

Exploring Pianists' Embodied Concepts of Piano Timbre: An Interview Study

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ABSTRACT

Timbre has been largely studied from a macro-perspective with the focus on the sound difference made by a range of instruments; Timbral nuances produced from a single instrument have been less studied, where the timbre production is closely associated with playing techniques and expressive intentions. This paper presents part of the results from a semi-structured interview study which investigated the specification of piano timbre concepts among 9 advanced pianists in their piano playing experience, addressing the question of how timbre concepts may be related to expressive intentions, and to what extent the bodily movements play a role in the conceptualization process. Taken together, this research studied piano timbre from a holistic and embodied perspective.

I. INTRODUCTION

In general, the majority of studies on timbre focus on the macro-perspective of timbre and regard timbre as a basis of discriminating sounds having the same pitch, loudness, and duration. For instance, psychoacoustic studies have been conducted to investigate the impact of acoustic structure (such as spectral energy distribution) on the perception of timbre (Rasch & Plomp, 1982). Recent interest has turned towards the micro-perspective of timbre and examined the influence of playing techniques on the perception and production of timbre from a single instrument, such as the clarinet (Barthet, Depalle, Kronland-Martinet, & Ystad, 2010) and guitar (Traube, 2004). A few studies have started to explore timbre in piano performance.

Expressive piano performance involves performance of the music with precise timing, intensity, and articulation. Additionally, pianists regard timbre as an effective device to realise their expressive intentions, as can be seen from extensive vocabularies to describe the variations of timbre in a piano performance (Bellemare & Traube, 2005); as well as different playing techniques employed by pianists to create a desired sound of their own (Berman, 2002). However, how is such an aim achieved? And what aims related to timbre do pianists have? This research aims to explore pianists' concepts of piano timbre in their expressive performance from an embodied perspective, and to identify the role of the body, and different sense modalities such as touch in these timbre conceptualizations.

A. Piano Timbre-Touch Relationship

Piano timbre has been studied from a scientific perspective since Ortmann's work "the physical basis of piano touch and tone" (1925), whose significance and contribution to the piano performance study has been pointed out by several following researchers (Seashore, 1937; Goebel, Bresin, & Galebo, 2004). Since then, the touch-sound relationship in the piano performance became a long debated question in terms of "whether or not touching can change the produced piano tones". Ortmann (1925, 1935) and other scientists (e.g.,

Turner, 1939) claimed that the independent control over tone quality is non-existent; Pianists can hardly vary the piano timbre independent of its intensity, and intensity is always associated with tone quality.

However for the piano performers, they tended to distrust these findings and develop the musicians' conceptions of piano timbre. This can be seen from the extensive utilization of timbre descriptors by pianists in the response to piano tones as indicated in previous linguistic studies; as well as the narratives by famous pianists and piano pedagogies (Kochevitsky, 1967; Berman, 2002).

B. Piano Timbre vs. Other Within-Instrument Timbre

The investigation on the timbral difference produced from the same instrument has been conducted within a range of fields. The acoustical analysis of recorded performance demonstrated that the timbre of within-instrument is closely related to the performers' playing techniques. For instance, the timbre of the clarinet can be changed by the blowing pressure, and lip force imposed on the reed (Barthet et al., 2010); the guitar timbre is strongly associated with the plucking position, plucking angle, and the utilization of nail/finger (Traube, 2004). It is noticeable that in these instruments, the sound is produced through the direct interaction between performers' finger and instruments' string/tube. However, piano tones are produced via the stroke of hammers rather than the contact with keyboard surface; while the most effective part of hammer stroke is actually without the control of the player (Hamilton, 2013). This makes the piano timbre mysterious.

