Body and music. An annotation scheme of the pianist’s multimodal behaviour

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ABSTRACT
The paper presents a research on the multimodal behaviour of a pianist during performance, and proposes an annotation scheme for this behaviour. The research data, aimed at a first testing of a theoretical model of the pianist’s mind, shed some light on the relation of trunk, head and face movements with hand movements during piano performance, and on their expressive import as to the pianist’s cognitive, emotional and motor processes. The annotation scheme is presented and some uses of it are proposed for research on music performance.

Author Keywords
Annotation scheme, Music performance, pianist.

ACM Classification Keywords
Annotation scheme, Music performance.

INTRODUCTION
Interaction linked to music performance has been analysed with methods of conversational analysis [2], [3], [6], while the gestures of classic orchestra conductors were analysed in terms of their visual metaphors [1].

But analysis of multimodal communication in music performance can also be carried on through more analytical annotation systems. An example is the classical orchestra conductor’s face, that was analysed [4] through a variant of the “score of multimodal communication” [5]. In this work I present an annotation scheme for the analysis of the pianist’s multimodal body behaviour.

A TOP-DOWN AND A BOTTOM-UP APPROACH
Research implies testing theoretical hypotheses by collecting and analysing data. But the very elaboration of a hypothesis often comes about thanks to induction starting from data observation. So any investigation uses both a top-down and a bottom-up approach, one starting from theory and one from data. In a research aimed to test a theoretical model of the cognitive and emotional processes holding in a pianist’s mind while playing the piano, I had the chance to tune up a variant of the “score of multimodal communication” [5], that can be used to transcribe and analyse multimodal behaviour during music performance. In the following I present the theoretical model proposed, the research aimed at its testing, and finally the annotation scheme of the pianist’s body tuned up thanks to this study.

THE PIANIST’S BODY AND THE PIANIST’S MIND
While playing the piano, three kinds of processes take place in the pianist’s mind.

• Cognitive processes. While playing, cognitive processes of attention, perception, and memory are at work. Attentional processes include, for example, the pianist being in concentration on the music to play, that is, his focusing of attention aimed at performing at his best. On the contrary, the pianist can sometimes be quite relaxed, for example when the piece to play is well mastered: and in this case he can suspend his tension and concentration. Attention is also implied, for example, in “caution”, when the pianist plays very softly, like in touching something fragile, something not to be spoiled with too vigorous a touch.

Perception is obviously at work while the pianist is playing. Of course, perception relevant to his playing is especially acoustic perception, both in hearing other players’ music, to start playing, to be consonant with others’ music, and in hearing his own music, to have a feedback of how he is playing.

Memory: while playing, the pianist has auditory images of the sounds to play, and visual images not only of the score to play, but also of objects or landscapes: any simply visual or synaesthatic image linking sound to vision. Moreover, tactile and spatial memory of where tunes are or how they are felt by hands. Finally, very much linked to these, the procedural memory of hands and feet movement is central in the pianist’s cognitive processes, since it governs his motor processes.
• Emotional processes. In a pianist we can distinguish felt emotions and enacted emotions. 

The pianist may feel real emotions while playing, but he also must recite emotions, feel as if he were feeling some. A pianist, and not only a professional one, is like an actor on the stage, who must induce emotions in himself: the emotions to be impressed in music, and thus to be transmitted to listeners. At the same time, a professional pianist generally has a capacity to manage his emotions, just as an actor does, in such a way as not to be overwhelmed by them while playing.

Two types of felt emotions can be distinguished:

- *process emotions*, the emotions felt during and about the very process of playing: the positive emotions of relaxation and flow (a sensation of being doing something beautifully and easily), and the negative ones of tension, or fear of making mistakes in performance.

- *outcome emotions*, the emotions felt about the outcome of one’s playing: disgust or shame for making a mistake, pleasure, satisfaction or ecstasy for how sweet it sounds.

