It's Not Just About Sound:
Investigating Marimba Performance as an Auditory and Visual Experience

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This paper is concerned with investigating expressive bodily movement in music performance, focussing on the keyboard percussion instrument, the marimba. A theoretical basis for developing a qualitative analysis of expressive bodily movement in music performance is presented. Research in experimental psychology and music performance has demonstrated that bodily movement creates visual information that can influence judgements of auditory information. The concert setting provides an excellent opportunity for performers to use both the aural and visual modes to their advantage in engaging audience attention and guiding awareness to musical content and artistic interpretation. It is suggested that the notated score provides sufficient information for the creation of an embodied musical interpretation resulting in an expressive audio-visual performance.

It is proposed that 'Laban Movement Analysis' can be implemented as a qualitative method and meta-language for analysing expressive bodily movement in music performance. Two worked examples illustrate analysis of a performer's expressive bodily movements. 'Effort-Shape Notation' is employed as a tool that links observed movement with the musical score. A theory based on embodied cognition of a musical score is proposed that explains the performer's role in effectively communicating their artistic image and musical interpretation with an audience through auditory and visual means.

Introduction

Traditionally, instrumental musical training has focussed on the development of technical skills and knowledge related to sound production with relatively scant attention devoted to the visual aspect of performance. However, there is a general understanding among teachers and musicians of the importance of presentation, for example, in preparation for exams or concerts, and the impact presentation can have on assessments of performance. While the visual aspect of performance includes such things as dress and stage presence, it also encompasses the movements and gestures musicians make when they perform. This paper is concerned with investigating expressive bodily movement as the 'visual aspect' of music performance, focussing on the keyboard percussion instrument, the marimba. While this paper investigates expressive bodily movement in marimba performance, the concepts and methods are applicable to the study of expressive bodily movement in other domains such as Western classical piano performance. More broadly, the concepts and methods discussed here have the potential to inform investigation of expressive bodily movement of any instrumentalist performing in the Western classical art music tradition. The goal is to heighten awareness of expressive bodily movement as an important facet of musical learning and communication, and to inform individual piano, keyboard and pedagogical practice.

An attempt to understand bodily movement in contemporary Western classical acoustic solo marimba performance will be made from two perspectives: 1) the audience perspective, or perception of performance, and 2) the performer's perspective, or the aspects of performance that drive the production of bodily movements. These perspectives draw on research in music, experimental psychology, experimental work in music performance, dance, and human movement. Our aim is to link perception and production perspectives. This will be achieved by taking a qualitative approach to the analysis of a marimba player's bodily movements in two different performances of the same musical excerpt.

The Expressive Nature of the Marimba

The marimba is an inherently staccato instrument where once a bar is struck the resultant sound decays at a rapid rate (Fletcher & Rossing, 1998; Rossing, Yoo, & Morrison, 2004). The decay rate is dependent on the register of the note being played; lower notes resonate longer than higher notes. While the marimba player cannot lengthen the duration of a note once it is struck, pressing the mallet head into the bar as it strikes the bar can shorten the duration of the sound (Dahl & Friberg, 2007). This is known as a *deadstroke*. Mallets made of different materials enable different timbral qualities as does striking the bars at different points (Fletcher & Rossing, 1998; Rossing, 1976). However, instigating such timbral changes is limited by technical constraints of performance. Whereas other instrumentalists are able to perform different articulations and perform notes of many differing durations, the percussionist is reliant on changes in dynamics and the timing between notes as a means of acoustically expressive performance (Dahl, 2000; Dahl & Friberg, 2007). As the movements necessary for sound production in marimba playing are highly visible to the observer (Dahl & Friberg, 2007), marimba performance is a valuable vehicle for the study of expressive bodily movement in music performance.

Pedagogical Approaches to Marimba Performance

There are two main philosophies in published pedagogical approaches to contemporary Western classical marimba performance. Stevens (1993) advocates a maximum level of efficiency to movement around the instrument. This approach was developed in the belief that different gestures do not produce different sounds on the marimba. Zeltsman (2003) takes the stance that differences in gesture do result in differences in sound on the marimba. She advocates the performer paying attention to expressive information provided in the score, such as articulatory markings, and utilising a variety of stroke types or gestures in order to render the different ideas in sound. Although acoustical differences do not necessarily result, these gestures may assist the performer in organising their bodily movement to reflect the structure and character of the score which in turn may have a perceptual impact on the observer.

Multimodal Perception - Understanding Audience Response to Bodily Movement in Music Performance

Music performance in today's society can be a multimodal (audio-visual) event. For example, the accompaniment of music with visuals such as that seen in music video clips, or concerts with designed lighting or other visual effects such as video footage. However, music is still accessed primarily through auditory means such as CDs and mp3s (Thompson, Graham, & Russo, 2005). A consideration of the contemporary musical cultural climate in which we live highlights the challenges that face practitioners of traditional live art music. A focus on knowledge regarding how human beings perceive the world, think and interact may provide an important pathway to developing musicians' skills in connecting with an audience in the 21st Century.