C. Main Approaches in Piano Timbre Studies

Recent acoustic analysis of recorded piano performance indicated that piano timbre can be changed by various touching techniques; however, their research emphasis is on singular piano tones. For instance, the study of Geobl and his colleagues (2004) showed that pianists can distinguish sounds of equal dynamic level produced by two types of touching: percussive or non-percussive; The acoustic analysis of piano tones indicated that the timbral difference results in the attacking noise, with bigger "attack noise" in the percussive (struck) touches compared with non-percussive (pressed) touches. A similar study (Geobl, Bresin, & Fujinaga, 2014) also found that musicians were able to discriminate whether a tone reached the bottom of the keyboard or not, when other physical attributes (hammer velocity, pitch, duration) were constant. With careful experimental manipulations, researchers identified several factors that influence the touch-sound relationship. However, piano timbre should be studied in a polyphonic and musical context, since piano timbre production involves more extensive utilization of bodily gestures besides finger touching. Additionally, the timbre perception may also be influenced by cross-modal perceptions (Parncutt & Troup, 2002).

Another approach to investigate the perception of piano timbre is to examine the verbalization of timbre descriptors. Bernays and Traube (2011) quantified the semantic structure

of timbre descriptors and identified the most encompassing subsets of descriptors based on a previous piano timbre verbalization study (Bellemare & Traube, 2005). This study created five subsets of timbre descriptors based on the cluster analysis of familiarity and similarity ratings given by pianists in response to a questionnaire, namely bright, dark, dry, round, and velvety. Kojucharov and Roda (2015) collected pianists' adjective description of touch and timbre definition as answered in a questionnaire and categorized their responses into five domains: physical-motor (by fingers/arms), articulatory (legato/staccato), sensory (heavy/light/soft), emotional (relaxed/tender/powerful), and aesthetic-stylistic (Baroque/beautiful/modern). This study found that touch descriptors were equally distributed into five categories while timbre descriptors exclusively fell into the sensory, emotional, and aesthetic-stylistic categories.

D. The Conception of Piano Timbre for Pianists

Piano timbre concepts differ significantly from one pianist to another in the context of piano playing. For instance, Kochevitsky (1967) suggested that the quality of piano tones depends mainly on pianists' mental conception. It is the inner conception of desired tone quality that guides and motivates pianists to move their arms, hands, and fingers. Thus, thinking that observing the playing hands of a great pianist will unlock the secret of producing a good tone quality, is misguided. Therefore, to listen is more important than to look. Berman (2002) relate piano timbre to the "sound" of a musical piece: the production of a "proper" sound only partly relates to playing techniques which emphasized the ability of playing rapidly and evenly; it is more relevant to a stylistic awareness with which a performer interprets a musical piece with an appropriate choice of tempo, rhythm, phrasing, and articulation. Therefore, pianists should have a "subjective ear" which guides pianists to create an "image of the kind of sound he would like to produce"; as well as an "objective ear" which "monitor the sound that actually comes from under his fingers" (p.13). In both cases, the concepts of piano timbre are not purely relevant to physical finger movements; instead, pianists create an inner image of sounds in the mind which drives the body to move to achieve a desired auditory outcome. In another words, the concept of piano timbre becomes a bridge between the performers' body, mind, and the produced sound.

Several pianists are aware of the relationship of piano timbre with other musical attributes such as dynamics, timing, and articulation. Hamilton (2012) associated the tone color of the piano with "the illusion of different hues by dynamic contrasts and shadings". He argued that there is a limited range of tone quality to vary on the piano itself, and that the most effective way to vary the tone color is to apply different degrees of force. However, tone color can be changed not only with force but also various types of touch such as, reducing the finger-stroke noise, articulation, and also use of pedal. Additionally, Bernays and Traube (2014) applied this notion of timbre in a polyphonic and expressive piano performance context, in which pianists use the elements of articulation, touching techniques, and pedaling to pursue a subtle tone combination while keeping the rhythmic and melodic structure unchanged.

E. Introduction of This Study

The psychoacoustic perspective on piano timbre emphasized isolated piano tones, regardless of cross-modal associations between musical context and timbre. Parncutt and

Troup (2002) suggested the role of weak cross-modal synaesthesia in the perception of piano timbre, and claimed that this is the reason why pianists believe various touches could affect the piano timbre and disagree with acousticians' findings. The authors argued that the perception of timbre of performers can be influenced by kinaesthetic feedback from finger contacts with the keys; while for the listeners, their perception of timbre may be influenced by visual perception of a music performance (e.g. perceiving a hard/brittle tone after watching a pianist brutally hitting the piano, p.290). Therefore instead of focusing on singular piano tones, this study will examine piano timbre in a polyphonic and natural musical context.

