Towards an Embodied Instrumental Music Pedagogy

Creativity through Embodied Affordance Navigation

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Abstract: This chapter examines the role of embodiment in instrumental music education and creativity development. In contrast to the traditional conservatoire approach, which often reduces the musician's body to a mere tool for reproducing predetermined musical interpretations, it proposes an alternative framework that places bodily engagement at the core of instrumental music learning. Drawing on theories of embodied music interaction, dynamical systems, and non-linear pedagogy, this chapter presents an embodied music pedagogy as an integrative approach that acknowledges how musical understanding emerges through an embodied interaction with music. Such interaction is deemed necessary to engage with music creatively. It builds on the basic mechanism of musical interaction, namely entrainment, alignment, and prediction. The presented embodied music pedagogy is explained based on its theoretical foundations, which include the theory of embodied interaction, dynamical systems theory, and non-linear pedagogy in conjunction with the constraints-led approach. Viewing a lesson as a whole of continuously interacting components (teacher, learner, content), this pedagogy argues that musical skills and understanding emerge from these dynamic interactions over time as shaped by a set of individual, task, and environmental constraints. Addressing the context of instrumental music education, this chapter argues that the possibility to engage in an embodied interaction with the music played and to navigate the affordance landscape creatively depends on incorporating the musical instrument as a natural extension of the musician. It explores how musical creativity emerges dynamically through the navigation of affordances in the interaction between performer, instrument, and musical environment. Finally, it presents a movement-based, or kinemusical, approach to instrumental music education that aims to foster creativity through integrating movement and music playing. After explaining the basic premises of this approach, it discursively elaborates on how such an approach may foster creative music playing. A basic idea is that this approach fosters metastable states where learners navigate multiple – bodily, instrumental, and musical – affordances, thereby creating the condition for creative musical expression beyond conventional performance patterns.

Keywords: instrumental music education – embodied music interaction – musician-instrument-relationship – affordance landscape – affordance navigation

Vers une pédagogie de la musique instrumentale incarnée : La créativité à travers la navigation d'affordance incarnée

Résumé : Ce chapitre examine le rôle de l'incarnation dans le domaine de l'enseignement musicale instrumentale et le développement de la créativité. Contrairement à l'approche traditionnelle des conservatoires, qui tend à réduire le corps du musicien à un simple outil de reproduction d'interprétations musicales prédéterminées, il propose un cadre alternatif qui place l'engagement corporel au cœur de l'apprentissage d'un instrument de musique. S'appuyant sur les théories de l'interaction musicale incarnée, des systèmes dynamiques et de la pédagogie non linéaire, ce chapitre présente une pédagogie musicale incarnée comme une approche intégrative qui reconnaît comment la compréhension musicale émerge à travers une interaction incarnée avec la musique. Une telle interaction est jugée nécessaire pour s'engager de manière créative dans la musique. Elle s'appuie sur le mécanisme de base de l'interaction musicale, à savoir l'entraînement, l'alignement et la prédiction. La pédagogie musicale incarnée présentée est expliquée sur la base de ses fondements théoriques, qui comprennent la théorie de l'interaction incarnée, la théorie des systèmes dynamiques et la pédagogie non linéaire, en conjonction avec l'approche fondée sur les contraintes. Considérant une leçon comme un ensemble de composantes en interaction continue (enseignant, apprenant, contenu), cette pédagogie soutient que les compétences et la compréhension musicales émergent de ces interactions dynamiques au fil du temps, façonnées par un ensemble de contraintes individuelles, liées à la tâche et à l'environnement. Dans le contexte de l'enseignement de la musique instrumentale, ce chapitre soutient que la possibilité de s'engager dans une interaction incarnée avec la musique jouée et de naviguer de manière créative dans le paysage des affordances dépend de l'intégration de l'instrument de musique comme une extension naturelle du musicien. Il explore comment la créativité musicale émerge de manière dynamique à travers la navigation des affordances dans l'interaction entre l'interprète, l'instrument et l'environnement musical. Enfin, il présente une approche de l'éducation musicale instrumentale basée sur le mouvement, ou kinemusicale, qui vise à favoriser la créativité en intégrant le mouvement et la pratique musicale. Après avoir expliqué les prémisses de base de cette approche, il explique de manière discursive comment une telle approche peut favoriser la pratique musicale créative. L'idée de base est que cette approche favorise des états métastables dans lesquels les apprenants naviguent entre de multiples affordances – corporelles, instrumentales et musicales – créant ainsi les conditions d'une expression musicale créative qui dépasse les schémas de performance conventionnels.

Mots-clés : éducation musicale instrumentale – interaction musicale incarnée – relation musicien-instrument – paysage d'affordances – navigation d'affordances

1 Introduction

Performing music is one of the most complex human activities, addressing a performer's wide range of physical, cognitive, emotional, and social capacities. Not surprisingly, learning to perform is an intensive process that requires effort and perseverance to acquire the necessary instrumental skills, such as posture and technique, in addition to developing musical understanding, expressiveness, communication, and creativity.

Europe has a long and strong tradition of music education, the so-called conservatoire tradition. Being passed down for generations from teacher to student and prevailing worldwide in many instrumental music classrooms (Burnard 2014; Jorgensen 2011), this tradition has led to high standards of musical performance, brilliant musicians, beautiful repertoire, and outstanding instructional materials.

