

Body and mind that experience and signify: proprioception and meaning in music teaching relations – considerations in dialogue with the cultural-historical perspective

Corpo e mente que vivenciam e que significam:
propriocepção e significação nas relações de ensino de música –
considerações em diálogo com a perspectiva histórico-cultural

Cuerpo y mente que experimentan y dan significado:
propiocepción y construcción de significado en las relaciones de enseñanza
musical – consideraciones en diálogo con la perspectiva histórico-cultural

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ABSTRACT

This article presents a synthesis of the main findings of a doctoral dissertation in Education, developed within the framework of Cultural-Historical Psychology (CHP), which investigates the relationship between proprioception and music teaching and learning. The study sought to understand how bodily and psychological processes are articulated in the development of Higher Psychological Functions (HPFs) during Group Piano lessons. Grounded in the works of Vygotsky and Luria, the dissertation proposes **self-mastery** as the minimal unit of analysis of musical learning, relating it to the internalization of signs and the cultural mediation that characterizes musical activity. The central research question was to understand how proprioception—conceived as the perception of one's own body in movement and as a condition for the voluntary regulation of action—can foster conscious attention and the aesthetic

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appropriation of music. Adopting a qualitative approach based on formative intervention and microgenetic analysis, the study examined interactive situations in Group Piano lessons in which proprioceptive practices and body-based methodologies, such as the Orff approach, promoted musical development. The findings indicate that proprioception, when culturally mediated, expands expressive possibilities, aesthetic listening, and self-mastery, constituting a process of internalization that transforms both bodily action and musical thinking. The dissertation concludes that, from the perspective of Cultural-Historical Psychology, proprioception can be understood as a psychological function capable of being requalified through cultural mediation, whose voluntary mobilization promotes self-regulation, conscious attention, and the development of a humanizing musicality, thereby contributing to the fields of Music Education, Cultural-Historical Psychology, and studies on the body, consciousness, and human development.

Keywords: Proprioception; Teaching and learning; Higher Psychological Function; Music education and cultural-historical psychology; Aesthetic dimension of music.

RESUMO

Este artigo apresenta uma síntese dos principais resultados da tese de doutorado em Educação, desenvolvida na perspectiva da Psicologia Histórico-Cultural (PHC), que investiga a relação entre propriocepção e ensino-aprendizagem musical. A pesquisa buscou compreender como processos corporais e psíquicos se articulam no desenvolvimento das Funções Psíquicas Superiores (FPS) durante aulas de Piano em Grupo. Fundamentada nas obras de Vigotski e de Luria, a tese propõe o domínio da própria conduta como unidade mínima de análise da relação entre propriocepção e aprendizagem musical, articulando-o à internalização dos signos e às mediações culturais que caracterizam o fazer musical. O problema central consistiu em compreender de que modo a propriocepção, entendida como a percepção do próprio corpo em movimento e como condição para a regulação voluntária da ação, pode favorecer a atenção consciente e a apropriação estética da música. Por meio de uma abordagem qualitativa, fundamentada no experimento formativo e na análise microgenética, foram analisadas situações interativas em aulas de Piano em Grupo, nas quais práticas proprioceptivas e metodologias corporais, como a abordagem Orff, favoreceram o desenvolvimento musical. Os resultados indicam que a propriocepção, quando mediada pela cultura, amplia as possibilidades expressivas, a escuta estética e o domínio da própria conduta, configurando-se como um processo de internalização que transforma tanto a ação corporal quanto o pensamento musical. Conclui-se que a tese contribui para compreender a propriocepção, na perspectiva da PHC, como uma função psicológica passível de requalificação por meio das mediações culturais, cuja mobilização voluntária favorece a autorregulação, a atenção consciente e a constituição de uma musicalidade humanizadora, ampliando o campo da Educação Musical, da Psicologia Histórico-Cultural e das investigações sobre corpo, consciência e desenvolvimento humano.

Palavras-chave: Propriocepção; Ensino-aprendizagem; Função Psíquica Superior; Educação musical e psicologia histórico-cultural; Dimensão estética da música.