Research in many fields has demonstrated the occurrence of an interaction or integration between auditory and visual sensory modalities. Visual information has the potential to enhance, modify or diminish the perception of auditory information. Schutz and Lipscomb (2007) reported that peoples' assessments of long or short notes played on a bar of the marimba were influenced by the performer's use of long or short gestures. Analysis of the sound alone revealed that, in fact, there was no difference in duration between (performed) long and short notes.

At a more global level, visual information created by a performer's expressive body movement has been shown to play an important role in the perception of expression in music performance (e.g. Broughton & Stevens, in press; Davidson, 1993, 1994, 2001, 2002, 2007; Dahl & Friberg, 2007; Vines, Krumhansl, Wanderley & Levitin, 2006; Wanderley, Vines, Middleton, McKay & Hatch, 2005). Visual information, created by a musician's bodily movement, has been demonstrated to be the most effective communicator of expressive intention (Davidson, 1993). In addition, a "positive" visual aspect has been shown to enhance quality assessments of the aural component of marimba performance when the observer can see and hear the performer (McClaren, 1988).

In a study of contemporary clarinet performance, Vines and colleagues (2006) showed that a view of the musician performing could influence participants' judgements of tension and phrasing when compared to a listening only condition. Vision served to intensify or dampen participants' assessments of the intensity of emotion (affect) being communicated to them. In addition, the performers' body movements and gestures enhanced observers' sense of phrasing as compared with assessments made when listening only. Movement prior to the beginning of a phrase cued observers that the phrase was about to start, and movement after a phrase had the effect of continuing the sense of phrasing into silence. Given that visual information created by a performer's expressive bodily movement can influence audience perception of a musical performance, it is logical to investigate possible motivations for the performer to produce or create such movement.

Understanding the Production of Bodily Movement in Music Performance

Embodied Cognition and Communicating Expressive Intention

We have noted that a skilled performer demonstrates expressive intentions through both aural and visual modes. The role of the body in this process is of utmost importance as it is the vehicle for sound production as well as for effective communication of artistic expression. An embodied view of musical cognition and expression was adopted in the early 20th Century by Swiss music educator Emile Jacques-Dalcroze. Dalcroze proposed that both the body and brain should be involved in musical activity (Galvao & Kemp, 1999). He developed a pedagogical method, *Eurhythmics*, based on fundamental, rhythmic, human behaviours such as breathing and walking that utilise the whole body kinaesthetically integrating and strengthening the communication between the brain and body (Farber & Parker, 1987). Dalcroze training has been implemented worldwide to help music students be more musically sensitive and responsive to the elements of musical performance (Mead, 1996). We propose that in preparation for performance in the Western classical art music tradition, the musical score provides a plan for the performer to begin to organise and integrate their embodied knowledge.

The Musical Score as the Source of Functional and Expressive Movement Plans

In the Western art music tradition, the musical score, which represents the composer's creative ideas and intentions, is the primary source for performance preparation. The score provides the performer with guidelines as to what note to play, where and when, and expressive markings including dynamics, tempo, articulations (such as accents) and phrasing. The performer's musicality enables the transformation of the score into imagined sound that is then realised, through their instrument, in audible sound (Hill, 2002). With the written musical score providing the map, the performer then transforms the notation into a functional (technical) and expressive motor program through their individual interpretation and movement style.

In analysing a performer's bodily movement, it follows logically that the score could provide the link between movement observation, and interpreting motivations for movement. An approach to the study of expressive bodily movement in music performance that enlists objective observation and kinaesthetic or embodied knowledge may be an appropriate method of investigation. Davidson and Correia (2001) concur, indicating the need for an embodied perspective when analysing expressive movements.

Analysing and Recording Bodily Movement in Music Performance

Wanderley, Vines, Middleton, McKay and Hatch (2005) note the need for a theory that accounts for performers' ancillary (expressive) bodily movements in relation to musical intentions and mental sound concepts. In a study of clarinettists' bodily movements, Wanderley (2002) concluded that expressive bodily movements were highly idiosyncratic and closely related to, and integrated with, instrumental technique or sound production. Wanderley identified *material/physiological*, *structural* and *interpretive* issues for consideration when attempting to draw conclusions as to motivations for movement. Davidson (2002,

2007) supported this notion proposing anatomical or physiological reasons, together with issues of musical structure, in accounting for movements of a pianist. The development of an effective and efficient lexis for identifying and describing expressive body movements, and a system for dissemination, would be of benefit to performing musicians, students and teachers (McClaren, 1988).