Despite these achievements, however, this tradition, especially its underlying master-apprentice teaching model, is prone to critiques based on recent pedagogical insights (Nijs 2019). Studies show that this model is often characterized by a teacher-centered approach that focuses on technique to promote reproductive imitation (Persson 1994; Rostvall/West 2003) that mainly uses verbal feedback and aural modeling as a mode of instruction. Arguably, this model neglects important aspects of learning such as learner autonomy, self-efficacy, self-regulation, the individual artistic voice, and creativity (McPherson/Welch 2012). Such critiques call for a reconsideration of in-

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strumental music teaching, thereby, for example, creating space in the curriculum for artistic creation (e.g., improvisation, composition), learner-centered teaching, and student initiative (e.g., choice of repertoire).

Nijs (2019) argued that a viable way to address the critiques and challenges that instrumental music education faces, is by bringing the body to the heart of the instrumental music learning process. According to the author, this can be achieved by promoting bodily engagement at the intersection of personal style, instrumental gestures, and bodily responses to the music through the deliberate use of expressive movement.

> Classical musicians are taught not to move. I've heard that from my Juilliard students. Their teachers tell them not to move when they play. It's undignified, they're told, it's not artistic. This rigidity has got to go[1]..

As indicated by Sandow, the deliberate use of movement in the instrumental music classroom is not evident, given the traditional approach to instrumental music education and its instrumentalist approach to the musician's body. That is, the body is conceived as a tool that needs to be mastered in view of playing the instrument. From this perspective, the body often becomes detached from the musical signification or sense-making process, as the meaning of the music is predefined by the teacher's model (see also Behnke 1989). Such an approach favors a "docile" body that, through templates of correct posture and instrumental technique, is deployed to reproduce the music according to a disembodied model of the music. As such, the learner does not construct the model based on their subjective – corporeal – experience of the music. Instead, it is provided by the teacher – the "master" – in the form of propositional knowledge or by aural modeling. This leads to "competent" performances that draw on conventional (e.g., determined by a particular school of playing) ways of moving, orienting, and behaving. Similarly, the musical instrument is conceived as a mere means, a channel through which previously established (e.g., through deliberate practice) musical intentions are communicated to an audience (Coonfield 2006).

In contrast to such a traditional instrumentalist view, an embodied approach envisions a "motile", or free and flexible body that draws on its original motility (Merleau-Ponty 1945) to attune to and perceive the elements of the music and attribute meaning to it based on an embodied model of the music. Here, the role of the body is constitutive of the musical sense-making process. Thus, musical understanding is embodied in the sense that it originates from feeling the music from within, that is, through the bodily sensing, feeling, and experiencing of the musical sounds (Shepherd 2002). It emphasizes the importance of the bodily experience of musical elements preceding the control of musical parameters, whereby the body is no longer a recalcitrant object that needs to be controlled or mastered to adequately play the instrument (Behnke 1989). Instead, it becomes a subject, a primary source of individual musical signification processes through the articulation of the lived experience of the music through instrument-mediated body postures and body movement.

[1] http://www.artsjournal.com/sandow/2007/11/berlin_moves.html (accessed 29/04/2025).

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Such *subjectification* of the body is based on an embodied interaction with the music, which requires the *incorporation* of the instrument (Nijs/Lesaffre/Leman 2013; Nijs 2017). The latter involves the transformation of the musical instrument from a mere artifact into a "natural" extension of the body (Nijs 2008), whereby the instrument's use and functioning have become so natural that it seems, or feels, an organic component of the musician's body (Nijs et alii 2013). As such, instrumental gestures (sound-producing and sound-facilitating; Jensenius/Wanderley/Godoy/Leman 2010) become constituents of the dynamic structure of the body (body schema) and, therefore, part of the somatic know-how of the musician (Behnke 1989). Consequently, incorporating the instrument enables the bodily motility required to engage in an embodied interaction with the music.

This chapter couples the above-described "embodied" perspective on the body and instrument in performance to the development of musical creativity. First, it presents Bremmer and Nijs' (2022 and 2024) Embodied Music Pedagogy as the overall pedagogical framework. We describe its musicological and pedagogical-didactical pillars: embodied music interaction, dynamical systems, non-linear pedagogy, and the constraints-led approach. The following section focuses on the musician-instrument relationship, connecting it to an embodied dynamic perspective on music performance. This is followed by a section that elaborates on an embodied perspective on musical creativity, addressing the dynamic interaction between musician, instrument, and music based on the concept of affordance navigation. Finally, this is exemplified by a kinemusical approach to instrumental music education.

2 Embodied Music Pedagogy

The Embodied Music Pedagogy, as conceived by Bremmer and Nijs (2020, 2022, 2024), acknowledges the fundamental role of learners' and teachers' physical and expressive interaction with music and each other in shaping the musical learning process. It is developed for group lessons where communication through/with/in sound and music is the dominant mode. This pedagogy is by nature multimodal, inviting musical engagement through all the senses and, as such, addresses learners' sensorimotor, affective, creative, and cognitive resources. Through movement-based music activities, it seeks to broaden and deepen learners' prior musical knowledge and stimulate them to physically engage with each other in joint musical sense-making.

The Embodied Music Pedagogy is rooted in the integration of musicology and pedagogy. It has three theoretical pillars: (1) the theory of embodied music interaction (2) dynamical systems theory, and (3) non-linear pedagogy and the constraints-led approach.