RESUMEN

Este artículo presenta una síntesis de los principales resultados de una tesis doctoral en Educación, desarrollada desde la perspectiva de la Psicología Histórico-Cultural (PHC), que investiga la relación entre la propiocepción y la enseñanza y el aprendizaje musical. La investigación buscó comprender cómo se articulan los procesos corporales y psíquicos en el desarrollo de las Funciones Psíquicas Superiores (FPS) durante las clases grupales de piano. Basándose en las obras de Vygotsky y Luria, la tesis propone el dominio de la propia conducta como la unidad mínima de análisis de la relación entre la propiocepción y el aprendizaje musical, articulándola con la internalización de signos y las mediaciones culturales que caracterizan la práctica musical. El problema central consistió en comprender cómo la propiocepción, entendida como la percepción del propio cuerpo en movimiento y como condición para la regulación voluntaria de la acción, puede favorecer la atención consciente y la apropiación estética de la música. Mediante un enfoque cualitativo, basado en la experimentación formativa y el análisis microgenético, se analizaron situaciones interactivas en clases grupales de piano, donde las prácticas propioceptivas y las metodologías corporales, como el método Orff, favorecieron el desarrollo musical. Los resultados indican que la propiocepción, mediada por la cultura, amplía las posibilidades expresivas, la escucha estética y el dominio de la propia conducta, configurándose como un proceso de internalización que transforma tanto la acción corporal como el pensamiento musical. Se concluye que esta tesis contribuye a la comprensión de la propiocepción, desde la perspectiva de la Psicología Histórico-Cultural, como una función psicológica susceptible de recalificación mediante mediaciones culturales, cuya movilización voluntaria favorece la autorregulación, la atención consciente y la constitución de una musicalidad humanizadora, ampliando el campo de la Educación Musical, la Psicología Histórico-Cultural y las investigaciones sobre el cuerpo, la conciencia y el desarrollo humano.

Palabras clave: Propiocepción; Enseñanza-aprendizaje; Función psíquica superior; Educación musical y psicología histórico-cultural; Dimensión estética de la música.

1. Introduction

Research trajectory: from teaching concerns to investigation

As a piano teacher, both in individual and group settings, I have always been interested in understanding how musical learning takes place, particularly during the initial stages of instruction. Traditional piano teaching commonly begins with music reading, often overlooking what should be at the center of the learning process: the

music itself. In many cases, insufficient attention is given during lessons to the sound that students actually produce.

As Paulo Freire (2010) argues, humanizing educational practices requires continuous reflection on the pedagogical approaches we adopt. Throughout my teaching experience, I observed that learning became more deeply internalized when students focused on their own musical activity—planning in advance what they intended to perform before playing, refining their attempts, and actively listening to the sounds they produced. Likewise, when learning activities began with bodily movement before students approached the instrument, the learning process also became more meaningful and internalized. In addition, listening to the repertoire beforehand at home helped students develop an internal sound representation, positively supporting their musical performance. Furthermore, students who were immersed in a musical environment—regularly listening to and engaging with music—demonstrated a more expressive development of musicality.

Taken together, these observations contributed to my primary goal as a teacher: to foster the fullest development of students' potential in learning music. Within a humanizing educational practice (Freire, 2010), the teaching-learning process is understood as a process of *becoming more* (*ser mais*), through which individuals develop their fullest potential. Consequently, I recognized the need to organize teaching in ways that promote the maximum development of students' musical potential.

These reflections and concerns gave rise to the present study, which investigates the relationship between proprioception and the teaching-learning process in music. Similar to the study conducted by Leite and Ferracioli (2021), which examined the role of written language in the development of attention and self-regulation, the present research explores how musical language is structured through the processes of internalization and the attainment of mastery. In piano performance, playing involves multiple dimensions, including posture, hand independence, the simultaneous execution of harmony and melody (left and right hands), pedal technique, and, above all, attention to the sound being produced. For students to focus on the musical sound itself, these other aspects of musical performance must first become internalized, allowing attention to be voluntarily directed toward the music.

This developmental process occurs through the mediation of signs and the transformation of externally organized social processes into internally mediated psychological processes, leading to new forms of psychological organization (Vygotsky, 1997; Luria, 1979) and enabling music to emerge in its aesthetic dimension. From this perspective, self-regulation constitutes the minimal unit of analysis of the relationship between proprioception and musical learning, as it encompasses the voluntary control and regulation of both movement and the psychological processes involved in instrumental performance.

