Measuring Responses to Dance

Is there a 'grammar' of dance?

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This paper reports a series of experiments that investigated how dance artists learn to see and understand dance. We measured, in real time, the responses of a number of dance artists and students, to a range of different dance stimuli to gain an understanding of how observers respond to structural elements of dance as they unfold over time.

We were particularly interested in how dance students learn to 'see' and understand a dance work. We assumed that the ways in which dance students learn to understand dance underpins how they learn to make dance. Therefore, observing dance students' responses to dance will provide a basis on which to begin to theorise about how dance students as observers of dance cognise or think about dance. That is, how do they construct dance as a meaningful system of movement and in some instances signs and/or symbols? Specifically, we were interested in whether we could elicit evidence that dance students were responding to the dance on the basis of any kind of shared dance 'grammar'.

When we speak of the possibility of a dance 'grammar', we are, of necessity, speaking in rather broad and general terms. The existence of a specific dance 'grammar', in the linguistic sense of a set of rules through which elements can be combined to make meaning, is far from established. The idea that perception of dance takes place linguistically, as a fundamentally symbolic process, has been questioned by theorists such as Daly (1992) and Gardner (1996), who, drawing

on Kristeva (1984) and Irigaray (1985) respectively, have challenged the separation of subject and object necessary for symbolic language. The assumption that dance is a 'language' has also been problematised by writers such as Dempster (1993) and Williams (1996), who suggest that touch and kinaesthesia challenge the foundation of symbolic or signifying language by blurring the sensory boundaries between 'self' and 'other', and by Vincs (2001) in considering the resistance to unambiguous symbolic or signifying representation afforded by the unique physicalities of individual dancers.

The fundamental problem in thinking about dance as a language is how elements of movement 'language' might be defined, given that dance movements are not discrete, but always joined through transitional weight shifts that render dance a constantly moving 'analogue' medium, with no unambiguous way of deciding what constitutes 'a movement' in the way that verbal language can be understood as constituted by words. A 'movement' can be defined, for example, by its final shape, by the pathways of the limbs through space to achieve a shape, by the rhythmic profile of the action, by the muscular quality of the movement, or by a dynamic combination of these factors.

As a result of this ambiguity, there has been, to date, no universal agreement on a definitive dance 'grammar'. The complex combinations of movement made possible by the structure of the human body ensures that dance is a highly complex system with no obvious set of foundational steps or moves that would be analogous to notes in music or words of a written or spoken text. For this reason, 'grammar' in dance has always been understood as culture and context dependent (Adshead et al 1988), and dance notation systems, such as Labanotation and Benesh, rely on the implicit knowledge of performers to interpret what would otherwise be ambiguous in the notation (Calvert et al 2005). Calvert et al go on to point out that this ambiguity has limited the development of computer based notation systems, and argue that a universal machine-readable ontology similar to XML in music is urgently needed.

The lack of a definitive, or universally agreed, dance 'grammar' does not, however, mean that specific dance grammars are not developed, shared and used in relation to specific dance genres, or even in relation to the work of specific dance choreographers. Stevens and McKechnie have suggested that dance grammars, which they describe as '…relations between identifiable (movement) patterns – the systematic way patterns are structured, sequenced, and related to one another in a piece' (2005, p. 248), can be defined in terms of individual choreographers' practices. They suggest that these dance grammars might be compared with artificial grammars, in which certain combinations and sequences of letters are permissible and others are not, in the sense that both are learned procedurally and to some extent unconsciously, through repetition (Opacic, Stevens & Tillmann, accepted 2009).

