By myself but not alone

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Agency, creativity, and extended musical historicity

The social nature of musical experience is most apparent in scenarios where two or more individuals are physically co-present and interact reciprocally, for example when performing together or learning music with a teacher.[1] This paper considers the social dimension of musical settings involving only *one* individual. We argue that, since musical activities are meaningful in terms of their social functions,[2] and that they consist in a networked ecology of relationships "created by the performers not only with the participants' relation to one another, but also with the participants' relationships to the world outside the performance space",[3] music brings into existence a rich intersubjective context, including situations involving one person alone. In this much, we pick up an established dialogic account of human musical communication, as in Buber's observation that "all art is from its origin essentially of the nature of dialogue. All music calls to an ear that is not the musician's own".[4] But further, our key contribution here, inspired by previous work, is to propose that individual musical activities (e.g., performing by oneself) are *inherently* participatory. Notably, we argue that such plural, or intersubjective, features are involved in both expert and novice performance. By doing so, we extend recent research by Høffding and Satne,[5] who examine a similar idea from the perspective of the expert performer. To articulate this proposal, we develop conceptual arguments and report on an original qualitative study.

Theoretically, we introduce the notion of *extended musical historicity* – the complex interplay of felt, imagined, and predicted shared experiences by which each musical agent relates to a broader (past, present, or future) social ecology – and show how the extended nature of musical performance transforms the constellation of habits and lived experiences developed by an individual in the course of her musical activities. Empirically, we find support for such insights in qualitative data from an original exploratory study involving six participants with different degrees of musical expertise. Semi-structured interviews were conducted to explore personal insights concerning the relationship between individual and collective musical agency, how intersubjectivity manifests itself in solitary practices, and how it informs the creative process inherent to performance. By combining theoretical analyses and verbal reports from novice and expert musicians, the present work draws on state-of-the-art thinking in cognitive science[6], and contributes a novel perspective to recent interdisciplinary scholarship in music cognition addressing the psychology of joint music performance and musical creativity.[7]

It should be noted that such domains have recently witnessed an important shift in both theory and practice, trading the traditional focus on computationally-described cognitive laws governing music

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[1] Tal-Chen Rabinowitch, Ian Cross, and Pamela Burnard, 'Musical group interaction, intersubjectivity, and merged subjectivity', *Kinesthetic Empathy in Creative and Cultural Practices*, ed. Dee Reynolds, and Matthew Reason, (Bristol: Intellect Press, 2012) 109–120. See also Siw G. Nielsen, Guro G. Johansen, and Harald Jørgensen, 'Peer learning in instrumental practicing', *Frontiers in Psychology, 9*:339 (2018).

[2] Thomas Turino, *Music as Social Life* (Chicago: University of Chicago Press, 2008); Martin R. L. Clayton, The social and personal functions of music in cross-cultural perspective.', *Oxford Handbook of Music Psychology,* ed. Susan Hallam, Ian Cross, and Michael Thaut (Oxford: Oxford University Press, 2008), 35-44.

[3] Christopher Small, *Musicking. The Meaning of Performing and Listening* (Middletown: Wesleyan University Press, 1999), p. 4.

[4] Martin Buber, *Between Man and Man,* trans. Ronald Gregor-Smith, (London: Taylor & Francis Group, 1947/2002) 30.

[5] Simon Høffding, and Glenda Satne, 'Interactive expertise in solo and joint musical performance', *Synthese* (online first, 2019), 1–19.

[6] Evan Thompson, *Mind in Life. Phenomenology and the Sciences of Mind* (Cambridge: Harvard University Press, 2007).

[7] See Dylan van der Schyff, Andrea Schiavio, Ashley Walton, Valerio Velardo, and Anthony Chemero, 'Musical creativity and the embodied mind. Exploring the possibilities of 4E cognition and dynamical systems theory' *Music & Science, 1* (2018).

making and creative action, for perspectives that privilege a more situated approach. These latter accounts recognize and focus on the fundamentally body-based nature of our thinking and doing.[8] This change in direction reflects a more general re-orientation in the field of cognitive science, in which body and action are now given considerable emphasis in explaining mind and subjectivity – and may be understood as the continuing operationalization, in scientific terms, of some of the problems posed through musicology's own ongoing re-imagination of the social and contextual ways in which music communicates.

In the cognitive sciences, this approach falls under the umbrella term *Embodied Cognition*,[9] an influential interdisciplinary school of thought whose novel heuristics and new analytical vocabulary have shaped the conceptual topography inherent to the sciences of mind over the past three decades. Terms such as 'embodiment', 'expertise', 'intersubjectivity', 'empathy', and 'agency' arise now in multiple contexts, though their usage has yet to reach a mature state of interdisciplinary coalescence.[10] In the following lines we introduce the main tenets of the embodied approach from a general perspective, and establish a number of key terms, making explicit our own conceptual use of them. We provide relevant music-related examples to clarify how we apply the insights from the field of embodied cognition to the position on musical agency and creativity that is discussed in subsequent sections.

Embodiment and music cognition

The term 'embodied', when referred to cognition (or mind), indicates a precise characteristic of our being-in-the-world: namely, that sensorimotor experience plays a key role in driving our ability to think, feel, communicate, or act. This implies that careful exploration of mental life may not concern the study of the brain alone (as in reductionist elision of neural and mental states), nor the study of the abstract laws and algorithms governing information-processing (as in functionalist approaches inspired by the mind-as-computer metaphor).[11] Instead, this body-centred orientation maintains that brain and body form a structured unity that, unlike computers, cannot be easily disassociated as functionally defined components (i.e., software and hardware). Consider for example the important contribution of hand gestures in communicating and thinking,[12] or the role played by body and action in guiding perception.[13] In these cases, so-called high-level cognition is continuous with processes of corporeal experience and movement.[14] While we may still identify certain bodily states as independent from cognitive states (as they do not always overlap in their functions), failure to recognize the complex entanglement of body and brain in cognition would compromise our understanding of what it is that communication, thought, and perception entail.

In musical contexts, there is already a rich, growing tradition that conceives of the body as the main site of musical experience: key empirical and conceptual contributions include work by Eric Clarke,[15]

[8] See Mark Johnson, *The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason* (Chicago: University of Chicago Press, 1987); Mark Johnson, *The Meaning of the Body: Aesthetics of Human Understanding* (Chicago: University of Chicago Press, 2007).
[9] Francisco Varela, Evan Thompson, and Elenor Rosch, *The Embodied Mind. Cognitive Science and Human Experience* (Cambridge: MIT Press, 1991).
[10] C.f. Youn Kim, '"Boundaries" and "Thresholds": Conceptual Models of the Musical Mind in the History of Music Psychology.' *Psychology of Music*, 42(5) (2014), 671–691.
[11] Louise Barrett, *Beyond the brain: How body and environment shape animal and human minds* (Princeton: Princeton University Press, 2011).
[12] Susan Goldin-Meadow, *Hearing Gesture: How our Hands Help us Think* (Cambridge: Harvard University Press, 2003).
[13] See Anthony Chemero, *Radical Embodied Cognitive Science* (Cambridge: MIT Press, 2009); Alva Nöe, *Action in perception* (Cambridge: MIT Press, 2004).
[14] Antonio Damasio, *Descartes' Error: Emotion, Reason, and the Human Brain* (New York: G.P. Putnam, 1994).
[15] Eric F. Clarke, *Ways of Listening: An Ecological Approach to the Perception of Musical Meaning* (New York: Oxford University Press, 2005).