Studies have attempted to examine expressive body movement using technology that quantifies the temporal and spatial aspects of bodily movements (e.g. Clarke & Davidson, 1998; Davidson, 1994, 2002, 2007; Wanderley, 2002; Wanderley et al., 2005), but few investigations have sought an approach that considers the style of movements a performer makes, and developed appropriate methods of recording and analysing the bodily movements of singers (Davidson, 2001) or instrumentalists (Davidson, 2007). While increased quantity of movement has been shown to lead to judgments of a more expressive performance, the quality of movement is also an important indicator of expression as moments of little movement, or stillness, can also be expressive (Davidson, 1994, 2002).

Davidson (2007) made a significant contribution to the field investigating expressive bodily movement in instrumental performance by recording and coding the expressive bodily movements of a solo pianist and the way those movements related to the musical score. Davidson (2002, 2007) found bodily movement in solo piano performance revealed both a general level of expression, and also identified discrete locations of heightened expression. With a symbolic notation system based on *Labanotation* – a widely used system for recording dance as it relates to a musical score, or human movement in general – Davidson (2007) coded observed expressive movements symbolically. The symbols were marked in a graph at locations corresponding to the bar numbers where they were observed. Labanotation is an excellent tool for recording observed quantitative movement, but has a limited capacity in capturing the dynamic, qualitative aspect.

A Qualitative Approach to Analysing and Recording Bodily Movement

Laban Movement Analysis

Laban Movement Analysis *(LMA)* is a system based on Laban’s research and theories of human movement that has been developed by subsequent generations of practitioners (Groff, 1995). LMA is based on the assumption that inner motivation for movement manifests in observable movement. Therefore, movement involves integration of mind and body. LMA has proven to be a useful tool in analysing movement in a variety of settings including dance, sport, work actions and non-verbal communication in conversation (Hamburg, 1995).

Laban identifies four components involved in movement: *body, shape, space,* and *effort* (Levy & Duke, 2003). The body, as the vehicle for movement, can be observed in segments, and shape refers to the way the body takes form in space (Levy & Duke, 2003). Space is made up of the horizontal, vertical and sagittal axes of spatial movement (Bartenieff & Lewis, 1980), and effort is defined as a person’s attitude towards movement or the dynamic qualitative variables of movement (Levy & Duke, 2003).

Theory of Effort

Laban's theory of effort is concerned with expression in human movement stemming from the observable rhythms of physical exertion (Maletic, 1987). Effort in bodily actions can be observed and understood from two perspectives: 1) the objective function of the movement (measurable aspect); and 2) subjective movement sensation important in expressive settings (classifiable aspect) (Laban, 1988 originally published 1950). Therefore, perceiving effort in movement involves not only objective observation, but embodied knowledge through kinaesthetic experience of movement. The analysis of effort in movement requires analysis of the four *motion factors*: *weight, time, space* and *flow*. Each motion factor includes a bipolar continuum of effort elements ranging from a 'fighting' to an 'indulging' quality: weight (strong-light), time (sudden-sustained), space (direct-indirect) and flow (bound-free). *Effort elements* reveal a person's inner attitude towards each of the motion factors and different qualities of movement (Bartenieff & Lewis, 1980).

The Effort Drives

Through his observations Laban identified different combinations of motion factors and effort elements to reveal essential qualities in human movement. Three-motion factor combinations that result in *effort drives* are the most obvious of expression (Bartenieff & Lewis, 1980). These are taken as core components in the analytical system presented here. Incomplete efforts or *inner states*, where only two motion factors are observed, most often appear fleetingly as upbeats to action or between drives. Four-motion factor combinations do not usually occur as they display extreme, wild and unfocussed action.

The a*ction drive* is comprised of three motion factors: space, weight and time. The combination of the bipolar effort elements of these three motion factors results in eight possible *basic effort actions*. Each of these basic effort actions displays two rhythmic phrases of exertion and relaxation. They are goal directed actions. The eight basic effort actions were first observed by Laban through his work in industry, observing factory workers' movements for greater productivity.

The eight basic effort actions represent the complete range of working actions performed in human movement. These basic effort actions are metaphorically named *slashing, gliding, pressing, flicking, wringing, dabbing, punching* and *floating* (Laban & Lawrence, 1947: 21-22). The metaphoric name refers to the kinaesthetic feeling of the action. The basic effort actions and their composition of motion factors and effort elements are shown in Table 1.