Enacted emotions can be:

- *meaning oriented* emotions, the ones the pianist must simulate or induce in himself in order to exhibit them through music: for instance, feeling sad to play a sad music.

- *movement oriented*: the emotions the pianist needs to simulate because their expression is linked to a particular movement or manner of movement. Typically, for example, a pianist frowns when he has to play very loud notes: frowning is an expression of anger, and anger makes you so strong and energetic as to touch keys with more strength. Here the emotion, and its consequent expression, is functional to the quality of sound.

• Motor processes, relative to the movements to perform and to the manner in which they should be performed.

Music is produced by movement; among the parameters of music, melody, rhythm and harmony could be seen as produced by hand movements (which tunes are touched by fingers and when), while parameters like timbre, tempo, expression, intensity as determined not by the movements themselves, but by the way in which they are performed – their “manner of movement”.

In a pianist, the combination of cognitive and emotional processes determines the way in which motor processes work in producing music.

AN ANNOTATION SCHEME OF THE PIANIST’S BODY

This is my hypothetical model of the pianist’s mind. But how can we know if it is an adequate model? An empirical evidence would be to find out external signals of these processes. So, leaning on the principles of the “score of multimodal communication” [5], I tuned up a specific annotation scheme for the analysis of the pianist’s multimodal behaviour. The pianist Marcella Crudeli, while playing the piano concert in A major K 488 by W.A.Mozart, was videotaped during a rehearsal and a public concert, and her multimodal behaviour was analysed through this particular variant of the “score” (Table 1). Later the results of the analysis were shown to the pianist, who provided some further comments and generally agreed about the interpretation of data provided.

<table>
<thead>
<tr>
<th>Bar</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. notes</td>
<td>B E D# C B A# A G</td>
<td>Goal / Meaning</td>
<td>Goal Type / Meaning Type</td>
</tr>
<tr>
<td>2. time</td>
<td>1.20</td>
<td>Shoulders raised and backward</td>
<td>I retract, I do not want</td>
</tr>
<tr>
<td>3. trunk</td>
<td>Shakes head slowly</td>
<td>No no = I reject sorrow</td>
<td>CP ➔ Mea E</td>
</tr>
<tr>
<td>4. head</td>
<td>Frowns, then raises inner brows</td>
<td>I am worried + I am sad</td>
<td>Mea E + Mea E</td>
</tr>
<tr>
<td>5. eyebrows</td>
<td>Squeezes eyes, then opens eyes</td>
<td>Help play sharp A (# A)</td>
<td>HM</td>
</tr>
<tr>
<td>6. eyes</td>
<td>Mouth</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In this study the analysis is carried out only on the pianist’s body, not on her hands and feet, that obviously do the technical job of playing.

The analysis is necessarily carried on by making reference to the score of the music performed and by examining fragments bar by bar (sometimes even note by note). In the first column you write the bar number, and in the lines 1 through 7, respectively, the following information:

1. the notes of that bar, either in musical notation or with their names;
2. the time at which the passage occurs;
3. the modalities taken into account for the analysis; in this study, respectively, trunk, head, eyebrows, eyes and mouth.

For each modality, the analysis is written down in the first three columns. In col 1, you write a description of the movements performed by that part of the body; in col 2, an interpretation of that movement: if it is judged a non-communicative action, you simply write its goal, while if it seems to have expressive or communicative goals, you write down the information it aims to provide, that is, its meaning. An action is defined as “communicative” if it has a conscious, unconscious or tacit goal, or a goal determined
by social or biological function, of having some other Agent assume some belief [5]. An “expressive action” is a type of communicative action that concerns information about the Sender’s mental states (not about the external world), and whose Sender is not aware either of his goal of communicating or of the signal produced or of both. An example of “communicative action” is when the Pianist, during the rehearsal, nods to the orchestra to praise for how it is playing. If she frowns in concentrating before starting, this is an “expressive action”. If she moves her head up and down rhythmically to accompany the rhythm of the music she is playing, this is a “non-communicative action”.