Marc Leman,[16] Mark Reybrouck,[17] Vijay Iyer,[18] Arnie Cox,[19] and other scholars interested in how listeners, performers, and composers engage in their respective musical activities through bodily movement and situated action (both consciously and unconsciously). For example, it has been recently demonstrated that when expert musicians and novices are asked to memorize novel musical excepts, they rely more on modes of bodily engagement with the target stimuli rather than on their theoretical knowledge.[20] Not only does the latter study highlight the fundamental role of action for a specific musical task (i.e., memorization), but it also suggests that both seasoned expert and novice musicians may primarily use body-based mechanisms as the basis of musical engagement. For our argument, this is key since it raises the question of whether this common corporeal grounding for musical learning is present in other aspects of musical experience. In the qualitative study reported below we begin to tackle this issue, by examining how corporeal factors contribute to experiences of agency and social presence in the lived experience of both inexperienced (novice) and highly experienced (expert) musician participants. To do this, we compare verbal reports of agency and creativity prompted through semi-structured interviews, which were designed to elicit thoughtful, reflective responses by a small number of articulate participants. As we shall see, while certain differences remain in terms of levels of description, participants of both groups develop similar insights concerning the role of (imagined or actual) social factors in shaping their musical activity.

Sociality – our relationship with other people in our world – is a key aspect of the embodied approach introduced above. Many scholars argue that human cognition is not confined within the boundaries of 'skull and skin': while body and brain may be conceived of as a functional whole, this whole is also necessarily situated within a social, cultural, and material environment.[21] Living systems, by this view, are seen as units of interaction that co-develop with their environment,[22] whose multiple modes of engagement, histories of coupling and adaptation give rise to a 'shared cognitive ecology'.[23] Importantly, because one's cognitive ecology both shapes and is shaped by social others (along with cultural and physical tools), concepts such as 'empathy' and 'intersubjectivity' are of fundamental importance for cognitive processes. Following Jensen and Moran,[24] we refer to the latter notion as concerning "how we are to understand the basic communicative relations between subjects and the importance of such interpersonal relations for our way of relating to the world as a whole". The former term – 'empathy' – instead, may be seen as a "particular topic within the larger discussion of the nature of intersubjectivity", one that deals with how we understand and co-experience what other living beings feel. When such interactions are approached from an embodied perspective, the role of the body becomes a chief concern for explaining empathy. As such, we may describe certain forms of empathic connection as involving a shared intercorporeality – where, as Fuchs put it, "primary social understanding is not an inner modelling in a detached observer, but the other's body extends onto my

[16] Marc Leman, *Embodied Music Cognition and Mediation Technology* (Cambridge: MIT Press, 2007).
[17] Mark Reybrouck, *Musical Sense-Making. Enaction, Experience, and Computation* (New York: Routledge, 2021).
[18] Vijay Iyer, 'Embodied mind, situated cognition, and expressive microtiming in African-American music', *Music Perception, 19*(3) (2002), 387–414
[19] Arnie Cox, *Music and Embodied Cognition: Listening, Moving, Feeling, and Thinking* (Bloomington and Indianapolis: Indiana University Press, 2016).
[20] Andrea Schiavio and Renee Timmers, 'Motor and audiovisual learning consolidate auditory memory of tonally ambiguous melodies', *Music Perception, 34*(1) (2016), 21–32.
[21] Hanne De Jaegher and Ezequiel Di Paolo, 'Participatory sense-making: An enactive approach to social cognition', *Phenomenology and the Cognitive Sciences, 6*(4) (2007), 485–507.
[22] Richard Lewontin, 'The organism as subject and object of evolution', *Scientia, 118*(1) (1983), 65–82. See also Kim Sterelny, 'Made by each other: Organisms and their environment'. *Biological Philosophy,* 20 (2005), 21–36 (2005).
[23] The idea of a 'shared cognitive ecology' refers to the participatory nature of meaning making: to how an agent's cognitive processes depend the development of patterns of action and perception that are shared with other agents (movement, gesture, sound making, speech, music, the use of tools, and other material features of the environment). See also Gregory Bateson (2000). *Steps to an Ecology of Mind*. *Collected Essays in Anthropology, Psychiatry, Evolution, and Epistemology* (Chicago: University of Chicago Press, 1972); Joel Krueger, 'Extended cognition and the space of social interaction', *Consciousness and Cognition, 20*(3) (2011), 643–657.
[24] Rasmus Thybo Jensen and Dermot Moran, 'Introduction: Intersubjectivity and Empathy' *Phenomenology and the Cognitive Sciences*, *11* (2012), 125–133.

own, and my own extends onto the other."[25] This evocative description highlights the body-centred processes by which we engage with others, reciprocally transform meaning, and share affective and emotional states. Remarkably, this process of mutual entanglement and participation develops early in life, and can be observed in the intersubjective contexts created by infant and caregiver as they act together in vocal play and imitation. Through these proto-musical engagements they co-enact patterns of action and perception that comprise a shared world of meaning.[26] In a sense, agency and human flourishing would be equally impossible without repeated intersubjective and interactive exchanges.

In line with these insights, research in embodied music cognition has been concerned with examining the dynamics of contextual interaction across a range of domains (sport, music, language and gesture, and so on), including collaborative forms of creativity, such as musical improvisation whereby the co-realization of a given musical event is negotiated between agents in real time.[27] While much work has focussed on face-to-face, real-time interactions among people, less attention has been dedicated to forms of intersubjectivity that do not involve direct interaction, that is, situations in which the social other is not physically present but is rather evoked, imagined, or recalled in memory in the act of music making. Indeed, it may be that the 'extended' social dimensions that guide human sense-making beginning in infancy also play an important role in how we construct meaning in solitary contexts later in life. Such social experiences are not visible, and often remain subtle and personal – yet, they often give rise to empathic connections which, we reason, may exert a considerable influence on one's musicking. To address this aspect in more detail, the qualitative data we present below deliberately sought out the reflective, considered views of a small number of participants in order that we might develop a more nuanced picture of such intrinsic, interior motivations towards musical experiences. These data involve descriptions of how intersubjectivity inheres in solo musical contexts, in turn transforming creative performance and the sense of motor control it involves. Our approach is by no means to presume to account for – or to categorise – the forms of musical experience within each individual's history. We will, however, shortly introduce our notion of extended musical historicity (EMH), an explanatory tool which is intended to address how the development of meaningful patterns of embodied interaction (histories), within the (extended) social environment, guides musical experience in solitary contexts.

What is (musical) agency?

Before we discuss extended musical historicity, we consider now the core concept of agency in more detail. One difficulty of utilizing this term in any study – especially given the fundamentally interdisciplinary nature of our current analysis – is that it has been deployed across a wide range of contrasting contexts, and has been simultaneously developed within and between multiple disciplines. In its broadest usage, agency might be used synonymously with personal identity; in other usage, it is more prescriptive – for example, indicating a sense of control over one's motor movements. Most traditional accounts of agency in cognitive science have focused on a conception of individual agency by which it is isolable from its surrounding environment.