Table 1
Chart of Basic Effort Actions

Metaphoric name (kinaesthetic feeling)	Space (effort elements below)	Weight (effort elements below)	Time (effort elements below)	Flow
Float	Indirect	Light	Sustained	N/A
Glide	Direct	Light	Sustained	N/A
Wring	Indirect	Strong	Sustained	N/A
Press	Direct	Strong	Sustained	N/A
Flick	Indirect	Light	Sudden	N/A
Dab	Direct	Light	Sudden	N/A
Slash	Indirect	Strong	Sudden	N/A
Punch	Direct	Strong	Sudden	N/A

A *transformation drive* occurs when one of the motion factors space, weight or time is replaced by flow. There are three possible combinations: *passion* (weight, flow, time), *spell* (weight, flow, space) and *vision* (flow, time, space). Transformation drives differ from the action drive in that they are more expressive of mood, quality, or attitude rather than being goal oriented. Whereas the basic effort actions of the action drive have distinct rhythmic phases of exertion and relaxation and are performed over a relatively short duration, the transformation drives can occur for longer periods of time. A transformation drive and a basic effort action can not occur at the same time; they follow one another in qualitative movement phrases. The transformation drives and their composition of motion factors and effort elements are shown in Table 2.

Table 2
Chart of Transformation Drives

Metaphoric name (kinaesthetic feeling)	Space	Weight	Time	Flow	Notes
Passion	N/A	Light or Strong	Sustained or Sudden	Free or Bound	Has a feeling or emotive focus – either wildly passionate or gentle and sensitive. Weight and time are highlighted. Flow pulsates.
Spell	Indirect or Direct	Light or Strong	N/A	Free or Bound	Has a focus of fascination or hypnotic quality as if time is standing still. Space and weight are highlighted. Movement has a stabilised quality.
Vision	Indirect or Direct	N/A	Sustained or Sudden	Free or Bound	Has a mentally alert focus. Precision in time and place. A disembodied state as if one is drawn out of oneself. Can be as if concerned with thought rather than the here and now or in concentration. Space and time are highlighted.

The Effort Graph

The Effort Graph represents Laban's system for notating effort consistent with the movement analysis system. The four motion factors with each of their bipolar effort elements can be represented in graphic form (see Figures 1 & 2, Bartenieff & Lewis, 1980: 224-225). The diagonal line joining the factor of space to the intersection of weight and flow factors signifies the presence of movement (Bartenieff & Lewis, 1980). The Effort Graph illustrates the complete range of efforts in human movement.

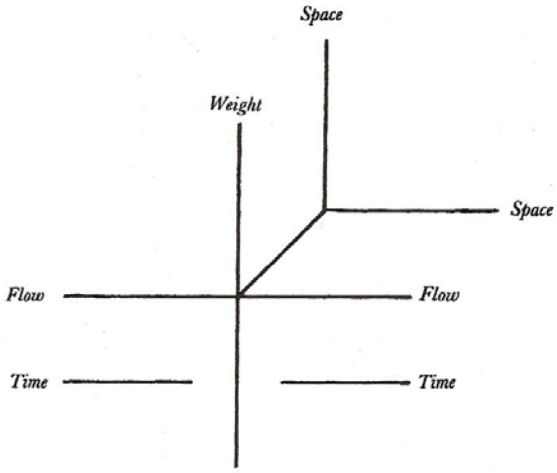

Figure 1. Effort notation graph showing the motion factors: space, weight, time, flow.

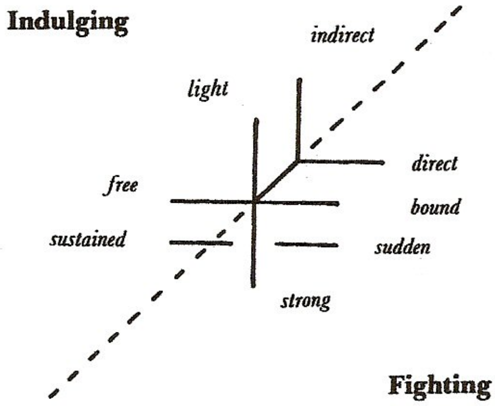

Figure 2. Effort notation graph showing the bipolar effort elements related to each of the motion factor lines displayed in Figure 1.

Shape

Shape requires analysis of movement with reference to the axes of space: vertical (rising or sinking), horizontal (widening or narrowing) and sagittal (advancing or retreating). Shaping reveals to what degree the whole body or person is involved in the activity. *Postural effort* shows that the person's whole body is involved in the activity they are performing, rather than just the body part required to perform the job (g*estural effort*) (Bartenieff & Lewis, 1980). Shaping features can be recorded symbolically using an extension of the Effort Graph (see Figure 3, Bartenieff & Lewis, 1980: 225).

Figure 3. Notation for shaping features.

Aims of the Present Study

The aim of the present preliminary study was to investigate the movements made by a marimba player in an attempt to understand the performer's motivation for expressive bodily movement. More specifically, we set out to discover links between the musical score and bodily movement through analysis of effort and shape, and to use the Effort Notation Graph as a tool for recording descriptive analysis of observed movements symbolically on the musical score.

