PARTICIPATORY SENSE-MAKING IN JOINT MUSICAL PRACTICE

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Introduction
In this chapter we explore musical interactivity as a form of “participatory sense-making” (De Jaegher & Di Paolo, 2007). This concept is associated with emerging embodied approaches to cognition, which pose a growing challenge to the information processing or cognitivist models that have traditionally (and often tacitly) directed research and theory in psychology and cognitive science (see Clark, 1997). According to the latter framework, cognition is generally understood as an input-output schema where strict separations are posed between an objective reality “out there” and the “inner” skull-bound mechanisms that process representations of that outer world. However, locating cognition in the head may play down the active role of the situated living body in meaning- and world-making, and tends to portray the cognizer as a disembodied, decontextualized, and anonymous spectator in both individual and collective tasks (Varela, Thompson, & Rosch, 1991).

In response to such concerns, the embodied approach understands mental processes not simply as in the head—i.e., in terms of mechanisms, computations, and representations—but rather as fundamentally integrated with the body of the cognizer in different ways (Thompson, 2007). Researchers have put forward a number of interpretations to explain how this could be so (Gallagher, 2011). For example, advocates of a sensorimotor approach maintain that what truly matters for cognitive processes is the mastery of certain concrete abilities that allow the animal to interact with the world (O’Regan & Noë, 2001). Others have adopted a more enactive interpretation, which considers the living body not only as the primary source of significance for our being-in-the-world, but also as a truly autonomous cognitive system in its own right (Varela, 1979). Here the origins of mind are to be found in the embodied processes through which an organism maintains itself through constant adaptive interactivity with the environment—where the body’s biological structure determines the regulation and control of the homeostatic needs of the cognizer, who continually strives to maintain a stable relationship with its niche through affectively motivated forms of action-as-perception (Stewart, Gapenne, & Di Paolo, 2010). In other words, the body’s metabolic, homeostatic, neurologic, immune, and thermodynamic systems allow the living self-organizing creature to interact with the world in a way that is meaningful in terms of its being-in-the-world: Because the system’s autonomous existence depends on maintaining metabolic stability under shifting worldly conditions, both bodily and environmental factors participate in driving cognitive processes in a recursive interplay (Di Paolo, 2009). The relational domain of cognition is thus not reducible to structures inside the head but is rather constituted by the active interplay between living system and its environment, which are understood to be co-emergent (Chemero, 2009).
It should be noted here that this enactive view of embodied cognition, as originally put forward by Varela et al. (1991) and then developed by a number of other authors (e.g., Colombetti, 2014; Hutto & Myin, 2013; Thompson, 2007), contrasts with positions such as extended functionalism, for example, which sees the body as a tool that mental operations can be offloaded onto, without offering a truly phenomenological and autonomous account of it (see Wheeler, 2010). Indeed, from the enactive perspective, a living, phenomenological body is not merely an objective piece of the world that helps us perform particular perceptual or cognitive tasks, nor can it simply be understood as a mediating category that separates de facto the realm of inner subjectivity from the world “out there.” Rather, it is the fundamental source of experience open to the social and physical environment, a flexible entity that participates adaptively in the world (Kyselo, 2014).