Hagendoorn, (2004) hypothesising on the implications of neurological mechanisms of movement perception for the apprehension of dance, raises the further possibility, as do Stevens and McKechnie (2005), of a 'grammar of the possible', in which permissible movement combinations and sequences are ultimately defined by the joint ranges of human physiology. Hagendoorn bases his argument on the idea of a forward predictive model of movement perception. He outlines neuroloscientific research supporting the idea that the brain perceives a moving object to be in its anticipated location, based on its speed and trajectory, rather than where it was last 'seen'. He suggests that this idea might, speculatively, be applied to the perception of moving bodies, and perhaps even to the ability of dance movement to elicit responses of attention/inattention and emotional satisfaction and dissatisfaction. He suggests that

> in dance, there is a double route to pleasure, one operates through the increased allocation of attention and by promoting a state of general arousal if a movement deviates from its predicted path, the other by rewarding the correct prediction of the motion trajectory. It follows that without the interplay of correct and incorrect predictions, the brain may as it were, 'lose interest'.
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> (2004, p. 98)

Haagendoorn's ideas raise the question of what movement predictions are based on in dance. A forward predictive model of movement perception in dance implies some form of dance 'grammar', that is, a set of rules regarding which movements are possible and which sequences they may be combined in, that generates the expectations which are either fulfilled or denied. Putting aside the complexities involved in predicting the precise nature of such a dance 'grammar', given that such a system would most likely be culture, genre and context specific, and given the questions that remain as to whether dance can be completely defined by a symbolic, linguistic structure, we were interested to see whether we could elicit any evidence that observers were working from a shared dance 'grammar' through empirical measurement.

Over the course of this study, we asked 20 dance artists and students over three sessions to watch a range of different dances. The observers were asked to record their responses continuously to the dance using the portable Audience Response Facility (pARF)[1,] developed at MARCS Auditory Laboratories at University of Western Sydney (Stevens, Schubert, et al). They were asked to record their responses to the dances by moving a stylus horizontally along the screen of a hand held personal digital assistant (PDA), indicating their levels of 'engagement' with the work along an 11 point scale on which 0 indicated no engagement and 10 indicated high engagement. Engagement was defined as being compelled, drawn in, connected to what is happening, interested in what will happen next. This term is often used by choreography teachers because it implicitly directs students towards evaluating a dance's ability to employ structural logic and movement imagery to draw an audience's attention, rather than towards its ability to 'entertain' (although the two are not mutually exclusive). The idea of 'engagement' allows that a dance might be termed 'successful' on

the basis of its ability to create a clear embodiment in movement of a choreographer's intentions and its development of a clear choreographic structure or syntax, rather than on the basis of the aesthetic or genre preferences of the viewer.

The PDAs recorded the path of the stylus along the horizontal axis, which was sampled twice per second and transferred to a central computer server. Initially, we asked 20 observers over three sessions to record their responses to a 12 minute physical theatre work by a young, emerging choreographer. Analysis of these recordings indicated the presence of 'bumps' and 'spikes', which we called 'gem moments' (Vincs et al 2007). Bumps were loosely defined as an increase in engagement of 0.25 units before a flattening or reverse in direction. Spikes were defined as a rate of change of 0.1 points/second over a short time frame. Bumps and spikes often, but not always, commenced at the same point in time and were also frequently associated with 'gem moments'. In other words, these were instances where the audience's level of engagement with the work rose suddenly.

We then reviewed the time coded video recordings of the dance to ascertain what was occurring within the dance when these moments occurred. Given the level of subjectivity involved in analysing and interpreting dance, we first familiarised ourselves with the overall structure of the dance, and then looked specifically at what dance events correlated in time with 'spikes' and 'bumps' in the engagement profile that we had defined as 'gem moments'. That is, when a 'bump' or gradual rise then decline in engagement occurred over a period of time, accompanied by a sudden *change* in engagement ('spike') the performance was defined as a 'gem moment' at around the time at which the spike occurred. While there is still a subjective component to this analysis, in that we needed to decide how to delineate and designate the dance 'movements' that occurred just prior to 'gem moment' responses, this approach meant that we were not imposing our analysis of the dance upon the data, so much as using the observers' data to indicate moments when something noticeably different was happening in the response profile, and using that indication as a prompt to look for something in the dance movement that could be associated with that change. We noticed that, in general, 'gem moments' seemed to be associated with moments in the dance where expectations were disrupted. This sometimes took the form of a comic twist in the movement or dialogue, or the form of an unexpected spatial or rhythmic accent within the movement.