Proprioception is directly involved in the regulation and coordination of intentional bodily movements. It is a sensory modality that enables individuals to perceive the position, movement, and orientation of their bodies in space without relying on vision. Proprioception involves sensory information originating from muscles, tendons, and joints, allowing the central nervous system to receive continuous feedback about the body's state (Sherrington, 1906; Sacks, 1997). This function is essential for maintaining balance, adjusting posture, and performing coordinated movements.

Building upon this understanding, the present study expands the concept of proprioception by conceptualizing it as a psychological function related to the perception of one's own body in motion, capable of voluntary development through cultural mediation. From this perspective, proprioception is not synonymous with movement, gesture, or bodily action, which constitute observable manifestations of human activity. Rather, it refers to the process through which individuals perceive, monitor, and regulate these actions in relation to a goal (Luria, 1979; Silva, 2025). From the perspective of Historical-Cultural Psychology, the central concern is to understand how this function, initially predominantly natural in character, can be qualitatively transformed into a voluntary psychological function, thereby fostering the appropriation of musical language.

However, this regulation does not occur spontaneously or in isolation. Rather, it takes place within the broader process of self-regulation, which involves the planning, monitoring, and refinement of actions (Luria, 1979). Although proprioception has a primary and largely automatic role in human ontogenesis, as a psychological function it is also closely related to the learning process and can become subject to voluntary

control. In other words, individuals do not merely respond to the body's sensory stimuli; they are also able to plan and adjust their movements according to the demands of their activity. This includes, for example, the ability to plan a movement before its execution, modulate the force applied to a gesture, and refine technique as learning progresses.

This dynamic is particularly relevant in music education, where proprioception plays a fundamental role in the motor coordination required for instrumental performance. The planning and refinement of motor actions involved in musical learning are enhanced through proprioception. Thus, proprioception extends beyond a mere sensory modality, becoming an active component in the development of musical skills and the refinement of musical performance, ultimately supporting the realization of music in its aesthetic dimension.

Within this framework, self-regulation emerges as the minimal unit of analysis of the relationship between proprioception and the teaching-learning process in music, as it enables individuals to appropriate their own actions and to develop motor and psychological abilities in qualitatively transformed ways—that is, as Higher Mental Functions (Luria, 1979). Self-regulation, in turn, allows individuals to regulate their own movements on the basis of the sensory information they receive. In this sense, proprioception functions as a process of sensorimotor self-regulation.

In this context, musical learning is also a social experience, involving listening, collaboration, synchronization, shared attention, and sensitivity to the collective. The Historical-Cultural Psychology perspective, articulated with the methodologies of the formative experiment and microgenetic analysis, made it possible to understand how music becomes both the means and the end of learning: a means because it organizes social interactions and challenges learners, and an end because it constitutes the object of study, the medium of expression, and the possibility for students' aesthetic appropriation.

Finally, the analysis of interactive situations in Group Piano lessons reveals that musical development is not limited to the acquisition of isolated technical or psychological skills. Rather, it involves an intricate relationship among perception, action, and meaning, mediated by the body in movement, by other people, and by a variety of cultural artifacts. From this perspective, proprioception emerges as a key element enabling students to move beyond mechanical gestures toward the construction of musical performance endowed with aesthetic meaning. Bodily awareness, mobilized through the relationship between gesture

and listening, as well as between intention and sound, mediates the internalization of musical elements and the construction of meanings that transcend mere mechanical execution.

From this perspective, the teaching-learning process in Group Piano can be understood as a culturally mediated activity in which the body becomes a medium for musical expression and attentive listening fosters conscious and sensitive musical performance. When the gestures required for sound production become one's own—that is, when they are appropriated and internalized—and the resulting sound is recognized, evaluated, and adjusted according to an expressive intention, musical learning advances beyond mere mastery toward appropriation (Wertsch, 1985) at the aesthetic level (Nassif, 2015). It is at this point that musical learning reveals its greatest complexity: by integrating musical signs, bodily movement, and the presence of others, it becomes a developmental process in which music, as a language, acquires meaning through the dynamic relationship among the individual, gesture, sound, and the constitution of the self through cultural mediation.