Embodied approaches to the study of human musicality, especially in relation to human ontogenesis, well-being, and how we make sense of the social and cultural environments we inhabit, emerged in recent years from a variety of perspectives (Leman, 2007; Reybrouck, 2005; Schiavio & Altenmüller, 2015). In particular, a growing number of empirical studies have provided evidence in support of an embodied interpretation of musical experience (Broughton & Stevens, 2009; Leman, Desmet, Styns, Van Noorden, & Moelants, 2009; Toiviainen, Luck, & Thompson, 2010). This work is exceptional in highlighting the role of the body for music performance, emotion, and perception (Keller, 2014; Maes, Leman, Palmer, & Wanderley, 2014; Maes, Van Dyck, Lesaffre, & Leman, 2014). However, it is from a more explicitly enactive perspective that we would like to discuss the concept of “participatory sense-making” in the following sections (De Jaegher & Di Paolo, 2007). This concept, situated within an enactive and phenomenological framework (Gallagher & Zahavi, 2008; Hanna & Maiuse, 2009), may help us better comprehend the complex dynamics in play when musicians interact and cooperate to achieve a musical task (Moran, 2014a, 2014b; Schiavio, 2014). Indeed, operating from this perspective will allow us to highlight the concrete patterns of sensorimotor, emotional, and communicative interaction among musical subjects and provide an alternative to what can be named the “spectatorial stance.” The latter, it may be argued, reflects a common perspective in cognitive science based on the assumption that the individual unit is sufficient to explain interaction (Reddy & Uithol, 2015). In music research, for example, studies framed within so-called simulation theory may consider musical interactivity as a matter of the individual—as the single individual can simulate internally the actions performed by the other performer(s) and respond accordingly—rather than of the interaction itself (e.g., Keller, Knoblich, & Repp, 2007; Schiavio et al., 2014).

With this in mind, we also contrast this traditional view with the phenomenological approach of “mutual incorporation,” which describes the way in which two or more (musical) subjects form a common intercorporeality when acting together (see Fuchs & De Jaegher, 2009). The remainder of the chapter will be structured as follows: In the next section we introduce the notions of participatory sense-making and mutual incorporation in the context of the embodied and enactive frameworks. We then explore these two concepts through the lenses of musical agency and interactivity. To conclude we discuss the main implications emerging within the broader context of musical research and make predictions for further empirical corroborations.

**Embodiment, Participation, Incorporation**

Embodied and enactive approaches to cognition ask us to rethink the relationship among brain, body, and world (Wilson, 2002). They help us reconsider the meaning of body by emphasizing its dynamical and self-determining properties, and to re-define the “world” not as a given category “out there,” but rather as an affordative structure, which has certain values and meanings depending on the adaptive complexity of the cognizer who interacts with it (Colombetti, 2014). In doing so, such frameworks do not identify brain with cognition or experience because...
extra-neural (environmental and bodily) factors are co-constitutive in driving mental processes (Di Paolo & De Jaegher, 2012). This implies that there is a primacy of bodily based skills over high-level mental faculties to understand how living beings participate in the changing dynamics of the world (Rizzolatti & Sinigaglia, 2008). Indeed, by adaptively developing its network of flexible self-generated properties and actions in relevant ways, the animal is able to maintain its own organization under precarious conditions (Varela et al., 1991). This idea is also known as “autonomy,” as the living system generates everything needed to stabilize its engagement with the world. But since these properties are self-regulated by the constant interaction of the system’s neural and extra-neural sub-networks, it is argued that the cognizer is also a “sense-maker”; that is, the creature must self-generate its own goals, significance, and meanings as it actively seeks out and develops the affordances of the environment (Thompson, 2007). In other words, sense-making defines cognition for enactivists because it accounts for the meaningful ways in which the living being interacts with the world. In the social domain, these enactive sense-making processes are explored in the study of interaction (e.g., Bourbousson, R’Kiouak, & Eccles, 2015; van Alphen, 2014), which represents a growing area of research across diverse fields such as development (e.g., Reddy, 2003, 2008), neuroscience (e.g., Favela, 2014; Riverstein & Miller, 2015), pathology and therapy (e.g., Behrends, Müller, & Dziobek, 2012; Koch & Fischman, 2011; Öberg, Normann, & Gallagher, 2015; Samaritter & Payne, 2013), philosophy of mind (e.g., De Jaegher & Di Paolo, 2007; Gallagher & Hutto, 2008), and music (e.g., Correia, Tahiroğlu, & Espada, 2013; Moran, 2014a, 2014b).

