

# *Expressive Movements in Piano Performance: The Inducing Factors*

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**Abstract:** Music and body movement are interconnectedly linked. Through a multidisciplinary perspective, this research aims to synthesise insights from physiology, psychology, and performance literature to elucidate the underlying mechanisms and effects of how music interpretation elicits both involuntary and voluntary bodily responses. Four influential factors that may induce an un-technique performing movement for musicians are found: 1) musical scores, 2) performer expertise, 3) personal traits, and 4) the environmental context of performances. The findings emphasise the pedagogical importance of integrating body awareness and expressive movement in piano education, advocating for a methodological shift that prioritises these aspects to significantly enhance students' performing expressivity. Further, the study advances the comprehension of how these elements interact to shape musical expressive movements, deepens students' musical engagement, and redefines conventional teaching paradigms, enriching both the practice and theory of music education at a scholarly level.

## 1. Introduction

Music and body movement are intrinsically interconnected. Previous research has discovered the dynamic interplay of our music perception and physical movements in two main dimensions: voluntary and involuntary<sup>[1][2]</sup>. Specifically, from an involuntary perspective, music can induce body movements spontaneously, such as the audience moving the body induced by their preferred music<sup>[3]</sup>. In this case, rhythmic patterns, melodic contours, and dynamic fluctuations are key elements that elicit physical responses<sup>[4]</sup>. From a voluntary perspective, the performer will intentionally apply specific gestures to deliver a specific musical expression<sup>[5][6]</sup>. For instance, during music performances, both virtuosic instrumentalists and vocalists will use body movements as the extension of their interpretation instead of mere technique execution. This can be aimed at exhibiting the musical features of specific periods<sup>[7]</sup>, expressing melodic comprehensions of rubato tempo<sup>[8]</sup> or presenting specific musical structures<sup>[9]</sup>. Within these moments, performers have transferred the musical features of pitch, tempo, loudness, and timbre into a multisensory (i.e. auditory and visual) musical experience. Although these movements are not directly required by the music score, they are often presented as expressive gestures that serve a significant role in enhancing the emotional and

interpretive delivery of the piece<sup>[10]</sup>. Such non-technical movements not only embody the performer's personal interpretation of the music but also add a layer of depth and meaning that transcends the written notes.

While research in music cognition has demonstrated the benefits of involving body gestures in deepening music and emotional expressivity<sup>[1][11]</sup>, how these expressive body movements are induced during piano performance is yet clear. Combining existing research from physiology, psychology, and performance science, this paper aims to be grounded on existing literature and synthesise the causes of body movements induced during music interpretation and argues the significance of these body gestures in enhancing musical expressivity physically and emotionally.

## 2. Embodied Musical Movements

As a trending topic, music-induced body movements have received significant attention from various fields, including systematic musicology, neuroscientists, music cognition, and performance science. The foundation that supports these diverse scientific explorations is the ontological view "that bodily involvement shapes the way we perceive, feel, experience, and comprehend music of embodied music cognition" (p. 747)<sup>[12]</sup>. Leman (2008) defined embodied music cognition as the cognitive process of music based on body-mediated interaction with music perception<sup>[12][13]</sup>. This theory challenges the traditional view of musical perception as a purely cognitive, brain-centred process. Instead, it posited that the experience and understanding of music are intrinsically linked to physical interaction.

Moving the body with music, such as foot tapping, head nodding, or instrument air-playing, is a common phenomenon for listeners<sup>[14]</sup>. This type of body reaction, often described as "music-induced movement", has been widely studied in the area of music perception. For instance, a neuropsychological study by Janata, Tomic, and Haberman (2012) showed that music-induced movements are often triggered automatically by the mental process of rhythmic patterns, demonstrating an instinctive, embodied human perception of musical rhythms and melodies<sup>[15][16]</sup>. Additional research has revealed that involuntary and spontaneous movement can be triggered by music via multi-mediating factors, such as personality traits, music preferences, music genres, and mood states<sup>[14][17][18]</sup>. Such movements, while seemingly a simple musical reaction of human body movements, highlight the deep multimodal interaction between the auditory system and motor responses, illustrating the basic level of embodied music cognition.

Contrasting with the involuntary body reactions to music are the intention-driven bodily movements observed in musicians' performances. For example, from orchestral performances to solo recitals, whether they are instrumentalists or vocalists, all music performers commonly engage in physical movements that are not particularly necessary for sound production but are integral to their music expressivity. Under this perspective, the human body is not only a vehicle for receiving pre-created musical compositions; instead, it plays an active role in shaping musical perception and expression.