Preliminary Study – Analysis of a Marimba Player's Bodily Movement

The analysis reported in this paper grew from a discussion with two professional percussionists regarding analysis of a marimba player's bodily movements and gestures observed via an audio-visual recording of an exemplar of expressive solo marimba performance. The researcher then performed an analysis of effort and shape features of a female marimba player's bodily movements as observed via two contrasting audio-visual recordings of solo marimba performance of the same musical excerpt.

An experiment (reported elsewhere) was conducted that investigated the contribution of expressive bodily movement to observers' assessments of *expressiveness* and *interest* of contemporary solo marimba performance. Two professional marimba players performed excerpts of standard contemporary marimba repertoire in two different manners: *projected* (consistent with public performance) and *deadpan* (minimised expressive features). Results showed that audio-visual presentations of projected performances received significantly higher expressiveness and interest ratings than those recorded from listening only to the same excerpt. Additionally, audio-visual presentations of deadpan performances recorded significantly lower ratings of expressiveness in comparison with assessments of the audio-only component of the same excerpt (Broughton & Stevens, in press).

The excerpt that received the highest expressiveness and interest ratings in the aforementioned experiment was selected for analysis in the present study. This highly-rated excerpt was an exemplar of marimba performance in a projected manner. An audio-visual presentation of the same excerpt, though performed in a deadpan manner, served as the second piece of stimulus material for a comparative analysis. The excerpt was drawn from *Suite No.2 for Solo Marimba, 3, Dreams of Foreign Shores* by Takayoshi Yoshioka (1995).

Procedure

The same procedure was followed for analysis of both the projected and deadpan performance manner excerpts. The projected performance was analysed first. The excerpt was viewed without sound in order to focus attention on the body movements of the performer. The researcher made several viewings of the excerpt and noted any moments where the body appeared to display expressive intent in movement or stillness. As in Labanotation, the symbolic system for recording movement, a horizontal line was drawn running parallel to and above the music stave to indicate observation of movement. A break in this line was an indicator of lack of movement, or stillness. Where expressiveness, or effort, was perceived the performer's body as a whole was analysed in terms of the involved motion factors (space, weight, time and flow) and each one's bipolar effort element continuum: space (direct-indirect), weight (strong-light), time (sudden-sustained), and flow (bound-free). Deviations from the neutral upright standing position of the performer's body were identified as expressive shaping features.

Both excerpts were then viewed with sound to enable a matching and recording of observed expressive body movements with specific locations in the musical score. Once these observed movements had been related to locations in the musical score, the video footage was again viewed without sound to lessen the possibility of auditory information influencing observation of the visual information, or movement component, of the marimba performances. The descriptive interpretations of observed expressive body movements were recorded on the score for the projected and deadpan performances in words and symbolically using *Effort-Shape Notation* (as shown in Figures 1, 2 & 3).

Two Worked Examples

Movement and Stillness

The horizontal line drawn above and parallel to each system of the musical score (see Examples 1 & 2 at the end of this paper) indicated the observation of bodily movement. A break in the line recorded a lack of movement, though where the stillness appeared to be expressive. In the projected performance, the two observed breaks in the line occurred where there were rests printed on the score (see Example 1, bars 25-27). Where the same passage of music recurred, no stillness was observed (see Example 1, bars 30-31). A possible reason may relate to the performer intending to communicate a different musical interpretation with the repeated passage. No moments of stillness were observed in the deadpan performance.

Effort Analysis

Observation of the projected performance revealed a far greater use of effort on the part of the performer than the deadpan performance. While a greater amount of movement was observed in the projected performance in comparison to the deadpan performance, the analysis of effort also revealed a stark contrast in terms of movement quality between the two performance manners (Davidson 1994, 2002). The analysis demonstrated evidence of effort in a continuous stream throughout the projected marimba performance. In addition, certain observed expressive movements seemed to occur at specific locations in relation to the musical score (Davidson 1994, 2002, 2007). In the deadpan performance, an exertion of effort was observed on only a few occasions linked to specific points in the musical score.

In the projected performance, the specific points of observed expressive movement revealed a basic effort action. The basic effort action, punch, was usually observed in relation to a *forte* (loud) dynamic and an *accent* marking in the score (see Example 1, bars 18, 20, 22 & 24). However, an accent marking in the score was not always a predictor of a punch. At a couple of points where an accent was recorded in the score, no punching actions were observed (see Example 1, bars 12 & 16). A possible explanation considers a physiological issue (Davidson, 2002, 2007; Wanderley, 2002). A punching action at these points would interfere with the flow of the performance as the accented notes are of a very short duration in the *samba* tempo of the piece. Punch basic effort actions were also observed at locations in the score where no accents were marked (see Example 1, bars 33 & 35). A possible reason for the punch basic effort action on these occasions is that it aids the performer in a technical matter such as 'grounding' or 'planting' their body giving a reference point for tempo control. Other explanations may be related to personal interpretation of the music or the highlighting of structural features such as harmonic change (Davidson, 2002, 2007; Wanderley, 2002).

