings from experimental studies have shown that autistic children can detect and categorise emotions expressed in music as well as, or better than, neurotypical children. Although beliefs about what music 'signifies' are likely to show wide individual variation (Cross, 2014), findings have shown agreement about which emotions can be expressed in music. For example, in studies by Kreutz (2000), Lindström et al. (2003) and Juslin and Laukka (2004);), participants agreed that music can express happiness, sadness, anger, fear, love & tenderness. In an experimental study exploring autistic and neurotypical children's categorisation of 'feeling states' (anger, fear, triumph, tenderness and contemplation) and 'movement states' (jumping, walking, gliding, climbing, running) expressed in musical extracts selected by professional orchestral musicians, patterns

and levels of performance did not differ across groups (Heaton et al., 2008, Allen, Williams, Cummins & Happe, 2008). A more recent study by Sivathasan et al. (2023) measured accuracy for the detection of simple emotions expressed on faces, in voices and music in groups of autistic and neurotypical children and reported that autistic children scored higher on the music condition than neurotypical children.

Within the concept of empathy utilised in psychology research,'-attunement' to the emotional states of others and responses to these states are distinct and commonly linked components. Although responses to musically expressed meanings and emotions also involve perception, feelings and action, these are less specified and linked than in person-to-person interactions outside the musical domain. Whilst emotions can be 'expressed' in music (Kreutz, 2000; Lindström et al., 2003; Juslin & Laukka, 2004, Cross (2014) has described a quality of 'floating intentionality' that enables listeners to infer meaning in music in ways that may be intensely personal. A theme that has consistently emerged in neurotypical and autistic people's accounts of how they use music in their everyday lives, is the use of music to modulate mood. Such a strategy reflects an individual's beliefs about and connection with the affective characteristics of the music they engage with.

Although a direct analogy between the different components of empathy and the musical bids and responses that occur during musical interactions is not sustainable, both rely on cognitive, emotional and communicative processes. For example, Sarah, an autistic jazz/funk musician, has described how 'when playing gigs with people I know, we can often play complementary phrases and we direct what each other will play; it all happens in the milliseconds just like day-to-day speech, and it's beautiful, because it is unspoken' (Heaton, 2025, p. 91). Musical improvisation involves creative processes, and Loui (2018) has described processes of *idea generation*, which involves a combining or recombining of musical elements, and *idea evaluation*, that involves an appraisal of ideas motivated by internally or externally generated feedback. Sarah has written, "As an improvising musician, I am constantly working out what to play with respect to the piece itself, what the rest of the band is doing, what the audience wants to hear, etc. And this requires a lot of on-the-spot flexibility and a deep understanding of the underlying musical structures" (Heaton, 2025, p. 89). Greenberg et al. (2015) have suggested that individuals who score high on empathy might focus more on the emotional content of music, whilst those who score high on systematising might focus more on musical components such as rhythm. Sarah has indeed described an interest in complex rhythms. However, she has also described the 'intense pleasure' she experiences when the rhythmic patterns she has generated are transformed in interchanges between interacting musicians during live performances. Autistic people's accounts of their musical experiences show that, for some, these are life-enhancing. In her description of music, an autistic participant in the study by Korosec and colleagues told how 'it is more important than food sometimes'.

The long-held belief that autism is characterised by 'deficits' in empathy and sociality has influenced the way autistic strengths and talents have been conceptualised and studied. For example, in Levitin's (2006) description of autistic musicality, he wrote, "Although some people with ASD play music, and some of them have reached a high level of technical proficiency, they do not report being moved by music. Rather, the preliminary and largely anecdotal evidence is that they are attracted to the structure of the music" (p 253). More recently, Jaschke, 2024) have written 'Autistic children, who have difficulties in social communication and often increased anxiety, tend to show a strong preference for music, because it can be structured and systematic, and therefore more predictable than social interaction'.

The idea that autistic talents can be explained in the context of systematising strengths was first formally proposed by Baron-Cohen, Ashwin, Ashwin, Tavasssoli and Chakrabarti (2009). However, findings demonstrating the heterogeneity of autistic experiences of empathy challenge a fundamental assumption within the empathising-systematising account. Moreover, definitions of musicality developed within an ecological framework (Honing et al., 2015, Ten, Cate, Peretz and Trehub, Sandra, 2001) cannot be explained within this approach. According to the empathising-systematising view, systematising strengths enable individuals to "predict and to respond to the behavior of nonagentive deterministic systems by analyzing input-operation-output relations and inferring the rules that govern such systems" (Baron-Cohen et al., 2009). It is proposed that these skills then facilitate strengths in understanding information within categorical (e.g. rules defining rocks and fungi), mechanical (e.g. understanding the workings of cars/computers), natural (e.g. rules governing the cardiovascular system) and other rule-based systems (Greenberg & Baron-Cohen, 2020). Importantly, systematising skills are relatively independent of social/emotional characteristics measured using the empathising questionnaire.

Under a structural definition in which the importance of musical materials (e.g. tones, rhythmic patterns), and their organisation are prioritised (Davies, 2012), music may meet criteria for a 'rule-based' system described by these authors. However, music permeates many, if not most aspects of life (Clark, DeNora & Vuoskoski, 2015). Findings showing that infants' early interests are focused both on social/emotional (Lense et al., 2022) and structural components of music (e.g. scale, melody, rhythm) (Trehub, Sandra, 2001) suggest that musical understanding and skills develop holistically. Rules governing the organisation of melodic and harmonic information are acquired early in life and are linked with emotions and with emotional processes in other domains at this time. For example, Kastner and Crowder (1990) showed that, by three years, children associate music written in the major and minor modes with happy and sad emotions. Moreover, Cohrdes et al. (2018) showed that perception of melodic information was linked with the ability to process emotional prosody in linguistic sentences by five to seven years. Whilst it is plausible to suggest that systematising traits may be associated with strengths in analysing the structural components of music, Huron (2006) described how perception of structural events during music listening evokes imagination, tension, prediction, reaction and appraisal responses. Huron's model suggests that we actively engage in imaginative 'sense-making' when we listen to music, and Davis, 2012 has described how 'the "dramatic" narrative of which the listener becomes aware must be uncovered in the music and be responsive to every subtle articulation of its structure. 'The "story" developed by the listener should map directly onto all the work's parts; it is the "story" of the piece's formal and expressive progress, these two being intimately and inextricably connected'. Unlike most of the 'systems' Greenberg and Baron-Cohen describe, music is a product of human creativity that expresses 'meanings' that are both powerful and intangible (Cross, 2014). Music listening elicits intellectual, affective, creative and sense-making responses that are more varied and intense than the satisfaction derived from understanding how a system works.

Autism-led theories and empirical findings supporting them provide an infinitely more complex and nuanced understanding of autistic sociality than the simplistic models that have dominated autism research for the past three decades. Progress within the scientific, clinical and wider social contexts will depend on disseminating research testing these new models. Accumulating evidence from first-person accounts of musical engagement adds an important new strand to research documenting autistic people's lived experiences. As Clark, DeNora and Vuoskoski (2015) have pointed out, there is no single window onto 'what it is like to be human', but musical engagement offers 'as rich, diverse, and globally distributed a perspective as any'.

During the preparation of this work the author used ChatGPT in order to generate a first draft of the abstract. After using this tool/service, the author reviewed and edited the content as needed and takes full responsibility for the content of the publication.

Declaration of Competing Interest

The authors declare that they have no known competing financial

interests or personal relationships that could have appeared to influence the work reported in this paper.

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