One of the significant studies in the field was Wanderley et al. (2005), who explored the significance of these voluntary body movements in music expressivity, particularly in clarinet performance<sup>[19]</sup>. By employing the motion capture technology to record and analyse the precise physical movement of clarinet performers, this study examined the relationship between clarinetists' gestures with the timing, the physical reaction related to the musical score, and the audience response, based on the different performance styles among performers (e.g. standard, expressive and immobilised). Although broader empirical data across varied musical contexts and genres is needed to ascertain the universal applicability of these findings fully, this research indicated that musicians' body movements are not solely the transformation from music notation to auditory sound. It is an

interaction between physical movements and musical expression and has the potential to impact the audience's perception and understanding of the performance.

### 3. Mediators for Music-induced Gestures

Building upon the theoretical foundation of embodied music cognition, research in music movement further demonstrated how body movements are induced and influenced by piano music. The term used to describe the gestures of music performance has varied in previous research. For example, “performer gestures” indicate the mechanical technique of playing instruments; “instrumental gesture”, however, has a similar meaning but is specific for movement with sound production, such as blowing the air into a woodwind instrument<sup>[20][21]</sup>. The “ancillary gestures”, additionally, denote the physical movement interact with music without any auditory contributions<sup>[19]</sup>. Although these gestures are non-sound-producing, research in music performance studies suggests that all kinds of physical expressions contribute significantly to music expressivity and communication<sup>[22]</sup>. Several causes have been discovered for inducing these gestures.

#### 3.1 Music Score

One such factor is the music score itself. The complexity, emotional depth, and technical demands of a piece can significantly influence the establishment and extent of ancillary gesture inducement. A vivid example can be demonstrated from the performance, such as Liszt's "La Campanella". It is a dynamic and technically challenging repertoire where the score is marked by a rapid tempo, often reaching Presto speeds. This fast tempo requires quick, agile finger movements and rapid wrist turns, which are visually manifested in the pianist's dynamic, almost athletic gestures.

Additionally, the piece is renowned for its wide leaps, often spanning over an octave, demanding precise and expansive arm movements to navigate the keyboard effectively. In addition, the use of octave tremolos, where the pianist rapidly alternates between notes an octave apart, adds to the physical intensity of the performance. Moreover, the dynamics of the piece vary from the soft passages at a pianissimo level, controlled to loud and resonant fortissimo sections where the pianist must exert more force and energy, resulting in a dramatic physical portrayal of these dynamic contrasts.

In contrast, when performing a piece composed with tranquillity and elegance, such as Debussy's "Clair de Lune", the pianist's gestures tend to be more restrained and less moved. This was because the melodic lines and subtle dynamics notation from music sheets call for minimal, delicate movements, emphasising the piece's introspective and serene character. In doing so, the pianist's hands might glide softly over the keys, with subtle shifts in posture reflecting the piece's ebb and flow. In light of this, the music score acts as a handbook of the music, employing diverse notation, including dynamics, articulation, tempo and pedal marks, to instruct the pianist's physical interpretation of the music.

#### 3.2 Performers Expertise

The expertise and experience of a pianist could be another factor shaping the inducement of their ancillary gestures. Palmer (1989) highlights that professional pianists, with years of practice and performance, develop a tailored rule of mapping their musical thoughts and the way to apply physical gestures as embodied expressions to enhance their musical interpretation<sup>[23]</sup>. For example, Rachmaninoff's Piano Concerto No. 3 is a touchstone for pianist expertise. An accomplished pianist who tackled the technique difficulties may have more attention to focus on musical expressions by exhibiting a wide array of nuanced gestures, such as using expansive arm movements and pronounced

body leans to embody the piece's dramatic passion or subtle shifts in posture or expressive hand flourishes to convey the music's delicate subtleties during the concerto's intense passages. Each gesture, meticulously aligned with the emotional and narrative threads of the music, is not just for show but is integral to conveying the depth and complexity of the piece.

For a novice pianist, on the other hand, the performance may rely on more basic or mechanism gestures as securing the technical aspects might be their primary concern. Their focus on achieving technical accuracy might result in less attention to the varied expressive potential of ancillary gestures. For instance, when tackling a piece like Beethoven's Moonlight Sonata, a less experienced pianist might primarily concentrate on the correct fingerings and timing, with their physical expressions limited to basic hand movements and minimal body involvement. This contrast between experienced and novice pianists illustrates how the depth of understanding and mastery of the instrument directly influences the range and effectiveness of ancillary gestures in piano performance.