Additionally, the semantic examination of verbal descriptors of piano timbre have led to the adoption of a disembodied approach when studying the subjective musical mind, regardless of the contribution of bodily involvements in the conceptualization of musical sounds. This research intended to suggest that pianists' conception of piano timbre may also be enriched by the contribution of bodily movements in the piano playing. This idea is inspired by few studies which examined the extent to which timbre perception may be relevant to corporal intentions in response (or preparation) of making musical sounds. For instance, Prem and Parncutt (2008) investigated to what extent female jazz vocalists described the timbre of the voice in relation to the human body. One female jazz singer was asked to rate the corporality of 250 vocal timbre descriptors on a scale from 1 to 7. This study found that 22 of 250 words received the highest ratings of corporality, such as "anchor, articulating, attack, avoiding, constricted, relaxed etc." The largest category relating to the corporality of timbre referred to the astral body, other than the actual physical body. Additionally, several studies indicated the perceptual similarity between vowels and guitar sounds (Traube, 2004) as well as saxophone sounds (Nykänen & Johansson, 2003) by the formant analysis, indicating the close association of timbre descriptors (e.g. thin, round, open, and sharp) with the phonetics domain.

This study aims to explore the role of pianists' gestural control and the interaction with the instrument in the conceptualization of piano timbre, in other words, the embodiments in the expressive production of timbre in the piano playing. Due to the fact that the perception of a musical performance is multi-modal (auditory/motor/visual/tactile), the second research aim is to identify to what extent piano timbre perception may be influenced by perceptions from other sensory modalities; and what the interaction is with other musical components (pitch, dynamics, articulation, melodic or harmonic structure).

II. METHODOLOGY

A. Overview

Twelve advanced pianists are interviewed and asked to give a performance demonstration. In the semi-structured interview, pianists are asked about their understanding of piano timbre – what it means to them and how they employ the term, and the ways in which they produce different timbres on the piano. In the performance demonstration, pianists are asked to play an excerpt from a self-selected piece of music and to explain their employment and production of piano timbre(s).

The interview questions functioned at different levels: the first category explored pianists' subjective definitions of piano timbre. Instead of emphasizing the given definitions of piano timbre, this question intended to identify various perspectives (sonic domain, emotional expression, technical production, or artistic/aesthetic perspective) that pianists employ. The second category explored the significance and importance of timbre in the piano playing. This aimed to discover to how pianists relate timbre concepts to the interpretation of a musical piece. The third category concerned the physical production of piano timbre and the methods pianists used to facilitate that process, such as imagination, metaphorical thinking, or perceptions from other sensory-modalities.

B. Analysis

The data analysis focuses on the emerging themes of qualitative interview data. This study firstly examined the extent to which the pianists' description of timbre had been influenced by other musical features (pitch, tone asynchrony, harmonic structure, melodic line); Secondly, it examined the verbal description or physical employment (derived from video recording) of fingerings, hand positions, and the body, in relation to specific timbral intentions. Thirdly, the significance and motivation for the employment of a variety of timbres in piano performance was explored, in order to understand the pianists' conceptualization of timbre as an expressive musical component.

III. RESULTS & DISCUSSIONS

A. Overview of Themes and Subthemes

The analysis of the qualitative data was conducted by coding line by line. Emerging themes and subthemes and their relationship are shown in the below in Table 1. The table shows that three dimensions emerged from pianists' descriptions of piano timbre. The first is the "objective listening dimension" in which piano timbre may be affected by environmental differences (room temperature, room size and space, resonance) and individual difference of each piano. The second dimension is a subjective experience of piano timbre. It is influenced by: (1) various qualities of touch applied to the keyboard; (2) the involvement of other bodily parts; (3) and the simultaneous perception from other musical attributes. The third dimension is the interpretive dimension of timbre production. In this case, the concept of piano timbre relates to the interpretation of a musical piece and musical expressiveness; the production of piano timbre is affected by the composer's intention, pianist's expressive intention, and the musical title and style.