In the projected performance, the basic effort action, glide was observed at locations in the score where phrase markings were evident (see Example 1, bars 25-27 & 29-31). The duration of the glide matched the duration of the phrase. Four of the six glide actions were directly preceded by the basic effort action, float. The floating action, as preparation for the glide, was enabled by the rest(s) notated in the score (see Example 1, bars 25-27 & 29-31). The remaining two glides were directly preceded by notes. It can therefore be deduced that the performer's body, engaged in playing, was not free to perform the preparatory floating action (Davidson, 2007). The remaining basic effort action observed in the projected performance was dab. The dabbing action was evident throughout passages in the score where a *piano* (quiet) dynamic was printed. A series of dabbing actions appeared to be linked to the performer's interpretation of rhythmic groupings (see Example 1, bars 17-24). A dab that was observed, though to a lesser degree than others, was notated symbolically on the score in brackets (see Example 1, bars 18, 20 & 22).

In the deadpan performance, only six basic effort actions, all of them punch, were observed. These six punching actions occurred where there was a note marked with a forte dynamic and an accent. These mirrored the location and type of basic effort action observed in the projected performance, though to a lesser degree. Therefore, they are notated symbolically on the score in brackets (see Example 2, bars 18, 20, 22, 24 & 28). Four of the punching actions were observed where a single note to be performed was located at a great spatial distance from the other notes being played. A physiological explanation is offered for the exertion of effort at these points. In order to remain 'in time' and produce a louder and stronger sound, some effort was required to cover the large spatial distance in order to return to the next playing position at the other end of the marimba. The remaining two punching actions might be the result of the performer's engrained motor program for the projected performance which may have been difficult to inhibit completely. The punching actions represented the only observed fluctuations of effort on the part of the performer in the deadpan performance.

In addition to the basic effort actions observed in the projected performance, an exertion of effort was observed that appeared to reveal the performer's inner attitude in performance. The vision transformation drive was observed at three locations where the performer appeared to increase their focus on locating and striking the correct notes (see Example 1, bars 23-24, 33 & 35-38). The passion transformation drive, where the performer's affective feeling towards a passage being performed, seemed evident on one occasion (see Example 1, bar 34). In this bar, the performer appeared to 'let go' absolute control before returning to a more controlled and concentrated state. No exertion of effort in the form of a transformation drive was observed in the deadpan performance.

Shape Analysis

The parts of the body not directly involved in the production of sound (e.g. the torso, head, upper arms and legs) displayed shaping features on the vertical and horizontal axes of space. On the vertical axis, shaping features mirrored dynamic markings in the score. For example, a quiet dynamic was often correlated with a sinking posture and a loud dynamic was often linked to a rising posture (see Example 1, bars 17-14, 33-34 & 35-36). Rising postures, coordinated with a punching action, were observed. These were quickly followed by a sinking posture as recovery from the exertion of effort (see Example 1, bars 28 & 31). Sinking postures observed prior to punching actions were interpreted as preparatory for an exertion of effort to perform the punch (see Example, bars 34-37). Rising postures were also observed at the same locations as floating actions and sinking postures occurred with gliding actions (see Example 1, bars 25-27 & 29-31). Different postures, involving widening on the horizontal axis of space, were observed with most gliding actions and sinking postures. A possible explanation is the desire to communicate different interpretations of the repeated phrase of music (see Example 1, bars 26-27 & 30-31). Shaping features seemed to be linked to exertion of effort and modified by the same material/physiological, structural (Davidson, 2002, 2007) and interpretive concerns noted in the effort analysis above (Wanderley, 2002). No shaping features were observed in the deadpan performance.

In looking for predictors of expressive movement in music performance, it seems necessary to not only identify expressive markings in the score, but also consider material/physiological, structural (Davidson, 2002, 2007) and interpretive concerns (Wanderley, 2002). Connecting the extant literature and the present preliminary analysis provides, we contend, the basis for a new theory of expressive bodily movement in music performance.

Theory of Expressive Movement in Music Performance

The theory of expressive bodily movement in music performance is based on the assumption that the score provides sufficient information for the performer to interpret and embody functional and expressive movement. That is, the score provides the blueprint for the performer to interpret and from this, embody their unique movement plan that is both functional (technical) and expressive in nature. Interpretation of the musical score involves the performer intentionally expressing concepts and ideas through their body manifesting as expressive movement and musical sound. This, in turn, is visually perceivable by the observer (Broughton & Stevens, in press).

One way to test this theory is to employ paradigms where the researchers have explicit knowledge of the performer's expressive intention. In order to understand performer's bodily movements more thoroughly and make effective use of technology, such as motion capture, it is imperative to develop systems from which we can infer the performer's motivation for action and, in turn, conduct empirical investigations of whether a performer's intention is received by an audience via expressive bodily movement.