Within the developmental process of musical learning, the internalization of musical elements—including motor, rhythmic, and expressive aspects—is understood as being effectively constituted through a continuous process of self-regulation. As Vygotsky (1995) emphasizes, in the development of attention, self-regulation involves "attending to one's own attention," that is, the conscious effort to direct and sustain attention toward a specific activity. According to Vygotsky (1995), movement also plays an essential role in the development of self-regulation, constituting one of the earliest processes through which individuals refine and master increasingly complex motor skills. This principle applies directly to musical practice, in which individuals must regulate their perception, movements, and thinking in order to develop musicality. Thus, it may be inferred that the development of proprioception not only enhances instrumental performance but also expands the expressive possibilities of musical practice, thereby contributing to the aesthetic appropriation of music.

Self-mastery, therefore, is characterized by the "mastery of cultural forms of behavior mediated by signs within concrete social relations" (Toassa, 2004, p. 3) and is closely related to semiotic mediation as a process through which individuals construct meaning (Valsiner, 2002). Internally, it consists of planning, guiding, and monitoring one's own behavior in relation to a consciously formulated goal (Vieira, 2011).

Self-regulation operates across perception, motor processes, and thinking. Without the selectivity and inhibition that characterize attention, the simultaneous activation of all possible associations would result in disorganized thought, making the execution of any purposeful activity impossible (Luria, 1979). Self-regulation develops through the process of internalization mediated by signs, involving the transformation of externally organized social processes into internally mediated psychological processes. However, this is not merely a transfer of function from the external to the internal. Rather, it is a process of structural transformation in which a psychological function develops from its natural form into a Higher Mental Function (Shuare, 2017). This transformation is marked by the internalization of signs through collective mediation. From this perspective, signs constitute the very movement of internalization, bringing about the qualitative transformation of psychological functions into their higher forms and enabling self-regulation.

Within this developmental process, the *other* is an intrinsic condition for self-regulation: "(...) people create signs by drawing upon their own history of sign construction, under the guidance of other human beings who are collectively oriented, through different social institutions, toward the shared enterprise of meaning-making" (Valsiner, 2012, p. 65). Mediating activity, which employs external signs as tools for the internal development of behavior, constitutes the structural foundation of cultural forms. In this sense, signs promote cultural development. At the same time, self-regulation distinguishes different developmental levels of a psychological function from the evolutionary stages of that same function (Linhares & Facci, 2021).

Having mastery of and clarity about all the elements that constitute musical language enables music teachers to organize each stage of the extensive learning process, emphasizing certain aspects at particular moments while temporarily placing less emphasis on others. This should be done with the understanding that, ultimately, the developing individual internalizes musical language to the extent that its use becomes genuinely appropriated, integrating it into psychological functioning while simultaneously making it a resource through which "...the individual continues to appropriate new contents which, once appropriated, in turn bring about further transformations in the organization and functioning of the psyche" (Leite & Ferracioli, 2021, p. 99).

Finally, the internalization of musical elements enables students to appropriate specific musical structures, thereby freeing their attention to focus on broader aspects of the sonic experience, such as expressiveness and the aesthetic dimension of music. Thus, learning is not confined to mastering the syntax of musical language—which, although essential, is not an end in itself (Schroeder, 2005)—but expands toward a more sensitive and conscious relationship with sound. In the context of Group Piano, this process becomes even more significant, as ensemble performance requires heightened attentive listening to recognize the different musical voices and their interactions.

From this perspective, Group Piano instruction grounded in proprioceptive practices seeks to create a learning environment that fosters the aesthetic internalization of musical language through attention and self-regulation. Such an approach not only enhances the teaching-learning process in piano instruction but also enriches students' musical experience by promoting more conscious interaction among participants and deepening their relationship with music.

It is important to emphasize, however, that studying proprioception is not equivalent to studying musical technique—a misconception I frequently encountered whenever I explained that proprioception was the focus of my research. Musical technique is a means of achieving musicality rather than an end in itself within the teaching-learning process of music.