A small survey of additional elements that are important to consider for agency include insights by philosophers, including seminal texts by G.E.M. Anscombe[28] and Donald Davidson,[29] which have drawn attention to the fact that agency is often understood hand-in-hand with various senses of intention

[25] Thomas Fuchs, 'Intercorporeality and interaffectivity', *Phenomenology and Mind, 11* (2016), 194–209 (p. 201).
[26] Colwyn Trevarthen, 'The concept and foundations of infant intersubjectivity', *Intersubjective Communication and Emotion in Early Ontogeny,* ed. Stein Bråten (Cambridge, UK: Cambridge University Press, 1998), 15–46.
[27] See Bruce Ellis Benson, *The Improvisation of Musical Dialogue: A Phenomenology of Music* (New York: Cambridge University Press, 2003); Keith R. Sawyer, 'Group creativity: Musical performance and collaboration', *Psychology of Music, 34* (2006), 148–165, and Jean-Julien Aucouturier and Clément Canonne, 'Musical friends and foes: The social cognition of affiliation and control in improvised interactions.' *Cognition. 161* (2017), 94–108.
[28] G.E.M. Anscombe, *Intention* (Oxford: Blackwell, 1963).
[29] Donald Davidson 'Actions, Reasons, and Causes', *Journal of Philosophy*, 60 (1963), 685–700.

and intentional action. More recent philosophical work by Elisabeth Pacherie[30] further highlights an important distinction between the sense of agency and the sense of control that, while often appearing together in everyday experience, can come apart in certain circumstances. Sometimes these shifts in control and agency occur in consciously mediated processes, such as the interplay of imagination and pretence, while other times it occurs unconsciously. Among other things, this insight may problematise the notion of 'authority'.

Musicological research focussed on performance has addressed this point by considering how executors (e.g., in Western classical contexts) often contribute to and expand on the original ideas developed by the composers, generating creative artefacts whose authorship might be considered as hybrid, or shared between them composer and performer.[31]

Psychological research by Daniel Wegner and colleagues[32] has further helped explicate how we make ascriptions of whether an action is 'authored.' In one notable study, the authors focused on cases where the sources of information regarding apparent mental causation – and thus the locus of agency – were unclear. As a result, and in their words regarding an overview of related studies on the topic, "the presence of information that prompts consistent, prior, and exclusive thoughts of another's actions might influence people to experience the sense that they have exerted control over those actions."[33] Such feelings can be related to oneself, imagined agents, other agents, or some combination therein, although the cited study focused on cases where the individual knew that another person was doing the action in question, while nevertheless being asked how their attribution of agency was related to what was seen. The notion of authorship may therefore be integrally connected with certain attributions of agency.

Agency is variously defined within interdisciplinary approaches within music scholarship[34]. As noted above with regard to agency in general, there have been multiple applications of the term in various areas – here including musicology, sociology, philosophy of education, human-computer interaction, and cognitive science. With regard to music cognition, specifically, agency is defined as the capacity to control the production of musical sounds[35] – an ability which, among other factors, allows expert musicians to recognize their own performance among similar others, even after significant time has passed.[36] Moran notes that the concept of agency that is brought to the surface in research into musical human-computer interaction provides further challenge to old musicological ground, concerning conceptions of authorship and attribution. While notions of autonomy in 'the music itself' have been thoroughly reimagined and scrutinized in past decades, metaphorical acts of submission by performers and audiences to 'the music' remain pervasive in academic and public discourse, conjuring an object which "attaches irresistibly onto the culturally apparent notion of an authoritative musical work, with its complex relationship to an autobiographical, individual composer- or creator-figure."[37]

We follow Moran to argue that the best way to use the term agency in studying musical experience is to recognise its necessary distance from constructs of 'author', 'individual', or 'identity'. Considering

[30] Elisabeth Pacherie, 'Sense of control and sense of agency', *Psyche, 13*, 1 (2007), 1–30.
[31] Nicholas Cook, 'Playing God: Creativity, analysis, and aesthetic inclusion', *Musical Creativity: Multidisciplinary Research in Theory and practice*, eds Irène Deliège and Geraint Wiggins (Hove: Psychology Press, 2006), 9–24; See also Nicholas Cook, *Beyond the Score: Music as Performance* (Oxford: Oxford University Press, 2013).
[32] See e.g., Daniel Wegner, Betsy Sparrow, and Lea Winerman, 'Vicarious agency: Experiencing control over the movements of others', *Journal of Personality and Social Psychology, 86*(6), (2004), 838–848.
[33] *ibid*, p. 839
[34] Nikki Moran, 'Agency in embodied music interaction', *The Routledge companion to embodied music interaction*, ed. Micheline Lesaffre, Marc Leman, and Pieter-Jan Maes (New York and London: Routledge, 2017), 105–112. See also Kevin J. Ryan, and Andrea Schiavio, 'Extended musicking, extended mind, extended agency. Notes on the third wave'. *New Ideas in Psychology, 55* (2019), 8–17.
[35] See for example Thomas H. Fritz, Daniel L. Bowling, Olivier Contier, Joshua Grant, Lydia Schneider, Annette Lederer, Felicia Höer, Eric Busch, and Arno Villringer, 'Musical Agency during Physical Exercise Decreases Pain', *Frontiers in Psychology,* 8:2312 (2018).
[36] Bruno H. Repp and Günter Knoblich 'Perceiving action identity: how pianists recognize their own performances', *Psychological Science, 15* (2004), 604–609.
[37] Nikki Moran, 'Agency' (2017), 109.

the importance of operationalizability[38] in our analysis of the interview data below, we use a definition of agency grounded in a psychological perspective. As such, in what follows, 'agency' refers to a capacity for control and indicates this influence exercised over some selection of musical actions and choices. We also distinguish here between 'agency' intended as the capacity for control described above, and 'sense of agency' – the subjective feeling accompanying our actions, involving both low-level experiences emerging from sensorimotor contingencies and high-level reasoning associated, for example, with retrospective judgment.[39] The data gathered from interview will speak to both agency and the sense of agency.

While the understanding of agency as the capacity of controlling sound production is an essential first step, it is important to further note that this definition spans individual, shared, and collective contexts, wherein a variety of different actions may be attempted. In connection with the discussion above, human beings often share and negotiate agency through cooperation and commitment towards a shared outcome or goal. This process can occur in situations where an action is performed jointly and spontaneously (e.g., playing an improvised piano duet). Other times, a shared goal can be reached within hierarchical social structures where multiple agents play well-defined roles, such as in a sports team or an orchestra. In both cases, different goals and action-specifications are often achieved and transformed collectively. Thus, a sense of shared responsibility – or at least a basic empathic connection – governs the dynamic interplay between actors at multiple levels and timescales.[40] Recent research in the field has likewise gained important analytical leverage for describing the various contexts in which action is enabled and constrained, including its social and interactive dimensions.[41]

The blending of these various insights further prompts us to think more deeply about situations where agents are not physically co-present. In these contexts, one might first assume that when acting alone there would be no social dimension at play. Arguably, composing a song by yourself, or rehearsing a piece in isolation, are activities which involve no shared agency at all. Deeper reflection, however, reveals that they are rooted in social contexts.[42] Indeed, the possibilities for thought and action, and the reasons that drive them in the first place, depend on a history of engagement between the individual and the socio-cultural, material environment in which they are embedded.[43] Musical practices are situated within worlds of equipment, language, sounds, and conventions, whose meanings are continually co-enacted over time. From learning the requisite motor skills to developing different musical styles and ideas, each activity involves others "at different degrees of remove, with more or less effort and effect, and with greater or lesser visibility."[44] Relevant social features here include those who built the musical instruments, as well as extant ideas authored by others from which one draws as

[38] Operationalizability is important insofar as it allows the phenomena in question to be clearly studied from an empirical perspective. Sometimes this process involves using working definitions, which can later be updated in light of additional data and any associated theoretical developments. For our purposes, since the psychological definition of agency has already been operationalized for use in similar domains, we employ it as the working definition of agency that guided the development of our experiments and subsequent data analysis.