Table 1: The sub-themes and themes from the analysis of interview data and their relationship.

Subthemes	Themes
Affordance of the instrument Environmental influence Individual timbre of each piano	Objective perspective on timbre production
Attack speed/depth Finger percussiveness Curved-flatted finger	Finger touching qualities

Performed articulation Dynamics Musical tempo Combination of tones	Relevance with other musical features
Body scope (finger, arm or entire body) Relaxation and tension Weight Musical phrasing and body breath Leaning forward/back and feeling "in/out"	Corporal intentions in timbre
Musical title creates an atmosphere for timbre imagination Musical style and the timbre of a musical piece Composers' narratives/intention determines the timbre	Interpretation as second-production process
Timbre as essence of the art of piano playing Get more concentrated on practice Important than playing techniques Emotional communication to audience	Functional relevance

B. Holistic Perspective on Piano Timbre.

The holistic perspective on pianists' conceptualization of piano timbre was explored in this study. This research showed that pianists occasionally considered the piano timbre as an entire impression of tone combination; they may experience the process of timbre production as the integration of musical aspects and its shaping over time rather than a particular sonic state. For instance, pianist JE reported that the production of piano timbre became "different things like fingering, position, and techniques trying to create the sound I want" and referred to the "acoustic journey that you go through with that piece in terms of creating the loudness and the softness and how that travels through the piece."

The perception/production of timbre was strongly associated with perceptions of other musical features. The following sections illustrate ways in which pianists' descriptions of produced timbre were influenced by other performance features, especially dynamics and musical structure (pitch, melodic structure, and harmonics).

1) *Musical Dynamics*. The results showed that the production of making timbral nuances was strongly associated with variations in dynamics. When pianists were asked to make contrasting piano timbres, it was usually accompanied by a changing dynamic. For instance, pianists tended to produce louder sounds in the production of "rich", "bright", "rough", and "full" timbres; while played softer when making "dark", "hallow", "tender" timbres.

Nevertheless, the results also indicated that pianists experienced piano timbre and the dynamics differently. Hamilton (2013) has clarified the difference between piano timbre and the musical dynamics. He argued that the change of dynamics relates to the degree of force applied to the keyboard; while piano timbre can also be influenced by diminishing the attacking noise and using the pedal. Pianist

YY gave an explanation of how the timbre of a chord would sound differently with equal dynamic level:

“The timbre of two equally loud chords would sound differently if I use different playing techniques. If I play in this way [with tensed arms], the timbre is tensed and tighten; It is significantly different from playing in this way [pushing forward], the sound is moving forward, which sounds better.”

2) *Musical Pitch*. The influence of musical pitch on the perception of piano timbre was significant. Pianist JE explained to what extent the timbre perception of a musical fragment was influenced by the high pitch: “This part is a lot sparser. I don’t know why...maybe it’s because it’s high [pitch]...I feel very open as a pianist, so the sound I want to create from that is something very clear. I don’t want to say cold, but very distant.” The perception of “sparser” timbre might relate to the embodied experience of playing higher pitches on the piano, reaching a further distance and resulting in a feeling of “being away from” the center of the body.

In contrast, Pianist LE experienced the impact of low pitch on the perception of piano timbre, with an impression of a “heavy elephant”. This is consistent with the cross-modal association between pitch and physical size (e.g., Marks, 1987): lower is bigger (i.e. impression of an elephant).

3) *Melodic Line*. In the polyphonic context, the variation of dynamics levels of tones within a chord or between the left/right hand, enables pianists to bring out a melodic line. A crucial aspect of the playing techniques is to apply different weights to the tones.



Figure 1: A musical fragment from Debussy’s *Doctor gradus ad Parnassum*. Red markings are the melodic line pianists LE tended to bring out.