**Sharing Musical Worlds of Meaning**

In social contexts, sense-making is participatory because social dynamics such as coordination and interaction may affect individual sense-making (De Jaegher, 2009). This can be seen, for example, in interactions between infants and primary caregivers. Infants are not just passive responders, but actively participate in the development of shared forms of communication and meaning-making through bodily and facial gestures and (proto-musical) utterances (Fantasia, De Jaegher, & Fasulo, 2014). In such primordial social coordination, meanings and intentions are not pre-given but rather are “shaped and adjusted as the interaction unfolds” (Fantasia et al., 2014, p. 6). With this in mind, we argue that because skilled coordination is a fundamental part of making music together, musicians (and audience), as a coupled system, participate in, and thus can form and transform each other’s sense-making, enacting unique shared worlds of meaning.

Think of two musicians playing together: How is it possible to study, model, and understand their ability to anticipate, complement, and participate in the other’s musicking? The theory of participatory sense-making sees the musicians as interactors, who are first and foremost highly plastic systems (De Jaegher & Di Paolo, 2007; Gallagher, Hutto, Slaby, & Cole, 2013; Kelso, 1995) who negotiate the often contingent patterns of goal-directed actions to be employed in a musical performance without inferential mediation. By this light, the phenomenological character of playing together cannot be studied through a stimulus-response perspective, nor through a sender-receiver framework, because its very nature requires that the coupling among musicians becomes self-sustaining (Di Paolo & De Jaegher, 2012).

Put simply, the relational nature of musical experience is made explicit by the concrete adaptive activities of the living bodies embedded in the musical environments they co-create in the performance (Schiavio, 2014). Shared musical practices, in this sense, are not fully based in mental processes and behavioral outputs established before the interaction. No matter how many times a trio or a duo rehearses, no matter how much its members practice individually, a collective performance will always entail a different phenomenology—one based on shared agency, shared intentionality, and contingently negotiated coupling in that unique context. This is not to say that prior rehearsals do not count in...
the development of a musical performance. The set of skills acquired through individual practice and rehearsal constitute a repertoire of acts, a set of possibilities that must be enacted or brought forth in light of the affordative demands of the music that is co-created; in and through our actions, emotions, thoughts, feelings, perceptions, we participate in the way other creatures make sense of the world, but we also depend reciprocally on the others’ sense-making as well (e.g., see Laroche & Kaddouch, 2014). In this way, the dynamical nature of sense-making may reveal the “musical object” not as a fixed and wholly pre-given structure, but rather as an emergent phenomenon that develops through shared active involvement in the musical event; the musical object is, by this light, an ongoing open structure that shapes and is shaped by the sense-makers in a circular fashion. This is true not only when considering musicians playing jointly, but also when a musical performance involves an audience (Geeves, McIlwain, & Sutton, 2016; Krueger, 2014a). Indeed, because interactivity is not a property of a single individual who “reads the mind” of the other and “responds” accordingly, there can be musical interactions before explicit communicative processes are achieved (De Jaegher & Froese, 2009; Schiavio, 2012). In other words, musical experience cannot be reduced to a causal process that resembles the classic categorization of the mind as a problem-solving device—one that perceives the musical event, elaborates a specific mental state (creating a musical mental representation), and produces an appropriate behavioral output. Although nowadays few researchers in music explicitly maintain such a view, it may be argued that leftovers of this position are still tacitly posited when describing collective music making through an input–output schema (see Schiavio & Hoffding, 2015 for discussion). Instead, we argue that musical communication is realized in the cooperative generation and transformation of musical meaning; it depends on the embodied participation of everyone involved in realizing the collective musical event and is thus best described in nonlinear, dynamical, and phenomenological terms.

Enacting Intersubjective Corporeality

From a phenomenological perspective, the way in which musicians play together may be best understood as ‘mutual incorporation’ (Fuchs & De Jaegher, 2009). The process of participatory sense-making is always a matter of gestures, expressions, speeches, and concrete actions, which allows for one individual to be integrated in the body schema of the other in a non-trivial way—as a dynamical source of significance that integrates and complements the subject’s original point of view of the world.