[39] See Shaun Gallagher, 'Ambiguity in the sense of agency', *Decomposing the Will,* ed. Andy Clark, Julian Kiverstein and Tillman Vierkant, (New York: Oxford University Press, 2013), 118–135; Manos Tsakiris, 'The multisensory basis of the self: From body to identity to others', *Quarterly Journal of Experimental Psychology*, *70*(4) (2017), 597–609; Elisabeth Pacherie, 'The sense of control and the sense of agency', *Psyche, 13*(1) (2007), 1–30.

[40] See for example John A. Dewey, and Thomas H. Carr, 'When dyads act in parallel, a sense of agency for the auditory consequences depends on the order of the actions', *Consciousness and Cognition, 22*(1) (2013), 155–166. For a recent musically-relevant empirical study see Andrea Schiavio, Jan Stupacher, Richard Parncutt, and Renee Timmers, 'Learning music from each other: Synchronization, turn-taking or imitation?', *Music Perception*, *37*(5) (2020), 403–422.

[41] See Albert Bandura, 'Toward a psychology of human agency', *Perspectives on Psychological Science*, *1*(2) (2006), 164–180; Elisabeth Pacherie, 'Intentional joint agency: shared intention lite', *Synthese, 190* (2013)**,** 1817–1839; Deborah Tollefsen and Shaun Gallagher, 'We-narratives and the stability and depth of shared agency', *Philosophy of the Social Sciences*, *47*(2) (2017), 95–110.

[42] A similar intuition was developed in Bernard Guerin 'Individuals as social relationships: 18 ways that acting alone can be thought of as social behavior', *Review of General Psychology*, *5*(4) (2001), 406–428.

[43] This resonates with contributions in evolutionary musicology placing a strong emphasis on the deeply intersubjective origins of music – whether for sexual selection, communication, or social status.

[44] *Distributed agency,* ed. N.J. Enfield, and Paul Kockelman (New York: Oxford University Press, 2017), p. xii.

one composes, or the historical continuum of musical practice and aesthetic understandings on which one's musical know-how is based.

Creativity and extended musical historicity

Above, we have attempted to outline how musical experience and meaning making are rooted in a proclivity for (and necessity of) the fundamental forms of embodied, empathic, and emotional communication by which we enact shared cognitive ecologies. Moreover, for individuals and social groups, musical behaviour develops over time within extended, historically evolving *communities of practice*.[45] It follows from this that, even in solitary musical activity, rich, multi-levelled histories of social participation underwrite every set of actions and, to varying degrees, guide the meaningful experiences that arise in a given musical situation. That said, there are, of course, important phenomenological differences between solitary situations and those in which others are physically co-present. Likewise, although the meanings and uses of a tool (a computer, a musical instrument, etc.) emerge from a history of practice involving others, this is not the same as the joint sense of agency that is experienced when two or more people use that tool to realize a shared goal.

We should also note that the use of musical instruments and conventions may involve levels of complexity not found elsewhere. As ethnomusicological research attests, musical practices such as playing an instrument, singing, or composing a song, are deeply associated with other subjects, their agency, and various layers of causation and context (e.g., ritual, work, play) [46]. In presenting findings of our study, we describe how similar intersubjective experiences emerged association with performative practices across both novice and expert instrumentalists. Before doing so, a little more detail on the notion of extended musical historicity and how it connects with creative musical engagement may be helpful.

Imagine an expert guitarist (name her Juliette), preparing for an important recital, where she will perform the famous *Concierto de Aranjuez* by Spanish composer, Joaquín Rodrigo. This work is important for various reasons: it is central to the repertoire of modern Spanish guitar music, and sometimes considered to be a rite of passage for performers. Many classical guitarists – from Ida Presti to Naciso Yepez and Paco de Lucía – have delivered highly virtuosic performances, while others re-interpreted parts of this concerto in different styles. Eloquent examples can be found in Miles Davis' album *Sketches of Spain*, or in Carlos Santana's *En Aranjuez con tu amor*, where the main theme of the second movement is re-arranged. The piece is historically loaded, so to speak. Regardless of whether or not Juliette is aware of, or indeed likes, all facets of this repertoire, there are inevitable connections between her musicking and instances of the piece in different recordings and experiences.[47] Listeners who attend her recital might associate some passages with prior interpretations or arrangements. Her phrasing might recall certain performances from other guitarists or deviate from precise indications in the score.

The important question for us is not whether Juliette will systematically go through all possible cases, review all recordings, or pay tribute to her preferred interpreter; rather, it is to what extent such a complex web of relationships shapes her own sense of agency and creativity.[48] In what sense do her musical style, experience, and goals transform and co-evolve in implicit or explicit reference to a particular musical tradition? How does her dialogue with the orchestra (and the audience) change as the

[45] Etienne Wenger, *Cultivating communities of practice: A guide to managing knowledge* (Cambridge: Harvard University Press, 2002).

[46] See for example Elliot Bates, 'The social life of musical instruments', *Ethnomusicology 56*(3) (2012), 363–395; Kevin Dawe, 'The Cultural Study of Musical Instruments'*, The Cultural Study of Music: A Critical* Introduction, ed. Martin Clayton, Trevor Herbert, and Richard Middleton (London: Routledge, 2012), 195–205.

[47] In hermeneutics, Gadamer refers to this as *Wirkungsgeschicht* ("effective history" or "historical effect") – the idea that our interpretation will be either implicitly or explicitly biased by previous interpretations.

[48] Note that this vignette does not allude to the notion of *authenticity*, which refers to the faithful realization of the composer's intentions. Instead, it addresses directly Juliette's interpretative choices and motor control while performing. See Stephen Davies, 'Authenticity in musical performance', *British Journal of Aesthetics, 27* (1987), 39–51.

performance unfolds? And how could such interplay lead to creative musical outcomes? Individual practices are contingent – our example intends to illustrate – on a profusion of social factors. In individual experience, these social contingencies seem to be sustained by habits of, for example, mental time travel (e.g., "am I respecting the original intention of the composer?"), or propositional narratives involving explicit predictions (e.g., "how would the audience respond to my performance if I don't respect the original score?"). They can also emerge from layers of experience that are situated below our conscious agency[49] yet nevertheless lead to a wide range of interpretative choices based on creative action, movement, and control. In fact, there are many kinds of connections one might develop with things and agents who are – or are not – physically present while musicking.