2.1 Embodied Music Interaction

Making music is all about learning to make sense of the music so we can understand it and communicate that understanding in an expressive and creative way. According to the theory of embodied interaction, musical sense-making is the outcome of active bodily involvement with music, in which musical patterns are associated with movement patterns that allow us to discover intentional states (Leman 2016). En-

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gaging with music –by listening, dancing, improvising, or performing – facilitates the formation of a sound-movement-intention association, thereby converting a sequence of sounds into meaningful musical experiences (Nijs/Bremmer 2019). That is, we associate auditory patterns (e.g., chord sequences, rhythmic structures, or melodies) and kinetic patterns (e.g., form, direction, energy) with the intentional states (e.g., emotions) that underlie these patterns. This physical engagement with music is called *enactment* (Leman 2016). Empirical research has found that different bodily mechanisms facilitate this enactment process (Leman 2016), namely entrainment, alignment, and prediction. People are born with these mechanisms that aid them in experiencing and making sense of music (Honing et alii 2009).

Entrainment is the process of being pulled towards synchronization. It can happen between objects (*cf.* Huyghen's clocks; Bennet et alii 2002) but also between people and music (Clayton/Sager/Will 2004). As soon as people listen to music, they are pulled to the beat, which (unconsciously) causes them to seek, find, hold, and, in a sense, become the beat (Leman 2016).

When listening to music and establishing a timing framework, people will often start *aligning* their physical movements to specific features in the music, thus visualizing elements in the music, such as the melody or harmonic sequence, with their body (Eerola/Luck/Toiviainen 2006). Leman (2016) distinguishes between two different forms of alignment: *phase* alignment, i.e., aligning movements to rhythmical structures in music, such as the beat, and *inter-phase* alignment, i.e., aligning movements to elements in-between beats, such as showing the melodic contour, dynamics, or harmonic structures of music with their body. Such movements help people to develop an expressive and "felt" understanding of music.

Establishing a global timing framework through the mechanisms of entrainment and alignment is connected to the ability to *predict* how the music unfolds as well as the outcome of a movement, such as hitting a drum or reaching (e.g., with the hand) a point in space when dancing. The way we interact and predict music is influenced, for example, by the biomechanical constraints of the body (such as the length and form of our legs and arms; e.g., Dahl/Huron 2007), and our state of arousal (feeling fatigued or being energetic). From this perspective, prediction or anticipation of music is viewed as the expected outcome of *bodily-mediated* perceptions and physical actions with music rather than the expected outcome of a direct line between music and the brain (Leman 2016).

The three basic mechanisms are not strictly divided but interact with each other, allowing people to make sense of music with and through the body. Within Embodied Music pedagogy, musical activities are designed to stimulate the further development of these mechanisms.

2.2 Dynamical systems theory

Embodied Music Pedagogy is also based on the dynamical systems theory and therefore Bremmer and Nijs conceive of a music lesson as a dynamical system in which learning emerges throughout the dynamic interaction between teacher, learner, and learning content (Bremmer/Nijs, 2020, 2022, 2024).

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Within the term dynamical systems theory, "system" refers to a network of components, "dynamical" refers to how those components always influence each other and the system as a whole, and how the system influences the individual components (Thelen/Smith 1994; Van Gelder 1995). As such, learners, the music teacher, and learning content influence each other *and* the music lesson as a whole. In turn, the way a music lesson develops influences learners, the music teacher, and the learning content.

From a dynamical systems perspective, the development of new musical knowledge and skills results from multiple interactions over time between learner(s), music teacher, and learning content (Chow/Davids/Hristovski/Arajo/Passos 2011). During those interactions, learners develop a relationship with their learning environment by attuning to its affordances (Renshaw/Chow 2019). Affordances can be viewed as environmental properties providing "opportunities for action" (Renshaw/Chow 2019 : 10; see also Gibson 1979): tools (e. g., instruments), activities (e.g., performing, improvising), and places (e.g., classroom, concert hall) all have properties that can elicit certain actions in learners. For instance, when pupils notice a drum, they will often spontaneously start hitting it as the drum provides that opportunity for action.

Teachers can support learners in becoming perceptually attuned to the affordances relevant for learning a certain skill by introducing constraints (Abrahamson/Sánchez-Garcîa, 2016). This approach is characteristic of a non-linear approach, including the constraints-led approach.

2.3 Non-linear Pedagogy and the constraints-led approach

Non-linear pedagogy is an educational approach that challenges the traditional, step-by-step (linear) methods of teaching and learning. The core idea is that learning does not follow a straight path from one stage to the next, but rather, it is viewed as a dynamic, constantly evolving process influenced by numerous interacting factors. In instrumental music education, such a linear approach is often repertoire-based, based on the belief that "a well-planned repertoire creates the framework for an excellent music curriculum that fosters the musical growth of our students" (Reynolds 2000 : 31).

Drawing on principles from dynamical systems theory, non-linear pedagogy views classroom learning as a self-organizing process where outcomes emerge from the dynamic interaction between the teacher, the learner, and the learning environment. As such, in view of creating possibilities for students to discover and develop their own understanding, teachers design activities that encourage exploration and experimentation rather than simply following a strict and linear predetermined curriculum.