To simplify things, we might first consider the notion of “incorporation” where a musical instrument—rather than an embodied agent—is involved. For example, Nijs, Lesaffre, and Leman (2013) describe musician–instrument interactions in terms of transparency and incorporation. That is, when playing a musical instrument, an agent incorporates it into her cognitive system rather than simply using it as an occurrent object. Consider Merleau-Ponty’s famous example of the blind man using a cane. As the cane becomes a transparent tool, incorporated into the agent’s body image like an “extension of the bodily synthesis” (1945 [1962], p. 153), the blind man becomes able to “see” through his cane by interpreting the data of the world without any inferential mediation (i.e., without measuring the cane in order to understand the distance of an object or feeling the pressure on his hand when the stick hits an object). Similarly, musical instruments may become transparent tools during performances (see also Heidegger, 1927). Here, Merleau-Ponty’s analysis of the organist is illuminating. Like the blind man, the organist explores a new instrument without analyzing the instrument in a disembodied way. He does not prepare a plan or develop abstract cognitive representations of the registers and the pedals. Indeed, during the rehearsal or during a concert, the keys, the registers, and the pedals are not simply located in an objective space. Rather, they become a horizon of musically directed motor possibilities and are therefore intermixed with the musician’s physiology and the musical environment in constitution.

These insights resonate with the idea of “transparency constraint” proposed by Thompson and Stapleton: “for anything external to the body’s boundary to count as part of the cognitive system it
must function transparently in the body’s sense-making interactions with the environment” (2009, p. 29). In joint musical practices, sense-making is always participatory in a strong sense, because both the object (the musical piece) and the dynamical process shaping it (playing together) are possible only through the systematic and recursive influence of each individual on another. Thus, like the relationship between musicians and their instruments (i.e., as ready-to-hand equipment), also the relationship between musical participants can be seen as enmeshed, where the horizon of possibilities is constituted by their embodied interactivity—the common inter-corporeality “lives” in the music and in the embodied interactivity that constitutes it. To repeat, music in intersubjective contexts is never “fully constituted”—it is not “given.” Rather, it is always shaping and being shaped, through time, space, and interactive dynamics—all of these elements are coupled together in musical perceptual experience. Interestingly, from a neuroscientific point of view, the dynamics of actions present in the musical feedback have been shown to occur pre-attentively, further highlighting the active role played by the body—over reflective awareness—in constituting musical experience (Lahav, Salzman, & Schlaug, 2007; Overy & Molnar-Szacaks, 2009; Schiavio, Menin, & Matyja, 2014).

Taken together, participatory sense-making and mutual incorporation point to a theoretical framework in which the coupling of interactors through participatory sense-making constitutes new intersubjective bio-cognitive organizations. By this view, the creative, transforming, and shared forms of embodied world-making that characterize living musical interactions display a bidirectional relationship with the “musical object.” They are irreducible to mind-reading, simulation, and sender-receiver modeling, as well as purely “in-the-head” cognitivist approaches. As such, we argue that further empirical and theoretical frameworks aimed at investigating musical interactions should explore the domain of mutual co-determination unfolding among music users and music makers (see D’Ausilio, Novembre, Fadiga, & Keller, 2015; Demos, Chaffin, & Kant, 2014; Glowinski et al., 2013).