Implications for Performance and Education

LMA, as a framework for the analysis of effort and shape in marimba performance, meets the challenge of capturing quality and effort rather than simply recording kinematics. Effort-Shape Notation, while a little tricky to learn initially, proved to be useful as a fast and effective tool for recording effort and shape observations. From the perspective of the performer, developing an understanding of Laban's theory of effort may be of use to performing musicians and teachers in the development of expressive music performance, regardless of instrument. An awareness of effort and shape in body movement may provide an effective means of focusing the performer's attention on their interpretation of the expressive features of the score in preparation for performance. This could act as a stepping-stone for the performer to inwardly experience and outwardly express their musical interpretation through embodiment. Effort-Shape Notation may be an effective tool for performers and teachers to record effort and shaping features interpreted through analysis of the score – a movement metalanguage for the musical score. This tool could act as a guide to embodiment of interpretation of the musical score as a part of performance preparation with and away from the instrument.

Future research will involve analysis of the same fast and slow excerpts performed by a number of male and female performers in projected and deadpan performance manners. This follows logically from an evaluation of the stimulus by unbiased expert judges to ensure the performers were effectively communicating their expressive intentions to observers. Research is underway examining the perception of a marimba player's expressive body movements by an audience in a live concert setting, as predicted by the performer's embodied musical interpretation devised in rehearsal.