We suggest that this principle, in addition to underlying Juliette's extended musical agency, can be referred to as extended musical historicity (EMH). On the one hand, the term is inspired by the notion of the *history of structural coupling* adopted in cognitive science to capture the temporally-extended mutual engagements between different unities (e.g., an organism and its environment). As cognitive scientists Maturana and Varela put it,[50] "we speak of structural coupling whenever there is a history of recurrent interactions leading to the structural congruence between two (or more) systems". On the other hand, EMH draws on recent theories of distributed creativity[51] and "long-term" creative cognition.[52] The former approach explores how creative action and ideation develop in groups, for instance through brainstorming or practices such as joint music-making, dance, and improvisation; the latter examines the role of large temporal spans in generating creative products. This long-term approach has been applied to music composition to describe how artistic ideas are developed, transformed, hybridized, and reconstructed by composers across longer periods of interaction with tools and artefacts from the environment.[53] EMH broadens aspects of both distributed and long-term approaches as it engages with social contingencies in solitary contexts (e.g., solo music-making), and can be applied to situations in which the authorial identity of the inventor is less clearly defined.[54]

To provide an additional example, consider how the development of a certain musical style – say, Death Metal – might lead a young singer to explore different 'growling' vocal techniques. In the process of discovery, one might be influenced by various extramusical sources, find inspiration in existing artists, engage with technologies to address a specific expressive need, or develop novel breathing techniques to better support the newly discovered vocal actions. In each case, motivations and reasons to further develop can be found in the engagement with, as well as appropriation and development of, musical traditions and established practices. The creativity within EMH, in this sense, is best understood as the relational process motivating these modes of engagement – an adaptive coupling that leads to new and appropriate artefacts.[55] This process suggests that there is no isolated process of creativity. In fact, there are many kinds of connections one might develop with things and agents who are – or are not – physically present while musicking. As Høffding and Satne[56] put it, expert performance displays "an overarching interactive structure that is transformed and sustained by an open-ended range of environmental resources including materials such as physical artefacts, e.g., sounds, written scripts and scores, as well as various bodies jointly attuned and the various resources they bring to the ongoing

[49] see also Michael Polanyi, *The tacit dimension* (New York: Anchor Books, 1967).
[50] Humberto Maturana and Francisco Varela, *The tree of knowledge: The biological roots of human understanding* (London: New Science Library, 1987), p. 75.
[51] See for example Vlad Petre Glăveanu*, Distributed creativity*: *Thinking outside the box of the creative individual*. New York: Springer, 2014).
[52] Nicolas Donin and Jacques Theureau, 'Theoretical and methodological issues related to long term creative cognition: the case of musical composition' *Cognition, Technology, & Work, 9* (2007), 233–251.
[53] *Ibid.*
[54] See Nicholas Cook, 'Playing God' (2006).
[55] Simon Frith, 'Creativity as a social fact', *Musical Imaginations: Multidisciplinary perspectives on creativity, performance and perception*, ed. David Hargreaves, Dorothy Miell, and Raymond MacDonald (Oxford: Oxford University Press, 2012), 62–72.
[56] Høffding and Satne, 'Interactive expertise' (2019).

exchange" (ibid). But can our very first, or non-expert, musical encounters, rehearsals, and practices, be already understood to be interactively constituted?

Qualitative study – interviews

In what follows, we report data from an original qualitative study based on semi-structured interviews that explore personal experiences and thoughts about agency and creativity in musicking. This method of data generation[57] is widely used in music research and spans a variety of areas. In a recent review, for example, Tan and Sin[58] found that interviews were the main qualitative instrument adopted to capture the lived experience of flow in musical settings.[59] The present study aims to provide similar insights with regard to musical agency and creativity. How can agency be shared and negotiated in the absence of an interactor? (How) does its subjective experience change according to its degree of interactivity? And what is the role of expertise and intersubjectivity in shaping one's creative efforts? To answer these questions, we prepared an interview protocol.[60] The study received ethical approval from the Ethical Committee of the University of Graz in September 2019, and all interviews were conducted individually in October 2019, after participants gave their written informed consent.

Participants

Six participants (3F; 3M; age-range: 30-58 age-median: 41,16) were interviewed by *Author 1*. Interviewees were novice (n= 3) and expert (n=3) instrumentalists, recruited through the personal network of the first author. No participant was financially compensated for taking part in the study. The three novices had limited active musical experience: they improvised from time to time by themselves, had a little amount of musical training (less than a year), jammed informally with friends, or have just started learning music. Experts, by contrast, all had more than 10-year continuous experience with their musical instrument, and have participated in several live performances, recording sessions, or rehearsals, alone or with others throughout the years. Our interviewees were:

- N1 (f, 30), novice flutist, recently started to learn classical guitar as well. She only performed amatorially with friends and family, though she did learn how to read music.
- N2 (m, 39), novice guitarist, with a passion for Eric Clapton. He used to jam with his friends from time to time, covering various songs (more or less successfully). Now he prefers to improvise by himself when he finds time after work.
- N3 (f, 35), novice singer, had a few lessons with a music teacher years ago. She once performed a couple of songs in a school recital in front of a few friends. She would like to take pop music lessons again.
- E1 (m, 44), expert singer, with relevant experience in ethnic and experimental music. Respected ethnomusicologist, he developed important aspects of his vocal style during a fieldwork in Peru.
- E2 (f, 41), expert organist and harpsichordist with classical background, she currently teaches historical musicology in Higher Education.

[57] See Thomas A. Schwandt, *The SAGE Dictionary of Qualitative Inquiry* (Thousand Oaks, CA: SAGE Publications, 2007).
[58] Leonard Tan and Hui Xing Sin, 'Flow Research in Music Contexts: A Systematic Literature Review', *Musicae Scientiae*, (online first, 2019).
[59] See for example Betty A. Bailey and Jane Davidson, 'Adaptive characteristics of group singing: Perceptions from members of a choir for homeless men', *Musicae Scientiae, 6* (2002), 221–256. Another good example can be found in Sara Ascenso, Rosie Perkins, Louise Atkins, Daisy Fancourt, and Aaron Williamon, 'Promoting well-being through group drumming with mental health service users and their carers', *International Journal of Qualitative Studies on Health & Well-Being, 13* (2018), 1–15.
[60] See appendix.

- E3 (m, 58), expert jazz singer with extensive experience in performing in bands and improvising with various ensembles.

Materials

A protocol was developed by AS and KR to guide the implementation of each interview and ensure consistency of the themes explored with each respondent. The resulting instrument comprised a total of nine items, which sought to elicit detailed descriptions of the respondents' thoughts, sensations, experiences, and beliefs concerning agency and creativity. All interviews (lasting between 21 and 40 mins) were conducted individually, audio-recorded, and transcribed verbatim. All participants received via email a written copy of their transcribed interview, and were given the possibility to clarify ambiguous statements and/or add additional comments on a particular topic.

Data analysis

Before data were analysed, the research team agreed to focus on two main categories: *agency* and *creativity*, to be compared between experts and novices. These predetermined categories allowed light-touch deductive analysis of the data in response to our research questions. The analysis began with the selection of quotations relevant to the research: AS and KR, accordingly, segmented each interview into single item quotations for use in the present study. This process was verified by DvdS, who checked the validity of the categorizations asking whether it was possible to assign a quotation to a different category, or whether it should be disregarded in relation to the current discussion. All authors examined the final selection of data pertinent to this study, leading to the current interpretation and presentation of these data.