The design of activities is often based on placing boundaries or "constraints" on the learners, thereby shaping or limiting certain behaviors (Newell 2003), helping them to focus on specific affordances, i.e., environmental properties providing learners with "opportunities for action" (Renshaw/Chow 2019 : 10; see also Gibson 1979). Newell (2003) distinguishes between three broad constraints. *Individual* constraints refer to a learner's characteristics and can be structural or functional. The former are constant, such as the size of a hand. Think of the ability to play chords on

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the piano, whereby the size of the hands matters. The latter can be changed or influenced, such as motivation, fatigue or concentration. *Task* constraints include the goal of a task, feedback on the task, or questions posed by a teacher or peer during a task (Hopper 2012). *Environmental* constraints refer to factors surrounding learners, such as classroom size, materials, or social factors, such as peers (Hopper 2012). In education, the different constraints interact in a certain way, influencing learners' self-organized development and causing a wide variation in development (Schiavio/Van der Schyff 2018).

3 The instrument as a natural extension of the musician

Musical performance is a highly complex, embodied activity in which the musician's body, instrument, and musical environment form an interconnected, complex dynamical system (Nijs et alii 2023). According to Nijs (Nijs et alii 2013; Nijs 2017), through repeated skillful interaction, the instrument may no longer be perceived as an external object but becomes a natural extension of the musician's body, allowing for a seamless and intuitive expression of musical ideas. Here, "natural" means that the instrument becomes transparent in use, as much as, for example, our arm is when we drink a coffee. Consequently, it becomes possible to express oneself freely and flexibly, without having to be preoccupied with the instrument, with how to play. In other words, the musician can focus on interacting with the music, fellow musicians, and the audience.

Incorporating the musical instrument, or the merging of musician and musical instrument, implies that the musician no longer experiences a boundary between herself and the instrument. The famous cellist Rostropovich expresses it as follows:

> There no longer exist relations between us. Some time ago I lost my sense of the border between us … there I was – and my cello became just a red spot at my belly, like a dissected peritoneum. And actually, I feel it now in this manner, much like a singer seems to feel his vocal cords. I experience no difficulty in playing sounds. Indeed, I give no report to myself on how I speak. Just so, I play music, involuntarily. The cello is my tool no more.

Here, the instrument is felt from within and has become like an organic component of the body (Nosulenko/Barabanshikov/Brushlinsky/Rabardel 2005; Zinchenko 1996). That is, the musical instrument is integrated into the bodily coordination system and, consequently, instrumental gestures become constituents of the dynamic structure of the body and, thereby, part of the somatic know-how of the musician (Baber 2003; Behnke 1989). As a result, material, functional, and formal features of the musical instrument no longer require to be explicitly represented and the musical instrument becomes relationally and functionally transparent in use (Rabardel 1995). Relational transparency implies that the musical instrument does not interfere with the direct perception of the musical environment. The *functional* transparency makes the musician feel she is responding directly to the musical environment, without cognitive reflection and relying solely on acquired skills. According to Nijs et alii (2013), direct perception and skill-based acting are essential components of an embodied interac-

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tion, i.e., an interaction in which the three basic mechanisms can, unhindered by instrumental concerns, function and promote meaningful interaction with the music.

The merging of musician and instrument is, however, not evident. It requires a gradual and dialectic process that transforms the musical instrument from a mere material artifact into a "functionally integrated, goal-oriented configuration of internal [musician] and external [musical artifact] resources" (Kaptelinin 1996). An important part of this process is the accumulation of peak – or so-called "flow" – experiences, defined as "a holistic sensation that [musicians] feel when they [play music] with total involvement" (Csikszentmihalyi 1990). The actual "feeling" of having merged with the instrument can be considered grounded in such optimal subjective experience (Nijs et alii 2013). Every time a musician experiences flow, the musical instrument becomes transparent and temporally a natural extension of the body. In the beginning, such an optimal experience will only have a short-term effect. However, the repeated experience will render the mental schemes that accompany the feeling of having merged with the musical instrument permanent. This presumably results in a long-term intuition, even when the instrument is not at hand.

4 Embodied musical creativity

According to theories on the embodied nature of cognition, the body and body movement play a significant role in higher-order cognitive processes, such as creativity (e.g., Matheson/Kenett 2020). This link between body movement and creativity has been addressed in a growing body of research (for an overview, see Frith/Miller/Loprinzi 2020), showing that movement may indeed enhance creativity. Whole body movement, and in particular unstructured, interactive, or spontaneous movements appear to introduce opportunities for unexpected perceptions and shifting perspectives (e.g., Kuo/Yeh 2016; Zhou/Zhang/Hommel/Zhang 2017). Moreover, studies of musical creativity consistently indicate the involvement of motor regions, indicating that musical creativity might be about "movement for sound's sake" (Bashwiner/Bacon 2019).

In line with existing work on movement and creativity and adopting a dynamic, action-oriented, and relational perspective on creativity (Glăveanu 2012), Nijs et alii (2024) argue that musical creativity is not solely a mental process but emerges dynamically through movement and active engagement with the musical environment. Central in such interaction is the discovery of a complex whole of action possibilities, or affordances (van Dijk/Kroesbergen/Blom/Leseman 2019).