From this perspective, investigating proprioception extends far beyond the mechanical execution of a musical instrument. Rather, it involves understanding the perceptual, psychological, and bodily processes that underpin self-regulation in musical practice. In a context where music presents multiple simultaneous elements competing for attention—such as rhythm, melody, harmony, articulation, dynamics, and others—developing proprioception means creating conditions under which certain aspects of musical performance become internalized. As a result, students gradually shift their attention from *how* to perform to *what* they are musically producing. In other words, well-designed pedagogical practices—such as those incorporating proprioception, the relationship between music and movement, musical models, dual stimulation, or other forms of mediation—facilitate the redirection of attention toward the sound itself. It is through this shift in attention that more sensitive listening and musical engagement emerge, allowing musical performance to fully attain its aesthetic dimension.

These concerns gave rise to the central research questions of the present study: if musical learning involves both attention to the surrounding environment and awareness of one's own body (proprioception), how do these processes manifest themselves in interactive situations during Group Piano lessons? In what ways does proprioception influence the teaching-learning process in Group Piano, enabling the aesthetic appropriation of music? Addressing these questions requires understanding music as an integrated whole rather than fragmenting it into isolated elements (Schroeder, 2005). From this perspective, musical experience is conceived holistically, giving primacy to aesthetic experience rather than focusing exclusively on technical improvement. As Schroeder (2005) argues, it is aesthetic perception that gives meaning to technical development.

From this perspective, the objectives of the present study were established to investigate teaching and learning in music education, specifically within the context of Group Piano instruction, by examining bodily and discursive elements that indicate musical development at the aesthetic level through proprioception. The specific objectives were: (1) to identify bodily and discursive indicators of the musical learning process, considering dual stimulation as a mediating element; (2) to analyze how students' movements express self-regulation in musical performance, highlighting proprioception as a structuring factor; and (3) to discuss the role of interaction and the presence of others in the development of self-mastery and collaborative musical learning.

To achieve these objectives, pedagogical strategies grounded in proprioceptive practices were implemented. The first approach consisted of breathing-awareness exercises designed to guide students toward a practice of mediated attention. This process was intended to foster conscious and intentional bodily regulation, supporting both sound perception and musical interpretation. Rather than simply repeating a task until it was performed correctly, students were encouraged to attend carefully to what they were playing in order to optimize the learning process.

The second approach involved body-based activities inspired by the Orff methodology, integrating movement and musicality. The underlying premise was that the body should first experience musical concepts before students approached the piano. Rhythm, melody, and other musical elements were initially explored through bodily experience, reflecting a dialectical relationship between mind and body. This learning body—one that acts, interacts, represents, and understands—creates conditions for students' development through cultural mediation.

Each analyzed episode, organized according to its respective thematic unit, highlighted different aspects of musical learning, including breathing (Episode 1), music appreciation and representation through dance (Episode 2), musical concepts explored through musicograms (Episode 3), music reading and bodily expression (Episode 4), the perception of meaning and intention in breathing practice (Episode 5), collaboration mediated by dual stimulation (Episode 6), and a microgenetic analysis of the development of one of the participants (Episode 7).¹

In summary, the proprioceptive practices presented in this study demonstrated their relevance for organizing collective music instruction by fostering a learning process that prioritizes musical engagement and the construction of musical practice at the aesthetic level. Music is not merely a matter of technique or mechanical repetition; rather, it involves perception, interaction, and the conscious appropriation of one's own sound. Attention to musical practice, together with proprioception, proved to be a valuable means of fostering meaningful and expressive learning in Group Piano instruction.

(...) music education (...) should be a creative aesthetic education that enables every individual, grounded in equality, will, freedom, ethics, imagination, creativity, and authentic, meaningful coexistence, to express their musicality through the diverse artistic forms that music has assumed throughout human history. Everyone is capable, provided that everyone has access and so chooses (Pederiva, p. 156-7, 2009).

2. Methodology

The present study is grounded in the concept of the Zone of Proximal Development (ZPD), understood as the level of development manifested in situations in which individuals perform actions with the assistance of others, anticipating future forms of autonomous performance (Vygotsky, 2001). In the context of Group Piano lessons, this perspective guided the analysis of the interactive processes emerging from the relationships between students and the teacher, with particular attention to learning processes in development. To this end, the study adopted a methodological approach that combines the formative experiment with microgenetic analysis, making it possible to examine in detail how pedagogical mediation and social interactions promote the internalization and development of Higher Mental Functions.