This activity was strongly associated with experiencing contrasting timbral intentions between the right/left hands and different fingers among pianists. For instance, Pianist LE said that “Here [example: Figure 1] are different things. I put more pressure on the very first note of each sixteenth note because it is the melodic line”. Pianists tended to associate the production of contrasting timbres in a polyphonic structure with the idea of “playing the melodic line clearly, smoothly, and audibly”.

C. Relationships between the Body and the Sound.

Observation of the video recordings and accompanying explanations indicated that piano timbre was closely associated with the way pianists used their bodies, including the finger patterns, hand positions, weight of body, and the direction/aspiration of the body.

1) *Finger Patterns*. Pianists tended to describe the sound as “fuller”, “round”, and “rich” with curved fingers. This might be because the shape of hands tends to be round and that the space under the hand is richer when playing with

curved fingers, which results in the sound impression of being “full” and “round”. As Pianist JE explained that: “This open phrasing, it is quite a rich chord to me. It will be under this bit (the space under the hand) where to me the sound comes from. However, if it is played with the flatter finger, to me it sounds a little bit hollow, it is not very pronounced enough to start the opening of a phrase.” In this case, the pianists paralleled the shape of hand with the mouth, and associated the finger touching with embodied experience of vocal pronunciation.

2) *Weight*. Weight is closely linked with the dynamics of performed sound on the piano. However, the extent to which pianists employ the weight of their body, whether it is solely from fingers, hands, arms, or the whole body, influences their perception of piano timbre. Hamilton (2013) has clarified the difference between finger touch, hand touch, arm-weight touch, and full-arm touch, suggesting that full-arm touch is recommended for heavy work and finger touch is reserved for the lightest grade of tone.

Indeed, chords were described as “thicker” and “fuller”, and “firmer” when pianists applied their whole body and produce a tone; Chords were described as “thinner” and “not-at-bottom” when playing with primarily the fingers. This finding is also applicable in the production of individual notes. Sounds were felt “lighter” and “softer” when played with less weight while felt to be “sharper” and “brighter” when played with more weight.

3) *Muscle Tension/Relaxation*. When playing the strong chords, pianists needed to borrow more weight and energy from the arm, shoulder, and even the entire body. Failure to transfer the weight from the body to the finger left pianists felt being “blocked” and “frozen”, resulting in the increased tension in their muscles. As a result, the corporal feelings of tension and relaxation affected their judgment of piano tones. As pianists YY described:

“The first time when I went to record my performance of Chopin’s Etude, I felt very tense, and my body was very tense, the performed sounds were quite tense, although it was fast, but the sound was stiff and rigid, no articulation and breath. The second time I told myself to relax and to breathe. I can feel the sound became more softened, with breaths in the melody.”

Charles Rosen (2002) has argued the importance of relaxed arms in the production of a chord with fine tone quality. He suggested that the relaxation of the arm enables the variation of weight that is produced from each finger, and makes the possibility to balance the notes within that chord and to exploit the harmonics.

The tense and relaxation of pianists’ body also affected the aspiration of pianists and their feeling of aspiration of musical phrases. As demonstrated in pianists YY’s description:

“I will make my finger breath through the breath of myself, and this contributes to the breath of the music. When I was tense, I want to make individual notes played loudly and correctly; while when I became relaxed, I realized that this is a sentence not individual note. Maybe I reduced the musical unit to individual note (when I was in tension), while being relaxed makes me to think in bigger section.” (Pianist YY)

In other words, the relaxation enables pianists to think the musical phrase in bigger and broader sections. In terms of the timbre production, relaxation helps pianists to interpret

musical phrases in a more coherent way rather than focusing on the dynamic and playing techniques of individual notes.

4) *Direction*. Timbre involves a sense of physical direction as shown in pianists' descriptions of playing chords, such as "going straight down", "moving forward", and "spreading". This phenomenon can be seen from the different ways in which pianists used their body and fingers. When pianists played louder chords, they had to use the energy from the shoulder, arms, and hands and shift the weight to the finger, like the action of "pushing". Changing the direction of weight resulted in a relative feeling of changing the direction of sounds. In terms of understanding "spreading" sounds, pianists spontaneously moved their elbow joints outwards and stretched the hand to support a heavy chord. This lateral weight shifting results in the feeling of "spreading".