In col. 3 you classify the goal or meaning of col. 2 in terms of a typology of the movements performed (see Table 2 below).

In col. 2 and 3 you can provide an analysis not only of the literal meaning or of the apparent goal of each movement, but also of its indirect meaning, or its superordinate goal. For example, this is the analysis of head behaviour in Table 1, row 4. At bar 100, the pianist shakes her head slowly (col. 1), like if saying “no no”, a performative of rejection; but what she rejects, as confirmed by the context, namely the meaning “I am sad” (line 5, col.2) provided by the raised inner eyebrows (line 5, col.1), lets you infer that she feels sorrow; sorrow is well something one rejects. So, in line 4, col.2, the literal meaning is “I reject”, but the indirect meaning is “I feel sorrow”. The analysis of these two meanings in line 4., col. 3, classifies, respectively, the literal meaning as CP (a Communicative act, namely a Performative), and the indirect meaning as a MeaE (Meaning oriented emotion): the rejection the pianist is communicating is a way to express her sorrow, which thus induces in the sounds she is playing.

On the right of the first three columns, new bars can be written down and analysed in the same way. Moreover, one can add other lines underneath to provide a parallel analysis of the multimodal behaviour of another pianist at the same bar, or of the same pianist in rehearsal vs. concert. This allows to compare the different behaviours and to state if the same body behaviour systematically co-occurs with the same hand movements (the same notes to play) across performances and across pianists.

**BODY MOVEMENTS WHILE PLAYING THE PIANO**

This first research allowed to state a typology of the possible functions of the pianist’s body movements, to be used in the classification of col. 3 (Table 2). The types of actions or meanings provided by the pianist’s trunk, head and face are the following:

- **Communicative acts.** Sometimes the pianist, even during performance, communicates something to specific people, and since music prevents verbal communication, this occurs through gaze, head movements or facial expression. In some cases only the performative of a communicative act is conveyed (CP), and the propositional content is to be understood from context: for example Marcella Crudeli, with a head nod, eyebrows raised and a smile, praises the orchestra. But sometimes also the propositional content of the communicative act is explicitly conveyed by trunk or face (CPc): with fast movements she incites the orchestra to go faster.

- **Communication and expression of emotional processes.** Given our definition of “expression”, information about the music can only be communicated, while information about the pianist’s emotions or cognitive processes can be either communicated (if the pianist deliberately and consciously signals it) or expressed (if it leaks instinctively or without awareness). Process emotions (PE) and outcome emotions (OE), since they are felt, can be either expressed or communicated. Among enacted emotions, those meaning oriented (MeaE) will presumably be communicated, if they are consciously simulated, while movement oriented emotions (MoE) may be simply expressed: the pianist might be conscious of the goal of making that movement, not of simulating the emotion in order to make that movement. An example of Process emotion in Crudeli’s data is her shaking her head rhythmically and smiling, showing mirth about her own playing; she displays an Outcome emotion of pride and satisfaction about how she played by raising external eyebrows and smiling. By raising inner eyebrows she expresses a Meaning oriented enacted emotion of sorrow, and she frowns enacting anger – a Movement oriented emotion – when playing loud notes.

- **Expression of cognitive processes.** The pianist can express her mental states of attention (EA), perception (EP), and memory (EM). Lowered eyebrows show attention and concentration; head down with ear close to the tunes shows the pianist is listening to the sounds played; a signal of memory processes (presumably typical of novice pianists, not of professionals in concert, might be eyes up while trying to remember.