Findings

In this section we use direct quotations extracted from our interviews to report and exemplify the data set. We present novice and expert groups in turn; in both subsections, the categories of agency and creativity are explored separately to facilitate comparisons and discussions. We characterize the former as involving descriptions of motor control in music-making, while the latter concerns performative activity based on novelty and improvisation. We describe verbatim the responses of our participants which pertain to musical agency and musical creativity, and we preface each subsection and each quotation with a summary – in our own words – of these preoccupations. To support our analysis, we also introduce descriptive terms intended to highlight overlapping aspects of the cognitive ecologies enacted by musical agents.

'Sonic ecology' refers to various sound qualities that a musical agent experiences, uses (e.g., through the manipulation of instruments in different acoustic spaces), imagines, and associates with a given musical environment-context (e.g., the addition of distortion to a guitar sound, the reverberance of a cathedral, and so on).

'Shared intercorporeality' concerns the mutually specifying nature of embodied communication (e.g., the repertoires of gesture and utterance that arise between infants and caregivers, meaningful facial and gestural cues given by the members of a string quartet or a jazz trio, or, indeed, the imagined-felt effect one's music making has on another).

'Social ecology' refers to the interpersonal dynamics and cultural factors that shape and contextualize a given musical activity (e.g., the shifts in coordinated movement and meaning as a New Orleans funeral procession develops, the various protocols and hierarchies associated with symphonic performance, or the unique relationships and understandings that form over time through creative collaboration). These aspects can be evoked and/or imagined.

'Shared musical ecology' refers to the dynamic interplay of the sonic-material, corporeal, and the socio-cultural dimensions in the realisation of a meaningful musical environment. This involves histories of social and material engagement that play out over various timescales (developmental, periods of practice and rehearsal, in the moment interactions and engagements, and so on).

Novices

Agency: being able to produce a desired musical outcome is a central concern for novice musicians, who often struggle to reach an adequate postural and gestural control. This involves a focus on the different bodily sensations and activities that contribute to generate that outcome:

> "[When I perform] it is kind of becoming one with the music itself, so you do not just listen to the music. I do not even listen to the music, I feel [it]. When I am playing guitar for example [I feel] a kind of reaction in my body, and a reaction to the music itself. It is actually more [than that] so, it is not just that ears give me this feedback from music; it is also my body. And, for sure, if you play for example a wrong tone, you feel uncomfortable in a [specific] way [...] it is like getting a cramp." (N2)

These sensations can be highly stressful for beginners, and might shape motivations, confidence, and drive. Consider how two novices report diametrically different experiences regarding the role of others in shaping their bodily feelings when performing:

> "When I play alone I am completely free, I can do what I want. When I am with others [...] you have certain room [...] but there is a line, a border, you cannot cross. This is for me a kind of social understanding as well: there are rules, and you have to 'stay there' – you cannot go further. This, for sure, makes playing alone or in a group completely different." (N2)

Let us now compare this statement with an opposite view:

> "Sometimes I feel more comfortable when playing with others because the audience won't hear my mistakes [...] this has an effect on my body movements, because when I play with other people I don't think of my body. I just think about the music I want to play." (N1)

A similar understanding of shared musical experience is described by another participant, who provides a personal example to explain how the presence of others can shape agency and bodily control:

> "When I sing, I tend to become too rigid and I often feel like I have a weight in my throat. I am aware that this can change my musical outcome so, as I perform, I try to rationally take control over this sensation. However, I can't always do it. But when I sing along with others, for example when I am with my teacher, or a choir, it is like the weight I feel in my throat could be shared with them, so that it can be relieved."[61] (N3)

[61] These quotations highlight the ways in which performing with others can both foreclose (N2) and open (N1 and N3) aspects of one's musical, creative processes. However, we see reference to other aspects of the EMH as well. The freedom that N2 highlights presupposes that they have learned certain rules and skills for navigating their instrument. Likewise, the nature of performance in front of an audience that are discussed by N1 and N3 is shaped by genre norms and navigated through the use of studying and understanding how others have approached similar situations in the past. We will return to this point in the discussion.

This last quotation shows that bodily sensations can be decentralized through the others: as she describes, the influence of others can also go beyond their physical presence:

> "There is a sort of 'tuning' between people when making music together, for example between teachers and their students. This [tuning], is a very personal aspect that changes from individual to individual, but surely stays with you even when you are alone. However, probably in all of us there is a deep fear to do something wrong [while performing]." (N3)

This "tuning" leaves a specific trace; it became retained in her musicking. As she comments:

> "There is always a re-enactment of a specific situation. For example, what happens with a teacher becomes part of how I perform." (N3)

Consider also how the (actual or felt) presence of others includes an important emotional connotation and influences musical choices even when this participant rehearses by herself:

> "If others can understand my emotions, then there is a higher connection among individuals: this can happen when you perform, but also when you rehearse alone and feel the presence of others: is this part too fast? Should I create more suspense before the chorus? All these choices are never solitary." (N3)

The data imply that the influence, or the implicit presence, of others often remains in solitary musical activity. While implicit presence is not fully akin to physical presence, it is important to see whether it also plays a role in informing performative choices and musical discoveries. Therefore, in the next subsection we report statements that more explicitly refer to creativity and its intersubjective connotations.

Creativity: in what sense can intersubjectivity become part of creative action while musicking? Firstly, we should consider creativity as a process of discovery. Sometimes, this is driven by a preexistent plan for novel invention, while other times it emerges as a result of local dynamics enacted in musicking:

> "When I am playing my instrument and want to become more creative I listen to how other people play it and try to find an inspiration, so there is a connection with other people – we are basically in the same situation: we are playing the same piece and I want to learn from them. I am sharing something with people even if they are not there." (N1)

This empathic experience, it should be noted, is not as easy or intuitive as it might seem. Instead, it involves potential serious challenges mostly linked with the novice's lack of expertise:

> "I don't feel I have connection with others [when performing alone]: I try to, but have mostly failed." (N2)

One of the reasons behind this tendency to seek for such connections might be individuated in the tension between the musician and his or her sphere of influence. This involves a circular interactivity:

> "Personally, I think other people could change completely my own creativity, because I have to focus, so I think it would confuse me a little bit … I may change others, but the

> critical point for me is that others can change me. When you think about it that's also creative though." (N2)

Such interplay is wonderfully captured by the next quotation: here, our participant was specifically asked how she could become more creative while performing, and what kind of influence other people may have in the process.

> "In my case creativity is linked to how I express myself, my body language, more than just making music. It is about interacting with who is around and who will eventually get in contact with what I sing and how, and see if I can change their mood and surprise them." (N3)

When asked to elaborate on this statement, she provided a longer comment, here divided into two quotations:

> "If interaction with other people is good, then I feel like I have more freedom and I can risk it too. This is a creative situation because it really depends on what other people respond to my initial impulse, and I need to read through the lines and find a [musical] solution that makes everyone satisfied. This works well when I am in front of people, but I can also, in a way, feel that other people can participate in what I do too because music is all about this." (N3)

> "I could feel more inspired and creative when I activate a 'collective image' as I perform alone. Instead, when I activate an image of 'myself-with-a-teacher', for example, I feel I am in a particular 'mode', which is more linked to the lesson itself (e.g., technical exercises), rather than, say, expressivity. Here all I do is trying out things that I have already rehearsed. It all depends on what I want to do with others so that we could share something." (N3)

The statements reported here convey important insights regarding personal experiences and thoughts of novice music performers, revealing a complex interplay between the presence of others - sometimes even the implicit presence of others - and their ability to creatively engage with their musicking, as well as reflections by these participants on their own sense of agency.