In this study, the author simultaneously assumed the roles of researcher and teacher, a position that requires systematic and reflective observation of educational practice (Ilari, 2007). Video recordings of the lessons, together with their subsequent analysis, provided the analytical distance necessary to understand the dynamics of interaction and learning processes. Consistent with the Historical-Cultural Psychology perspective, human development is understood as being constituted through socially mediated cultural relations (Vygotsky, 1997). Accordingly, investigating pedagogical practice entails analyzing the processes of mediation, appropriation, and meaning-making constructed among the participants.

The study was conducted within the context of the PianoForte Project, a socio-educational music initiative carried out in Ribeirão Preto, São Paulo, Brazil, funded through the São Paulo Program for Cultural Action (ProAC – Call 37/2021), for which the author served as both principal investigator and instructor. Six elementary school students, aged between 8 and 12 years, participated in the study. No prior musical experience was required. The participants attended a Group Piano course consisting of ten weekly sessions, each lasting one hour. Lessons were organized into welcoming activities, breathing practices, Group Piano instruction, and body-based activities inspired by the Orff approach, with the aim of integrating movement, bodily awareness, and musicality. Data were generated through video recordings, field notes, and group discussions, in accordance with ethical procedures for research involving human participants.

Methodologically, the study was grounded in the formative experiment (Davydov, 1988), understood as an investigative procedure that intentionally accompanies and intervenes in the educational process in order to examine the conditions under which new psychological formations emerge. Unlike approaches that merely observe already established phenomena, the formative experiment organizes teaching situations capable of promoting qualitative transformations in students' development, thereby enabling the investigation of learning as it unfolds. In conjunction with this perspective, microgenetic analysis (Wertsch, 1985) was employed to conduct an intensive examination of interactive episodes, focusing on the gradual changes that reveal the genesis of developing psychological functions. The analysis emphasized the interactions among students, the teacher, and cultural

artifacts, seeking to understand how mediation, internalization, and self-regulation were constituted throughout the learning activities.

The methodological procedure was organized into three interconnected stages. First, the students' Actual Development Level (ADL) was identified by mapping their existing knowledge and forms of interaction with music. Next, the Zone of Proximal Development (ZPD) was examined to guide the design of proprioceptive practices intended to foster new forms of musical activity mediated by the teacher and peers. Finally, the selected episodes were analyzed using self-regulation as the unit of analysis, considering gestural, discursive, and relational indicators that revealed processes of internalization, self-regulation, and the appropriation of musical language. In this way, the integration of the formative experiment and microgenetic analysis made it possible to understand musical learning as a historically, socially, and culturally mediated developmental process, highlighting the dynamic nature of participants' activity in Group Piano lessons.

The data were organized into analytical episodes selected according to their relevance to the research questions and the objectives of the study. Within the formative experiment, these episodes constituted privileged situations for tracing the transformations produced through pedagogical mediation over the course of the lessons, making it possible to observe how intentionally organized instructional practices fostered students' development. The selected episodes were subsequently subjected to microgenetic analysis, involving a close examination of participants' interactions, gestures, verbalizations, and actions in order to capture the genesis of learning processes and the qualitative changes that emerged throughout instruction.

To this end, the analysis was organized into three thematic axes constructed *a posteriori* from the data: (1) "Signs" comprising episodes that revealed the internalization of musical language; (2) "Music, Movement, and Proprioception" encompassing situations in which gestures and bodily awareness mediated the appropriation of musical practice; and (3) "Collaborative Teaching", consisting of episodes that highlighted interactions between students and the teacher in the development of self-regulation. Several episodes contributed simultaneously to more than one analytical axis, reflecting the integrated nature of musical learning processes. This analytical organization made it possible to understand, in accordance with Historical-Cultural Psychology, how processes of mediation, internalization, and self-regulation are constituted within teaching relationships, thereby fostering the aesthetic

appropriation of musical language. Owing to the space limitations of this article, a detailed description of the episodes and their analytical organization is not provided. Readers interested in a more comprehensive account may consult the full doctoral dissertation, available through the University of São Paulo Digital Library of Theses and Dissertations⁴.