- **Accompaniment of hand motor actions.** In some cases head, face and trunk movements do not have a

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**Table 2**

<table>
<thead>
<tr>
<th>Communicate</th>
<th>Performative</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Performative + Content</td>
<td>CPc</td>
</tr>
<tr>
<td>Express or</td>
<td>E/C Process Emotions</td>
<td>PE</td>
</tr>
<tr>
<td>communicate</td>
<td>E/C Outcome Emotions</td>
<td>OE</td>
</tr>
<tr>
<td>Emotional</td>
<td>E/C Meaning Emotions</td>
<td>MeaE</td>
</tr>
<tr>
<td>Processes</td>
<td>E Movement Emotions</td>
<td>MoE</td>
</tr>
<tr>
<td>Express</td>
<td>Express Attention</td>
<td>EA</td>
</tr>
<tr>
<td>Cognitive</td>
<td>Express Perception</td>
<td>EP</td>
</tr>
<tr>
<td>Processes</td>
<td>Express Memory</td>
<td>EM</td>
</tr>
<tr>
<td>Help Motor</td>
<td>Help Melody</td>
<td>HM</td>
</tr>
<tr>
<td>Action</td>
<td>Help Rhythm</td>
<td>HR</td>
</tr>
<tr>
<td>Help Harmony</td>
<td>Help Harmony</td>
<td>HH</td>
</tr>
<tr>
<td>Help Manner</td>
<td>Help Tempo</td>
<td>The</td>
</tr>
<tr>
<td>of Movement</td>
<td>Help Timbre</td>
<td>Hti</td>
</tr>
<tr>
<td></td>
<td>Help Intensity</td>
<td>HI</td>
</tr>
</tbody>
</table>
communicative or expressive import: they are “simply” movements. But since they are often synchronous and analogous to the movements of the pianist’s hands, they even seem to “help” them to move better. An objection to this claim is that, were this so, pianists that move their body more would be better pianists. Which is not. Actually, different schools of piano technique exist, some encouraging body expression, others composure; but also people of different personal styles may be more or less keen to body motion, and yet be equally good pianists. However, saying that one can be a good pianist even without so much moving his body does not exclude that moving head or trunk at the same time as hands does help. After all, if work songs helped Negroes to work better, why should body movements not help hand movements? Within the movements that directly help the hand motor actions, we can distinguish those that help the actions aimed, respectively, at producing melody, rhythm, and harmony. Movements that help melody (HM) exploit a spatial analogy: direction and intervals of trunk head and face movements are analogous to those of hands. For example in Crudeli’s data, at bar 209, the pianist’s right hand makes a circular movement to play the tunes E, #G #F M; at the same time, her head makes an analogous circular movement. Or again, in playing an acciaccatura from an E to another E an octave higher, as she moves her right little finger up, at the same time she moves her external right eyebrow up! In movements that help rhythm (HR), their rhythmical structure is analogous to that of hand movements: at bars 210 – 211, head shakes rhythmically every two quartines. In movements helping harmony (HH) an analogy holds with the visual image of harmony relations: the pianist, for example, plays a piece around the tonic and then, while playing it again a third lower, lowers her eyebrows. Within the movements helping the manner of movement, some help tempo, others timbre, others intensity. Movements helping tempo (HTe) use the same tempo of the hands; like in the fast head shaking that accompanies fast hand movements; to help timbre (HTi), the tension of body movements is analogous to that of hands: like in raising the external parts of eyebrows which helps a tense timbre; to help intensity (HI), the movement or position of trunk, head or face allows or favors the intensity of hand movements; like in raising whole eyebrows, that helps making a delicate sound. Actually, in some cases it is not easy to tell if some action should be classified as Help Manner of Movement or as Movement Oriented Action, since as we said the manner of movement is very much linked to emotion expression [7].

CONCLUSION
The annotation scheme presented here can be used in research on music performers. After analysis through it, the different distribution of the functions of body movements illustrated above could be computed in different pianists (amateur and professional, with different personalities or coming from different technical schools, and playing different types of music); this could allow a better understanding of the role played by a musician’s body in making music and expressing its meanings. In any case, it could once more show us the subtle synchrony and harmony of our body.

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