Experts

Agency: as we saw in the previous section dedicated to novices, much of their body control appears to be associated with contextual and social contingencies, and can be transformed by the felt presence of others. When looking at experts, a first thing to notice is that the level of reflection becomes deeper, and the emotional components associated with bodily sensations emerge more strongly:

> "There is an important aspect linked to sad or difficult sensations one can feel while performing music. When I am alone with myself, these sensations can be felt much more clearly in the music I play and experience. Some time ago, for example a dear friend of mine died, and at the same time, there was this beautiful song from a German songwriter [...], a piece composed for his dead wife. And I remember very clearly that this song really hit me hard and I cried a lot. I also played that piece with a colleague once but it was different [...]. When playing that song together [with him] he could take some pain away from me because we were sharing that burden together, even if he didn't know my friend." (E3)

This statement presents important similarities with the quotation from a novice mentioning how the weight she feels in her throat while singing can be shared. In both cases sensations and feeling are shared with others. And when asked explicitly about bodily sensations and control, the same participant mentions again an emotional state:

> "The first, spontaneous, sensation I feel while doing music, is something positive, almost like joy and happiness, but that's more like a mental thing. Even when I am sad or depressed, this positive energy can be felt." (E3)

As he explains, this is an important, if not the most important, part of what doing music together entails:

> "When you play with another person. It's like a 'take it and give it', a continuous exchange where I receive the other's energy. I am not focused on myself, because I am literally doing something collectively, and also because we do have a shared goal, say, a song, a show." (E3)

What changes in situations where performance is done individually? Consider the following response:

> "I guess it doesn't change that much honestly. So, the organ is an instrument with more solo repertoire, and if you play with an orchestra, the orchestra is usually located behind you, so interaction with others is complicated. But if you play with a harpsichord, for example, is different: I have often played the sonatas by C.P.E. Bach with a violinist, and you must have a shared sense of attention. Part of your focus on what you play, part of your energy, now belongs to the other person too. It is important to "tune" with the other person to understand when the other breathes, or begins a new musical phrase." (E2)

Bodily sensations are not here equated with actual movements, or motor dynamics; they are rather more visceral, and involve both an emotional and attentive focus. There is more detail in what is shared with others (attention, energy, focus) when compared to novices, and fewer differences between solitary or collective musicking are reported. This, however, does not mean that joint musical settings become less valued:

> "When I play with others it is like I want them to change me, and push me toward certain expressive moments one can find in the music. And this really changes my performance." (E3)

This point recalls the previous quotation from the expert organist/harpsichordist, as well as one of our novices (who referred to the "tuning" between teacher and pupil). Another important factor we explored in the previous section concerns the felt presence of others while performing alone: here we report two quotations from the same participant about his experience:

> "When I am alone, sometimes it happens that I ask myself what's the story behind the piece; what is the energy behind the composition. When I work on material composed more than 100 years ago, I suddenly 'see' the world as it was 100 years ago, and I imagine people, and places that are not here." (E3)

> "I always try to be as close as possible to the original intentions of the composers. This puts me in a weird place because then I must account my emotions, my sensitivity, and my fingers. It is like, I can look at the world with the eyes of the composer, but still within my own body." (E3)

Note again how the presence of others is here described in a more emotional sense when compared to novices, contributing to shape feeling and control of musical actions. Another participant confirms such insight when she says:

> "When I rehearse by myself I can feel the composer and his intentions, yeah. I say 'feel' because there are no main thoughts here. If I lose focus, I may think about other stuff, like a grocery list, but not if I am on track." (E2)

Interestingly, the presence of the composer is "felt", rather than consciously thought. This 'other-oriented' feeling is embodied by the performer, giving rise to musical experiences where emotions, visceral sensations, and actions are shared across time and space.

Creativity: while the notion of creativity is highly personal, we saw above that our novices shared a certain agreement about its multi-personal constitution. As it appears from the following quotation, however, experts might be less prone to emphasise differences between creativity in individual and collective situations:

> "Creativity is one word for a huge thing [...] but if I think for myself, when I am creative in playing music [...] what I feel is a certain kind of feeling where I think 'this is cool', or 'this is something that I like and find interesting'. When I am playing with others, or even in listening, a very similar thing can happen: you are kind of getting into this time-space area of interesting sounds [...] there are some features of music that takes you away from your staying there and put you in contact with other things, with other people. (E1)

That said, the feeling of being in touch with others is still present, and arguably plays a major role in shaping performance. Consider how this can influence precise expressive needs:

> "As I said, I want to communicate something with the piece I am performing. When I play the piano for example, I can only do that by emphasizing precise dynamic choices. When instead I am playing the organ or the harpsichord I cannot change dynamics because of the instrument's limitations. However, the pressure I feel on my fingers changes nonetheless, as if I could still make those changes in the dynamics. It is my whole body that communicates here rather the musical outcome – I still feel the need to communicate with someone." (E2)

Even if organ and harpsichord do not allow for audible changes in dynamic range, E2 still feels the need to play expressive passages actively, as if she could communicate these nuances. This need arguably comes from the 'feeling of others' and the communicative aspects this entails; it is sedimented into her body and emerges even if the music will not be affected sonically. This process can be understood as inherently creative as it involves the development and transformation of novel musical and emotional outcomes generated on the spur of the moment. As she put it:

> "Creativity is finding new solutions and adapting themselves to these solutions, according to your expressive needs." (E2)

Creativity is thus understood as an adaptive, multiply constituted, phenomenon, which has strong roots in action and movement. This is further confirmed by another participant, who insists that creativity involves a dual exchange, a reciprocal interaction where one changes and is changed by the others:

> "It always depends on how receptive I am. On the basis of your relations with others, you can create a structure, a 'thing' that wasn't there before. As simply as that. You can do it both with other performers, and with the audience. I can feel that in specific moments when I play – there is a feedback, an energy, that inspires me and changes me." (E3)

As he explains, while these mutual adaptations can be very subtle, they can nonetheless shape various musical parameters and styles:

> "When you work with another person you clearly have stylistic repercussion on what you are playing. Every musician has its own style, and we can both influence each other even if we play the exact same notes [...]. The creative process can be only developed when there is a mutual connection with the others." (E3)

Like our novices, experts also have repeatedly stressed the importance of interaction for creative musicking. In both cases, novel musical configurations, styles, and outcomes are thought to emerge within a shared musical ecology – one that extends the individual's ability to generate novel creative outcomes.

Discussion and Conclusion

The data reported in the previous section provide rich descriptions of the ways in which reports of solitary musical practices exceed descriptions of individual agency, referring beyond to social contingencies that are seen to generate or transform creative musical activity.