### 3.3 Personality of Performers

The pianist's personality also plays a pivotal role. The research conducted by Luck et al. (2010) offers valuable and pioneering insight into the relationship between music-induced movement and personality traits<sup>[24]</sup>. In the study, 952 individuals were initially involved in completing the Big Five Inventory (i.e. Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism) to assess their personality traits. Then, 60 extreme-score participants were selected to participate in the motion capture lab experiments section and exposed to a number of 30 music excerpts covering six popular genres. By analysing the quantitative data of the music-induced body postures, five principal components were categorised to represent various types of movement, including Local Movement, Global Movement, Hand Flux, Head Speed, and Hand Distance. Besides exploring the relationship between music genre and body inducement, it illustrated the intangible correlation between the Big Five personality traits and the types of movements exhibited in response to music. Specifically, this research found that Conscientiousness was strongly correlated with Head Speed, Hand Distance, and Global Movement; however, Openness was only closely associated with Local Movement. Agreeableness had a significant relationship with Hand Flux, Hand Distance, and Global Movement, while Extraversion had a favourable correlation with all five movement components. Eventually, it was shown that Neuroticism exhibited a negative association with Global Movement, Hand Flux, Head Speed, and Hand Distance but a positive correlation with Local Movement.

Expanding upon the insights, Luck et al.'s (2010) findings on music-induced movement and performers' personality traits required further empirical exploration in different contexts<sup>[24]</sup>. It is clear that this research provided a unique and vital framework for future research in viewing the relationship between a pianist's personality characteristics and the extent of ancillary gestures applied in their performances. For example, pianists with a high degree of Conscientiousness, a trait linked with Global movements and Head speed, might exhibit gestures that are precise and measured, reflecting a disciplined approach to their performance, and these music-induced gestures could closely align with their meticulous attention to musical detail.

### 3.4 Environment of Performance

Last but not least, the performance environment also plays a critical role in shaping these gestures. The size and acoustics of the venue, the presence and number of the audience, and even the lighting and stage setup can affect the pianist's expressive movements<sup>[4][22]</sup>. For example, a pianist might engage their movements with exaggerated gestures, such as broad arm sweeps and pronounced body leans, to ensure the auditory sound could reach every corner of the space and the emotional intensity of the music could move the audience from far behind. Instead, in a more intimate setting, such as a

small chamber room or music salon, the pianist's gestures could be subtler and more nuanced. As the stage is close to the audience, the listeners could easily catch delicate movements from performers, such as a slight lean of the head, a gentle lowering of the hands, or minimal shifts in body posture, and these refined gestures, integrated with thoughtful music interpretation, may allow for more entrainment and engaged of the music. Moreover, this adaptive body movement demonstrates the pianist's expertise not only when facing diverse performance environments but also their body sensitivity when interacting with music. This induced musical movement not only benefits musicians' performance by resonating with the audience but is also more adaptive to the setting and enhances the overall musical experience.

#### 4. Conclusion

Building on the previous studies of musicians' body movement, it is clear that the physicality of a pianist's performance extends beyond the pressing of keyboards. The embodied movement in piano performance, particularly through ancillary gestures, plays a critical role in the pianist's own experience of the music. Research has shown that the body movements presented by pianists within the concert can provide insight into their intentionality with respect to the music being interpreted, and these movements can also influence how the audience perceives the expressiveness of the performance [4]. In other words, the pianist's body becomes a physical interpretation of the music and the body extension of the instrument. These deliberated embodied musical movements are carefully aligned with the musical notation in the scores and accurately reflected by the pianist's performance. To manage this expressive musical embodiment, a well-controlled interaction between well-understand score interpretation, high-level performance techniques, suitable personality traits, and familiarisation with the performing environment is essential.

In addition to enhancing musical expression and audience engagement, embodied movements in piano performance also serve a pedagogical implication. Enhancing body awareness is often emphasised within piano teaching as a significant means of developing students' technique and musicality. The way a pianist sits, breathes, and moves can significantly impact their playing. By mastering controlled, expressive body movements, students thereby learn to control their physicality into more effective and expressive performances.

Conclusively, while the music-induced movement has been widely reviewed as a passive body reaction to music from the listeners' perspective, it also has the potential to be recognised as an active physical interpretation of music features through the lens of music performers. The extent to which each mediating factor, such as notation on the music sheets, the expertise of performers, the diverse personalities, and the environment of the performance, influence the inducement of pianists' bodily movement requires further empirical data evidence. Encompassing aspects of expression, communication, personal experience, and pedagogy, it is true that embodied music movement plays a significant role not only in transforming the music interpretation from the mental inner world to more projective physical settings and enhancing the auditory experience for the audience, but also in deepening the pianist's own connection with the music, and creating a symbiotic relationship between the performer, the instrument, and the audience<sup>[25][26][27]</sup>. In this way, embodied music movements are not ancillary but essential to both the artistry and the pedagogy of piano performance, shaping the way music is both taught and experienced.

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