Considerations

At the conclusion of this study, it can be affirmed that the proposed hypotheses were confirmed. The findings contribute to a deeper understanding of the relationship among music, self-mastery, and psychological processes, highlighting the importance of the internalization of musical signs in promoting the development of Higher Mental Functions. Furthermore, the results provide insights into how students perceive their own learning processes in relation to proprioceptive activities, thereby contributing to a better understanding of the relationship between proprioception and musical learning. It can therefore be inferred that educational practices intentionally organized along the lines proposed in this study create conditions for the development of attention and self-regulation, ultimately fostering musical practice at the aesthetic level.

The analysis of interactive situations in Group Piano lessons demonstrated that proprioception, understood from the perspective of Historical-Cultural Psychology, is directly involved in the development of Higher Mental Functions, particularly self-regulation, and emerges as a central element in the teaching-learning process of music.

Both the general objective and the specific objectives of this study were achieved, as it was possible to understand how proprioception—beyond its automatic sensorimotor dimension—can be voluntarily mobilized and qualitatively transformed into a Higher Mental Function through the cultural mediations present in music education. The combination of microgenetic analysis and the formative experiment made it possible to demonstrate that active listening, the planning of actions, and the organization of bodily gestures constitute forms of internalization that are constructed through social interaction and musical practice.

The methodological approach proved adequate for carrying out the procedures required by the investigation, making it possible to follow the learning process in its concrete and relational

⁴ Tese de doutorado da primeira autora: <https://teses.usp.br/teses/disponiveis/59/59140/tde-12092025-085458/pt-br.html>.

dynamics. The selected literature, although requiring continuous dialogue across different fields—including neuroscience, developmental psychology, and music education—provided a solid theoretical foundation for the analyses. It should be noted, however, that conceptualizing proprioception as a Higher Mental Function within the framework of Historical-Cultural Psychology led this study into a relatively unexplored area, with very few studies directly addressing the topic. Consequently, the research required a substantial effort of theoretical systematization, as discussed in the systematic review presented in the doctoral dissertation.

This gap in the literature, however, also highlights the original contribution of the present study: to offer a conceptual and practical expansion of the understanding of proprioception as a mediating element in human development through musical learning, articulating it with the theoretical propositions of Vygotsky, Luria, and other scholars within the Historical-Cultural Psychology tradition. By considering proprioception as a psychological function that can be transformed through cultural mediation and social practices, this study proposes a new analytical perspective for understanding the development of musicality, particularly in the context of collective music education—not only in Group Piano, but in music education more broadly—where the body and listening become driving forces of pedagogical activity.

Much has been written about the role of the body in music education, yet this discussion has been largely framed through the lens of the so-called Active Methods. Inspired by the Progressive Education movement, these approaches were primarily practical in nature, aiming to renew pedagogical practice rather than to establish a systematic theoretical account of the role of the body in music. Although they profoundly transformed music education, they left unresolved the need for a more robust theoretical foundation. It therefore falls to contemporary research to develop such theoretical underpinnings. In this regard, the present study advances the field by conceptualizing proprioception as a psychological function that fundamentally integrates body and mind in musical activity. This perspective proves especially fruitful for understanding the development of musicality within a Historical-Cultural Psychology framework.

As a music and piano teacher working in both individual and group settings, I reaffirm that the pursuit of a more humanizing pedagogical practice—one that recognizes who learners are, how teaching relationships are established, the sounds produced within these relationships, the meanings that are constructed, and the importance of listening, both to the

music and to learners' voices—is an ongoing endeavor. The present investigation emerged from authentic questions arising from educational practice and, in turn, offers theoretical and methodological contributions that support its continued reflection and transformation.

Finally, this study highlights the need for further research examining the role of proprioception in the constitution of Higher Mental Functions from the perspective of Historical-Cultural Psychology, particularly in educational contexts mediated by the arts. Future investigations should also explore different musical instruments, age groups, and sociocultural contexts in order to broaden both the empirical and theoretical scope of this discussion, while strengthening the foundations of a more critical, sensitive, and development-oriented approach to music education.

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