With regard to agency, the (actual or felt) presence of others appears to give rise to both positive and negative sensations for novices, who still feel unsure about their own motor control while performing. Novices also tended to focus on more compartmentalised descriptions of their musicking (e.g., muscular tension), whereas experts have offered more detailed accounts concerning how bodily and emotional aspects interact with each other. An important difference between novices and musicians with more experience may concern the way in which the latter tend to apply the experiences of one context to another. This relates to engagement of imagination, and may explain the fewer differences between solitary and collective musicking that were observed. In both cases, however, it was found that social factors involving past or future encounters can play a major role in transforming their practice and its associated feelings. Consider how one expert and one novice explicitly mentioned how collective musicking helped them alleviate bodily and emotional pain by "sharing" their sensations with a co-actor. Similar descriptions are not limited to situations where others are physically present; on the contrary, a number of statements well illustrate how the imagined, expected, or remembered, presence of other individuals might affect body control, emotions, and musical outcomes. To take a representative case from our data, note how the influence of the composer could help the performer develop a novel ontology, where a world "seen by the eyes of the composer" is created as musicking unfolds.

With regard to musical creativity, novice and expert participants emphasized its strong link with intersubjectivity and adaptation. Music-making involves a shared intercorporeality, which informs expressive and performative choices and – as we saw – contributes to the creation of a novel agentic domain. The kinds of relationships that are being developed, however, need to remain interesting and

engaging in order to continually foster the creative process of musicking. They likewise need to help the performer achieve a given task, or to express a specific nuance. Of course, it is not necessary, strictly speaking, that such connections display these characteristics – one may find that a specific performance can give rise to inadequate or negative relationships, after all. In this case, one might re-adapt his or her musicking to the sonic ecology being created, allowing novel intersubjective relationships to be formed. This may involve navigating the diverse creative possibilities afforded by the music, which may in turn affect the shared intercorporeality.[62] One can explore novel fingerings, breathing techniques, or compositive strategies, and then relate them in novel, fascinating ways, to the broad (past, present, or future) sonic ecology being created.

To better illustrate this point, we raise the following example: while practicing a piece for lute, an expert musician may try to use a differing fingering for the right hand during a scale – for example, changing the traditional articulation of thumb-plus-index finger with index-plus-middle finger that is adopted more often in contemporary classical guitar repertoire. This can create novel expressive phrasings, possibly leading to the formation of novel relationships with co-performers, or between performer and the composer, and between performer and future audience. While this may raise problems addressed in the discourse of historically-informed performance practise, one can also observe how this example is not arbitrary. Rather, it involves a precise choice to bring together two stylistic nuances conventionally known to belong to different historical periods, instruments, and repertoires. Recalling work by Kirton,[63] among others, this example illustrates how creative outcomes oscillate between adaptation (improvement of pre-existing concepts or items) and innovation (changes in a domain); it chimes also with the combinatorial kind of creativity proposed by Boden,[64] which focuses on the capacity to merge in novel ways categories or products that already exist, thereby generating novel ideas through a unifying process that is historically relevant.

Musical performers are immersed in a history of shared experiences that, once retained as embodied knowledge, can be expressed in various ways. This echoes the idea of EMH proposed above: the creative re-enactment of existing, shared experiences can give rise to novel intersubjective connections based on a de-centralization of agency, which involves the felt, imaginative, or predicted presence of other agents. Such relationships can be transformed on the basis of the moment-to-moment contingencies of performance, affecting our creative choices and corporeal experiences. So, not only does creativity play a role in developing such relationships, it can also be modified by existing connections. A further quotation precisely illustrates this point:

> "But even when alone, you may be in front of your piano, and try out different things and then you notice that a phrase came out of nowhere. And you ask: is this something I like and has a sense for what I have to do? It changes a lot if I have to play for myself or for others and with others. There are always constraints – an example is the reaction of the people around me. It is sometimes a matter of milliseconds – I can feel if what I play can be of any interest for others: their reactions, or possible reactions can really change what I play and come up with when improvising." (E3)

In each musical phrase composed, or even hinted on the piano, there is already a hidden sociality which affects us in various ways. Interestingly, our data also point to a double dimension of creativity: the first involves finding new solutions in response to certain circumstances; the second highlights the often-intuitive nature of the creative process, where something novel can be developed without a precise scope or goal (e.g., a musical phrase that pops up while improvising informally on the piano). The first

[62] Andrea Schiavio, and Hanne De Jaegher, 'Participatory sense-making in joint musical practices', *The Routledge Companion to Embodied Music Interaction,* ed. Micheline Lesaffre, Marc Leman, and Pieter-Jan Maes (New York and London: Routledge, 2017), 31–39.
[63] M. J. Kirton, *Adaption-innovation: In the context of diversity and change* (New York: Routledge, 2003).
[64] Margaret A. Boden, *The creative mind: Myths and mechanisms* (New York: Routledge, 2004).

sense seems to be something that we strive for; the second sense seems to be something that emerges from a combination of factors. In both cases, however, they cannot be considered as solitary events. Our analysis of musical creativity and agency suggests that individual musicking is in fact never individual. It belongs to an intersubjective domain where connections and relationships are established contextually. Even if composers, teachers, audience members, and co-performers (or other individuals) are not physically present during a performance, they can nevertheless transform musical goals, styles, and outcomes; influence expressive choice; and affect emotional aspects in various ways. These insights align with work by Benson,[65] who argues that "music making is something that we inevitably do with others (whether they are present or not)", and by Folkestad,[66] who maintains that "music making is … always a collective activity regardless of whether it is done individually or in a group". This contributes to expand existing work on musical interaction and creativity by putting individual practices under a new light.[67] Our findings suggest the need for conceptual apparatus which can privilege the idea that cognitive ecologies are enacted through musical participation. We propose that EMH might present as an alternative explanatory tool to support the paradigm shift that we see to be directing music cognition and music research away from individual solipsistic enquiries and towards fully social accounts of human experience. Therefore, terms such as 'sonic ecology', 'shared intercoporeality', 'social ecology', and 'shared musical ecology', lend themselves to further examination and development through future empirical research.

Before concluding, we wish to briefly address the main limitation of the present study, that is the lack of generalizability. Our data are not offered to test a hypothesis, but rather to provide a number of specific examples that can illustrate certain lived aspects of performative experience, through which we explore EMH as it plays out amongst those with lesser and greater degrees of musical expertise. As such, we make no attempt to account for – or to categorise – the forms of musical experience within each individual's history (a study designed towards those aims would call on significant ethnography, rather than semi-structured interviews). Additionally, future work can build on our theoretical framework to develop larger group analyses involving both qualitative and quantitative methodologies with participants with more different backgrounds and interests. A mixed-methods approach might be particularly useful to explore at different (physiological, neural, and phenomenological) levels the range of changes in motor control and sense of agency associated with the actual, felt, or imaginative presence of others, and how these shape creative outcomes. This can lead to a number of theoretical advances and practical insights, which could inspire novel interventions. These may include the development of mental training protocols based on controlled imaginative experience of others to help enhance the creative potential of the individual, or facilitate (a better awareness of) body control.

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[65] Bruce Ellis Benson, 'Improvisation' (2003) (p.164).
[66] See Göran Folkestad, 'Digital tools and discourse in music: The ecology of composition', *Musical Imaginations: Multidisciplinary perspectives on creativity, performance and perception*, ed. David Hargreaves, Dorothy Miell, and Raymond MacDonald (Oxford: Oxford University Press, 2012), 193–205. The passage reported here is quoted in Nicholas Cook, *Music as Creative Practice* (New York, Oxford University Press, 2018), p.8.
[67] See for example Nikki Moran, 'Agency' (2017).