D. Function of Timbre in the Musical Performance

The concept of timbre affected the expressive musical performance in many ways. Firstly, it helped the pianists to make an emotional communication with the listeners. Pianists changed the tone colors according to their own interpretation of the music and thus considered how they could enable the audience share the experience with them. Consequently, timbral intention functions as a bridge to connect the thoughts of pianists in their performance and perceptions of listeners in their listening experience, in order to achieve a shared experience. This was demonstrated by pianist JE:

"It is really an important thing in terms of shaping your journey and your audiences' journey through a piece...in terms of creating a relationship with your audience. Because you understand how beautiful the piece is in different sounds, so it's about you putting that through, just to hear the different sounds and the acoustic, articulation that comes through, to hear the richness of the piece."

Secondly, awareness of timbre improves pianists' musicality and technical abilities as well as training their ears to actively listen to their own performance. Pianists stated that they occasionally had the moments of "total absence of mind" in piano playing, and what happened as a result was that they were producing "fingering-movements" – "like a robot". Thinking about timbre and tone quality let them move beyond the technique and fingering, and enabled them to keep the sensitivities of timbre variations at the front of their minds.

"Finally piano playing is the art of listening. It is not about how high and complex technique you have. Timbre lets me no longer pursue the complex techniques; instead to a higher level, listen to your performance by ears, listen what timbre has been performed." (Pianists YK)

In this context, active playing means that pianists learn to listen sensitively and to concentrate on the sound outcome rather than the technical approach. As argued by Wulf and Prinz (2001), the performance of golf players would be better if their focus was the ball rather than movements of their bodies. Parncutt (2013) also suggested that piano performance would be more successful if pianists concentrated on the sounds produced, rather than techniques.

IV. CONCLUSION

The concepts of piano timbre were examined from a holistic and embodied perspective. With regard to the holistic understanding of piano timbre concepts, pianists experienced the timbre of produced piano tones as a combination of various elements, including the touch, the bodily movements, and the coordination with other musical features. This finding differed with previous psychoacoustic studies which regard timbre as a physical attribute of sounds and our subjective experience of timbre relates to certain physical property of sounds. The concept of timbre in a musical context is more complicated, and becomes the subjective reaction to concurrent perceptual events. These perceptions are multi-modal: the perception of touching qualities and bodily involvements is both visual and tactile, while the perception from other musical features is an auditory event, resulting in the cross-modal perceptual characteristics in the timbre perception.

In addition, the embodied experience relating to the perception of piano was examined. It was found that pianists' description of perception and production of piano timbres largely referred to the bodily movements in that activity. This research revealed that piano timbre can be perceived with various physical features such as space, direction, weight as well as senses such as muscle tension and relaxation. Each type of experience was found to be relevant with the physical utilization of bodies, which was discussed separately in the data analysis. This can be seen as the evidence of embodied cognition of piano timbre in pianists. These results partly explained the phenomenon that pianists believe the piano timbre can be changed independently of other musical attributes by the various ways of touching and bodily movements, since the embodied experience relating to piano timbre makes the perception of timbre meaningful and colorful.

The piano timbre concept also has functional relevance to the performer. Firstly, the concept of piano timbre relates to the artistic and aesthetic dimension of piano playing. It enables the performer return to the essence of piano playing by being more concentrated on the produced sounds rather than focusing on the physical techniques. Secondly, the idea of focusing on piano timbre in a piano performance helps with pianists' emotional communication with listeners. All the experience makes the piano playing to be life-long meaningful and enjoyable.

One of the limitations of this study is that it failed to make the performance recordings of pianists, so it is still unknown to what extent the performance parameters (timing, dynamics, articulation) will be varied in the production of a certain timbral intention. The data analysis merely relied on pianists' subjective descriptions, and observation of video recorded data. Future studies are planned that include the performance data and examine its relationship to timbre concepts.

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