Starting from the concept of purposeful navigation of the affordance landscape, i.e., the process by which individuals interact with their environment by perceiving and utilizing multiple affordances (e.g., Pezzulo/Cisek 2016; Rietveld/Kiverstein 2014), Nijs et alii (2024) connect creativity to cognitive flexibility that, conceived as a unified cognitive function for flexible behavior in the brain-body-context interaction (Ionescu 2012), allows a context-sensitive selective openness to the (musical) environment. Such openness is connected to the process of enactment, constituting the embodied interaction with music and fostering musical sense-making (Leman 2016). The basic idea in this work is that inviting to move to music provokes a flexible and creative navigation of the musical affordance landscape by bringing the learner in a metastable

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state, i.e., a condition in which behavior dwells between stability and instability (e.g., Tognoli/Kelso 2014), in which movement helps to make choices and gain a grip on the multiplicity of affordances. Arguably, this elicits a meaningful engagement with music, leading to novel insights and experiences that spur the expressive interaction with music.

When performing, that is when playing an instrument, in contrast to actively responding to music, such as through movement, the musical affordance landscape is (co-)created by the player through the interaction with the instrument. Considering the complex interaction during performance from a dynamical systems perspective, Nijs et alii (2023) argue that musicians generate different "hypotheses" with little or no pre-planning and use their bodies to selectively navigate the range of possibilities such hypotheses entail. Such bodily navigation entails the combination of personal and instrumental gestures in addition to movement responses to the music (Nijs 2019). The latter is especially important in terms of musical creativity. However, as tools alter perception (Osiurak/Federico 2021), the instrument can interfere with the flexible and adaptive navigation of the musical affordance landscape, which is, as Nijs et alii (2024) argue, essential to musical creativity. Therefore, only when the coupling between musician and instrument is optimal, understood as a merging of musician and instrument (Nijs et alii 2013; Nijs 2017), the instrument does not interfere with the basic mechanisms that are fundamental to an embodied interaction with music (Leman 2016). This allows the performer to freely navigate the landscape of musical affordances, to consider different hypotheses based on the incoming sensory signals as well as their own predictions, and to cope with them to generate new meanings in the moment.

5 A kinemusical approach to instrumental music learning

Based on the Embodied Music Pedagogy and the idea of the incorporation of the musical instrument as characteristic for an optimal relationship between musician and instrument, a kinemusical approach to instrumental music learning reconsiders the role of the body and body movement in learning how to play an instrument, and introduces an "education of the body" that goes beyond the mere instrumentalist approach to body and musical instrument (Nijs 2019 and 2024). The approach aims to foster musical understanding, expression, and creativity in an integrative way. Rather than using movement to develop bodily awareness and remedy physical complaints (somatic) or to develop specific musical skills, such as tempo and rhythmical sense, and musical understanding (complimentary), a kinemusical approach combines body movement and instrument playing (see also Bremmer/Nijs 2024). The idea is that making expressive and creative movements *while playing* the instrument promotes the subjectification of the body. On the one hand, it stimulates using one's body as a source of independent expression and meaning. On the other, it allows for the incorporation of the instrument into the body, i.e., feeling one with the musical instrument, by stimulating the integration of instrumental technique with the student's individual body language and bodily responses to the music. Moreover, compared to the conservatoire tradition, a kinemusical approach is group-oriented. Learning to play an instrument becomes a collaborative endeavor, whereby the joint engage-

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ment in kinemusical activities facilitates and stimulates intersubjective interaction and participatory sense-making. The corporeal dimension of human communication is intentionally addressed while, at the same time, the basic mechanisms of musical sense-making are activated (Malloch/Trevarthen 2009; Leman 2016).

Based on the pedagogical and musicological insights discussed above, the kinemusical approach adopts a set of five premises.

5.1 Premises

5.1.1 Developing the inner musician

A basic idea of the kinemusical approach is that, to develop an inner sense of the music, the internal mechanism of associating movement and music can be emulated by movement-based sense-making musical activities that allow discovering, exploring, and experimenting with the music- instrument-body-connection. The movement-based activities seek to stimulate a process of internalization based on the use of movement in different spaces, namely the external (ample space, locomotor), the personal (space reachable with the body, non-locomotor), and the internal space. By gradually reducing the extent to which the movements occupy space, it is assumed that a process of interiorisation is stimulated based on the kinaesthetic memory of the invariants of the music-movement associations (see also Schnebly-Black/Moore 2004 : 7-8). As an example, one might think of learning to play a musical phrase. Playing a phrase might first be accompanied by a movement in the external space (e.g., walk in such a way that the intentional arc of the phrase is reflected in qualities of walking such as speed or stride length), then by a movement in the personal space (e.g., a lateral movement with the torso in such a way that the walking qualities are mirrored in this lateral movement), and finally by the movement that is felt within the body *(internal space)* during, for example, blowing (wind instrument) or bowing (string instrument).

Obviously, the three spaces are not separate but nested into each other. For example, moving in the personal space always involves movement in the internal space. Also, through interpersonal processes, movement in personal space (by a learner) might integrate movement in external space (by the teacher or another learner). Here, the movements of peers or the teacher can play an important role in facilitating or supporting a learner's enactment of movement-music associations (see also Bremmer/Nijs 2020). For example, by entraining to the same musical pattern (e.g., a musical phrase), teacher and learners can become physiologically entrained (e.g., breathing rate, heartbeat, and brain wave activity), enhancing their attentional and motoric coordination and strengthening cohesion (Cross 2007).