Conclusion: Dynamically Open Co-Creation of Music

In this chapter we examined how a phenomenological and enactive perspective on embodied musical interactivity enriched by the notion of participatory sense-making may inspire a more nuanced understanding of the complex dynamics involved in joint musical practices. In doing so, we are heeding the call of Moran (2014b), who shares with us some of the same worries concerning the legacy of individualism in music psychology research; we agree with her that we need to highlight social interactions as the heart of joint musical behaviors and develop our research agenda accordingly. With this in mind, we find that enactive-friendly approaches to cognition provide a fertile ground for such an enterprise—one that may open fascinating new perspectives for the study of human musicality and cognition (van der Schyff, 2015). To anticipate a likely objection, however, we want to clarify that we do not endorse an implicit version of behaviorism or interactionism. Enactivism differs from both. First, as acknowledged by Moran (2014b), enactivists do not tend to reduce meaning to behavior only. Meaning is rather enacted through the history of structural coupling between organisms and environment; it depends on neural and extra-neural (bodily, wordly, interactive) factors and as such is not simply dependent on or causal to behavior. Rather, behavior and meaning, perception and action, “low level” and “high level” processes are always mutually and dynamically interacting in nonlinear terms. This makes enactive approaches to music cognition highly attractive, not only with regard to studying the relationship between music and movement but also for the processes of interaction and meaning-generation. In fact, while we recognize the outstanding work done by recent studies on movement analysis for communication, sensorimotor synchronization, and interactions among performers (e.g., Badino, D’Ausilio, Glowinski, Camurri, & Fadiga, 2014; Repp, 2005), we also notice the risk of being committed to an individualist or Cartesian framework when movements are not coherently integrated.
with the constitutive dynamics of meaning-making and interaction. We say Cartesian because some may interpret the focus on movement analysis as representing movement as a distinct category from cognitive processes, giving rise to the dichotomy we previously discussed between inner subjective experience and objective external world. This may emerge, for example, when the notion of mental representation is adopted to describe the way in which performers elaborate a stimulus “in the head” before generating a relevant behavioral outcome (e.g., Davidson, 2005). Also, our framework is different from interactionism (see De Jaegher & Di Paolo, 2013). Indeed, while we consider interactivity to be necessary for understanding (music) cognition, we do not endorse a view that sees embodied interactions as sufficient for cognitive processes to take place. Rather, interactions are understood as fundamental to sense-making, which shapes how living systems engage with the world as autonomous entities; they entail the study of how individual and participatory forms of sense-making relate and affect each other in non-reductionist terms (Di Paolo & De Jaegher, 2016).

Lastly, while we argue that methodological individualism may fall short of capturing the concrete dynamics of musical interactions, we do not attempt to make interactivity the only factor in play. This is best understood when considering how dynamical systems may elegantly model interactive situations (Kelso, 1995). Good examples of the application of dynamic systems to musical performance and entrainment come from Clayton (2013), while other studies have focused on musical tonality (Large, 2010) and interactive performance and artificial systems (Zhang & Miranda, 2007), among others. Dynamic systems are indeed useful in characterizing living systems as truly open, context-dependent, but at the same time “patterned and recurrent” (Colombetti, 2014, p. 58) creatures. As De Jaegher and Di Paolo (2007) put it, considering interactions as autonomous processes allows dynamic systems models to study the histories of coordination, breakdowns, and recoveries that characterize self-sustaining interactions at different levels and timescales. Along these lines, exploring the degrees of interactivity occurring in real time among sense-makers may reveal interesting features of what musical interactions entail. This could shed light, for example, on whether a system comprising performers with similar degrees of expertise will suffer fewer perturbations and be thus more stable in terms of performance accuracy when compared to music-makers with different years of musical training (see Schiavio & Cummins, 2015). Moreover, modeling how the loss and regain of coordinated behavior impacts individual musical choices and the perceived expressivity of the musical material could shed new light on how sense-makers gain new contextual significance through interactions—how they negotiate emotional, expressive, sensorimotor, and communicative musical skills to “bring forth” the music in real time. While many more possibilities remain to be considered, we hope to have provided here a useful introduction to how the idea of participatory sense-making can help better understand the complex dynamics governing both the flexibility and openness of musical creations, as well as the dialogical, active, and participatory nature of music in interaction.

Acknowledgements

We are grateful to Dylan van der Schyff and Nikki Moran, whose comments on our first drafts improved the quality of this chapter. We also thank the editors and the anonymous reviewers for their insightful suggestions and remarks.

References


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