About the Authors

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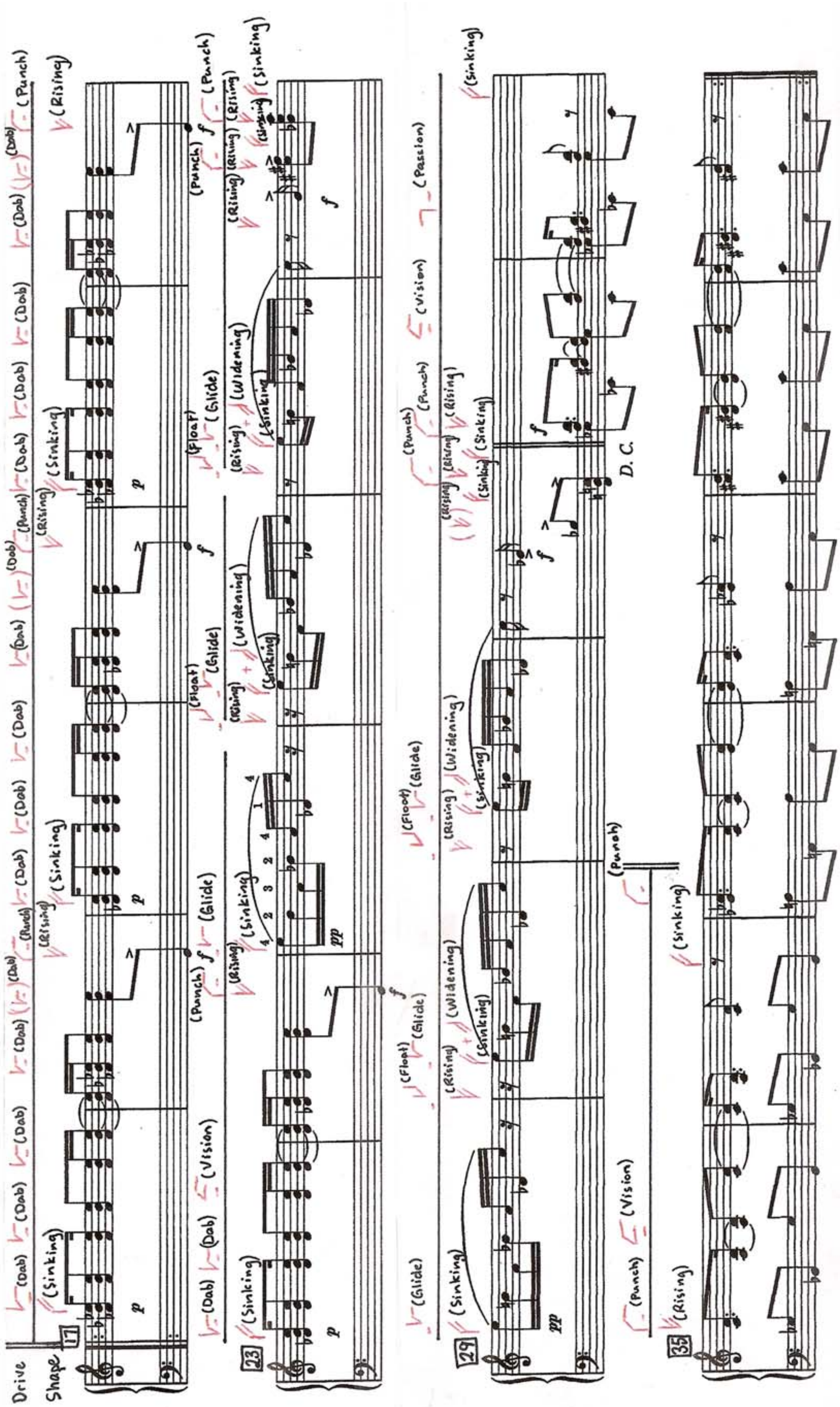
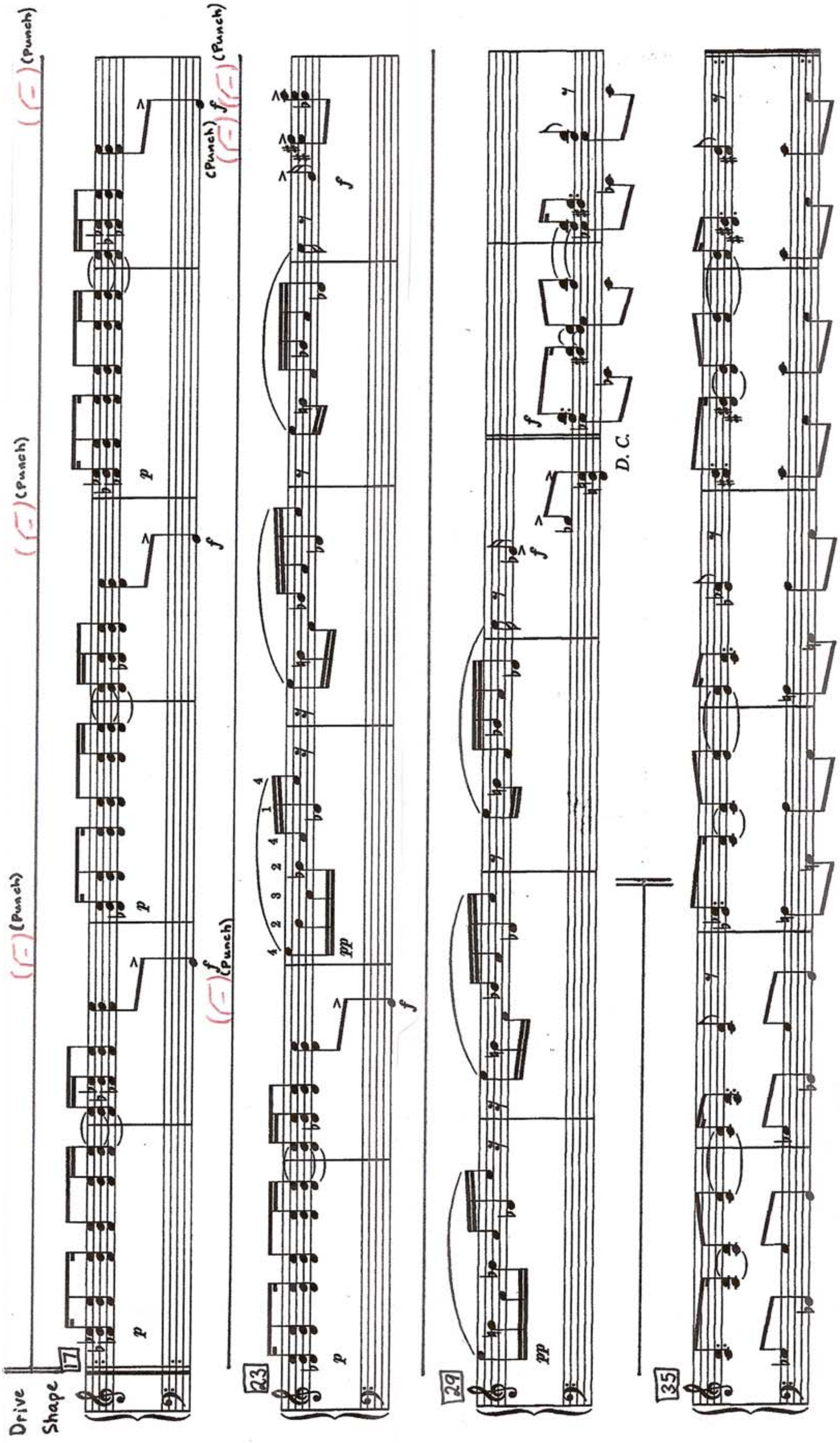
Musical Examples



Example 1. Descriptive and symbolic notation of LMA of a projected performance of *Suite No.2 for Solo Marimba, 3, Dreams of Foreign Shores*, bars 17-40 by Takayoshi Yoshioka, ©1995 Zen-On Music Co., Ltd., Tokyo.



Example 2. Descriptive and symbolic notation of LMA of a deadpan performance of *Suite No.2 for Solo Marimba, 3, Dreams of Foreign Shores,* bars 17-40 by Takayoshi Yoshioka, ©1995 Zen-On Music Co., Ltd., Tokyo.