5.1.2 Involving the instrument

In contrast to pedagogical views (Manifold 2008; Gordon 2007; Schnebly-Black/Moore 2004) that certain musical skills need to be developed (through movement) before starting to play a musical instrument or away from the instrument, the kinemusical approach integrates movement in the development of instrumental skills right from the start. Certainly, engaging in movement activities away from the instru-

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ment can be an efficient way to gain a repertoire of sensations that may lead to great dividends in musical performance and appreciation (Manifold 2008; Schneebly-Black/Moore 2004). However, the linear approach (first moving without the instrument, then performing on the instrument) tends to underestimate the impact of the musician-instrument relationship. Alternatively, one can develop bodily attunement from the start with the instrument. This promotes the integration between personal, instrumental, and musical gestures (see Nijs 2019).

The idea of the kinemusical approach is that performing extraneous movements may augment awareness of adequate or natural movements. Imagine how a clarinetist doing a sudden movement might cause an increase in lip pressure to such a degree that no air can be blown into the clarinet. The intention to produce music while moving may bring attention to the embouchure and urge to lower lip pressure consciously. Such adaptability may be of benefit when playing in a dry concert hall, which often causes an increase in lip pressure. Finally, the process of integrating extraneous movements within one's playing might support restoring the body's original motility by expanding the learners' freedom to move while playing. Indeed, a kinemusical approach invites learners to engage in the creative use of the body by encouraging variations of movements.

5.1.3 Experimenting and exploring

The kinemusical approach is primarily not about the use of predefined choreographies (top-down) but about promoting exploration and experimentation with music-movement associations (bottom-up). As such, it provides a learning context in which variability of movement is introduced, allowing learners to move from "I must" (docile body) to "I can" (motile body). A priori defined idealized performance patterns ("templates") are replaced by subject- and context-dependent performance patterns, helping learners to find their individual optimal way of performing (see *differential learning*; Frank et alii 2008; Savelsbergh et alii 2010). The deployment of this variability can stimulate the development of body awareness and possibly increase bodily – or enactive – knowledge, i.e., improved knowing in and through the body (Juntunen/Westerlund 2001). Kinemusical activities induce a certain "noise" or movement that is more than needed in playing the instrument.

According to the dynamical system theory, a learner can detect an "ideal" movement through the addition of noise (Savelsbergh et alii 2010). Moreover, adding noise to a certain target movement (e.g., instrumental gesture) might provide a broader array of potential solutions. In a way, one could say that through the noise, the familiar is made strange, and in doing so, it becomes possible to experience a degree of freedom in one's movements (Sheets-Johnstone 2010). According to Gordon (2003), the freedom to explore movement develops a relaxed feeling when moving, which is the best foundation for music instruction. A kinemusical approach introduces "noise" by inviting learners to combine task-related and non-task-related movements. Task-related movements can be viewed as sound-producing, sound-facilitating, or sound-accompanying gestures (Jensenius et alii 2010). Non-task-related movements concern the learner's expressive and creative movement explorations (e.g., turning around, bending over, lifting a foot).

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When trying to play in different ways, it becomes possible to find the invariant through variations, namely the felt quality of movement (Sheets-Johnstone 2011). Learners become more sensitive to and aware of kinaesthetic sensations. This way, kinemusical activities might evoke an experience in which the body becomes an intimate context for knowing. It is assumed that, through bodily sensing, feeling, and experiencing music in combination with movement, such activities support developing the ability to feel the music from within and, accordingly, gaining an embodied understanding of the music (Bowman 2000 and 2004; Shepherd 2002).

5.1.4 From simple to complex

Activities in a kinemusical approach are designed in a learning trajectory from simple to complex music-movement activities. This trajectory is established by adding layers in both music and movement, the addition of which leads to an expanded visualization of musical expressiveness through the body. Such a trajectory aligns with Bronfenbrenner's (1979) idea that development requires the repeated occurrence over time of increasingly complex activities. Importantly, a kinemusical approach does not involve a strict repetition of the same movements that increase in complexity but always combines the repeated occurrence of movement or musical patterns with a degree of free and autonomously decided elements. In other words, improvisation with movement or music is always part of the experience. For example, the same movement pattern might be combined with increasingly complex musical possibilities for improvisation, such as using pentatonic instead of only three notes or a different scale instead. Another way is to increase the complexity of rhythmical patterns on which a learner can improvise while doing a certain movement pattern.

In addition, within the trajectory of developing increasingly complex – instructed – movement patterns (e.g., a specific stepping pattern), free movements are also integrated, allowing learners to explore possible music-movement associations, to freely implement learned patterns, and to explore variations and elaborations. Typical activities are moments of free improvisation, inviting learners to invent a kinemusical performance or to improvise with music and movement on some background music (see Figure 1 for a snapshot of a joint improvisation).

Figure 1: Kinemusical activity using free improvisation with music and movement.

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Furthermore, activities often promote continuous movement, characterized by uninterrupted, smooth actions and contrasting with discrete movements, i.e., periodic actions preceded and followed by a period of no or little motion (Braun Janzen et alii 2014). Although musicians are mainly skilled at discrete and regularly timed rhythmic actions (Braun Janzen et alii 2014), the experience and development of continuous movement are beneficial. Interestingly, in Gordon's view (Gordon 2003), free movement is an important starting point for learning rhythm. In his view, learners need to experience *continuous fluid movement,* i.e., free, unbound, lightweight, continuous flowing motion, exploring and filling all of the surrounding body's space (Westervelt 2002), before they learn to focus on beat movement and before they experience movement focused on space and time (Gordon 2003). Free movement allows learners to discover and develop a spontaneous interaction between movement responses and the music they play. Moreover, as Slepian and Ambady (2012) found, fluid movement can lead to enhanced creativity, promoting creative generation (e.g., musical ideas), cognitive flexibility (e.g., switching between musical possibilities), and remote associations (e.g., giving meaning to the music), all of which can arguably play an important role in interpretation and improvisation. Moreover, as described above, body movement supports creatively exploring the musical environment and developing a deepened musical understanding through purposeful affordance navigation (see also Nijs et alii 2024). This was supported by the work of Fortuna and Nijs (2019, 2020, 2022), showing that not only movement has an impact on the way children make sense of music but also that the nature of that impact is linked to the type of movement used. Children perceive more and different elements in the music when movement is used while listening than when they talk about the music they listened to. In addition, such increased differentiated listening is enhanced by the type of physical movement (e.g., fluid *versus* rhythmic) used to express the music.

5.1.5 Exercising the performing body

Finally, a fifth premise of a kinemusical approach concerns movement-based activities as a means to train the performing body. Performing is a physically demanding activity, and developing musicians may develop unhealthy playing habits while practicing, leading to discomfort or pain and even injury (Ackermann et alii 2002). Russell and Benedetto (2014 : 260) therefore state that it is imperative to "develop healthy practice habits from the beginning of their study so that they may become lifelong music makers unencumbered by pain." In their view, teachers should play an active role in preventing student pain. Baadjou (2018 : 14) believes that to improve the health of future musicians, it is necessary to integrate health education in music schools.

Generally, a typical strategy to prepare the performing body involves warming-up activities. Williamon (2004 : 84) mentions that such warming-ups do "not mean playing scales and specific exercises for the instrument" but "stretching the arms above the head, stretching the neck in all directions, arm circling, elbow rotation, wrist shaking, knee bends, trunk rotation, and deep breathing" (see, e.g., Frederickson 2002). Baadjou (2018 : 14) asserts that such physical warming-up is, in contrast to sports athletes, only practiced by a small number of musicians. Musicians' warming-

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up concerns mainly involve practices on the instrument, such as slow scales, long tones, or finger exercises.

A kinemusical approach integrates both musical (e.g., long tones, slow scales) and physical (e.g., stretching, knee bends) warming-ups. For example, different musical warm-ups are used in an activity that seeks to loosen the degrees of freedom in the joints (see Figure 2). Learners explore the degrees of freedom in the different joints while interacting with the instrument and, as such, "negotiate" possibilities with their instrument, preparing the creative use of the body in expressively responding to music. According to Torrents and colleagues (2020), the release of degrees of freedom promotes exploratory behavior and, as such, motor creativity, especially when doing it in a group (Kimmel/Hristova/Kussmaul 2018). Considering the embodied nature of musical creativity, motor creativity in alignment with music may lead to musical creativity (Nijs et alii 2024). At the same time, this activity may help to increase awareness of the degrees of freedom. As such, it counterbalances a tendency to freeze degrees of freedom at the beginning of the instrumental music learning process (Konczak et alii 2009).

Figure 2: Loosening the joints.

Finally, loosening the joints and exploring the different joints' degrees of freedom may contribute to the musician's flexibility, which is an important element in skilled physical behavior, such as playing music (Bernstein 1967; Tuitert et alii 2017). For example, according to Wilke and colleagues (2011), violinists lack sufficient joint range in the shoulder and arms. In their view, this lack of flexibility may be addressed through training, improving coordination skills, and preventing muscle shortening. Training commonly involves muscle stretching and mobilizing passive structures such as tendons, ligaments, and joint capsules. Kinemusical activities integrate such training in musical tasks.

Adding extraneous movement to playing an instrument may also contribute to developing task-specific endurance. Endurance is, next to flexibility, an important element of music performance (e.g., Wilke et alii 2011). Commonly, musicians' endurance is addressed and improved through activities such as walking, running, cycling, and swimming. Such activities may enhance general endurance but not necessarily task-

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specific endurance. As kinemusical activities involve most often the instrument, endurance is trained while playing.

As discussed earlier, kinemusical activities introduce movement variability in performance, which has been related to reduced fatigue as it distributes muscle activity (Bauer et alii 2017). It is known that the repetitive nature of practicing an instrument may induce muscle fatigue and constitute an injury risk factor (e.g., Goubault et alii 2021). Variability has been observed to be a strategy to cope with endurance problems. Moreover, studies suggest kinematic adaptations to enhance endurance can happen in different body segments depending on the task performed (Goubault et alii, forthcoming). Interestingly, Turner and colleagues (2023), who conducted a study on the influence of proximal motor strategies on pianists' upper-limb movement variability, concluded that "Pianists should consider incorporating trunk motion and a variety of shoulder movements as performance strategies while performing leap motions at the piano, as they might reduce exposure to risks of injury." Kinemusical activities typically involve trunk movement, in addition to, for example, walking or on-the-spot stepping while playing (see Figure 3).

Figure 3: Children walking while playing.

5.2 Fostering creativity through affordance navigation in a kinemusical approach

The kinemusical approach, by integrating movement and playing an instrument, envisions creating an engaging context for the development of musical creativity through the stimulation of affordance navigation. In kinemusical activities, when the music learners are invited to move freely, they are encouraged to explore and experiment with the dynamic interplay between bodily, instrumental, and musical possibilities or affordances. Such exploration is not random; instead, it is a deliberate and embodied inquiry into how different movements can evoke, modulate, or transform musical expression. This inquiry is guided through the introduction and manipulation of individual, task, and environment constraints. Individual constraints may be related to the motor skills of the learner; task constraints may introduce certain musical (e.g., improvise vs. play a specific melody) or motor goals (move freely vs. use a certain pattern movement); environmental constraints may involve the use of the environment (e.g., locomotor vs. personal space), specific configurations of positioning learners in

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the classroom (e.g., facing each other vs. standing in a circle), or the use of specific materials (e.g., pads, ropes, sticks) (Nijs 2024).

The idea is that, through the introduction of these constraints, kinemusical tasks invoke a metastable state, urging learners to make choices to gain an optimal grip on the multiplicity of affordances. This metastability is crucial for creativity. It allows learners to break away from habitual performance patterns, as acquired through conventional training, and to explore novel possibilities for musical expression. Einarsson and Ziemke (2017 : 7) define optimal grip as "having the full palate of artistic expression made available, in relation to the situational demands". Note that, in kinemusial activities, the affordance space is not only encompassing musical affordances but also instrumental and bodily affordances. This creates a multiplicity of entangled affordances. Indeed, a movement affordance (e.g., bending) might interfere with instrumental affordance (e.g., playing a certain note). As such, affordances do not present themselves as independent, *a priori* possibilities for action but rather disclose themselves as nested structures that only make sense within a situation (Bruineberg/Rietveld 2014), here created through the combination of playing and moving.

Together, the affordances can be described as the "hypothesis space" i.e., the range of affordances a learner might act upon (Nijs et alii 2024). This makes a kinemusical activity a constantly evolving space where different performance possibilities or "hypotheses" can be put forward and explored in the spur of the moment through affordance navigation. Moreover, due to the situational demands provoked by moving while playing, new *solicitations*, i.e., affordances standing out as relevant to a situated individual and generating bodily states of action readiness (Rietveld/Denys/Van Westen 2018), can emerge. Indeed, when learners oscillate between stability and instability in the metastable state, they may become more open to various unexpected and innovative bodily, instrumental, and musical possibilities. From the movement point of view, learners are encouraged to generate "noise" in their performance by adding extraneous movements. Far from being disruptive, such noise functions as a catalyst for exploring new movement patterns in combination with musical ideas. The variability introduced through such explorations makes the familiar strange, opening up the possibility for creative kinemusical performances.

Given the multitude of possibilities, learners engage in the process of negotiation between different options or "hypotheses" (Nijs et alii 2024). The in-the-moment decision-making is based on competition within the sensorimotor system and is biased by the desirability of the outcome of the action (Pezzulo/Cisek 2016). In music playing, the perceptual and motor systems are tightly coupled, enabling a continuous feedback loop. However, because kinemusical activities introduce extraneous movements in the habitual ways of playing the instrument, the sensorimotor system is challenged in new ways that go beyond the habitual performance challenges. Arguably, this affects the negotiation between the instrumental possibilities and the desired kinemusical outcomes, as provoked by the combination of creative and musical expression.

Finally, the collaborative and group-oriented nature of kinemusical activities can amplify creative potential (Clapp 2016). In a collective setting, the shared movement

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and synchronized exploration of musical ideas foster participatory sense-making (e.g., Hermans 2016; Peñalba/Martînez-Ãlvarez/Schiavio 2020; Schiavio/De Jaegher 2017). As learners observe and respond to each other's bodily expressions, they gain additional perspectives on the affordance landscape. This intersubjective interaction not only reinforces individual creativity but also cultivates an emergent, co-created kinemusical dialogue where every participant contributes to the collective exploration of possibilities.

6 Conclusion

This chapter presented a novel perspective on cultivating creativity in instrumental music education, connecting the purposeful use of non-instrumental gestures to the creative navigation of expressive possibilities or affordances while performing music. A core idea of the proposed perspective is that, for musical creativity to flourish, it is essential to engage in an embodied interaction in which the enactment process can occur without interference from instrumental considerations. It was argued that the latter necessitates the merging of musician and instrument. When incorporated as a natural extension of the musician, the musical instrument becomes part of the musician's somatic know-how. Consequently, it does not interfere with the basic mechanisms of the enactment process, i.e., entrainment, prediction, and alignment, that are fundamental to an embodied and expressive interaction with music. This allows the performer to navigate the landscape of musical affordances freely, to consider different creative and interpretative possibilities, and to flexible adapt the performance accordingly.

The suggested kinemusical approach, embedded in an embodied music pedagogy and the associated view on the musician-instrument, seeks to promote such creative navigation by fostering metastable states through the integration of extraneous movement while playing the instrument. This chapter argued that, in doing so, learners are encouraged to navigate multiple – bodily, instrumental, and musical – affordances, thereby creating the condition for creative musical expression beyond conventional performance patterns.

By dissolving the conventional boundaries that separate technical mastery from creative expression, the kinemusical approach envisions creating an environment where creative movement and music co-evolve. This embodied, affordance-driven process may enrich musical creativity by continuously prompting performers to navigate, adapt, and reimagine the landscape of musical possibilities. The result is a more dynamic, flexible, and innovative form of musical expression.

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