In subsequent trials, we asked a group of 11 observers to record their responses to three different kinds of dance stimuli; 4 x 2-3 minute second year choreographic assignments, an excerpt from a PhD work in the early stages of development, of similar length, and the original 12 minute physical theatre work. All of the works were solos. We found similar patterns of bumps, spikes and 'gem moments' in the collated responses to all of the dance works. 'Gem moments' in

response to the other kinds of dance stimuli also seemed to be associated with disjunctures or disruptions of expectation in the dances.

Interestingly, however, the degree of consensus between observers, as determined by the average standard deviation of levels of engagement (low standard deviations indicate a relatively high degree of agreement between observers, and vice versa), differed between the different kinds of dance works. So, while a gem moment of the combined participant responses could be identified, there is a possibility that the moment was a result of a spurious combination of responses at that time which led to an apparent gem moment. These could be identified by the larger variation in response across participants at that point in time, compared to other gem moments where the standard deviation was lower – that is there was statistically better agreement that a gem moment had occurred. We have previously argued that the levels of agreement in the responses to the 12-minute work were surprisingly high, given the high level of subjectivity we would expect in responses to dance. Two out of three, or +/- one standard deviation of observers responded to the 12-minute physical theatre work within 21% (2.3 points on an 11 point scale) of each other. By comparison, the average standard deviation of level of engagement for the short PhD excerpt indicated that agreement was lower, with two out of three observers responding within a wider range of 39% (4.29 points on an 11 point scale). Levels of agreement or consensus for the four student studies were also lower, ranging between 30-34% of the scale.

We speculate that 'gem moments', which occurred in all the works, might be construed as an indication that observers are working from some level of shared dance 'grammar'. The variation in levels of agreement across different dance stimuli might be interpreted to mean that while some observers respond with markedly increased engagement to a shared apprehension of surface structure in the dance during gem moments, levels of agreement on the extent and timing of increased engagement across all the observers might be related to other factors. Levels of agreement were greater when the observers watched a 12-minute completed dance by an emerging choreographer than when they watched 2-3 minute choreographic studies made by second year dance students. Agreement levels were least when the observers watched a short excerpt from a PhD work in the early stages of development. This leads us to speculate that gem moments might indicate 'hooks' that draw the viewers attention on the basis of their ability to disrupt and play creatively with expectation, but that they do not necessarily correlate with the creation of a cohesive, overall structure, which would underpin greater agreement in responses.

In conclusion, it is important to point out that these results indicate a relatively high level of agreement and consistency between observers not in absolute terms, but in the light of the highly subjective nature of dance artistry and its reception, and across a group of observers who had varying degrees of dance expertise (students to professionals) and some of whom had shared dance

training and background. Levels of agreement in our results are high in the sense that, given the complexities and problems of defining dance as a single or cohesive symbolic language or languages, it would not be surprising to find almost no agreement in responses. It is likely, that when watching a dance performance, multiple systems of dance 'grammar', which intersect with systems of symbolic, cultural and experiential meaning are in fact at play, and in this light it is not surprising that our results reveal some ambiguity. Perhaps of most interest in this context is the striking recurrence of 'gem moments' in which disruptions to expectation give rise to sudden, increased engagement. It is not clear, at this stage, whether these moments are specific to audiences with dance experience or whether they are more general phenomena that can be found in the responses of a wide range of experienced and novice dance observers. It is also not clear whether dance students are more or less prone to seeing dance in terms of 'gem moments' than more experienced dance artists. Intriguing aspects of these questions are whether 'gem moments' are associated with specific aesthetics and dance genres, and whether they are more or less actively promoted in teaching choreography in specific artistic contexts, or whether they are part of a wider mechanism of dance perception that choreographers have found to be effective mechanisms for engaging audiences. These issues raise questions for future research, and provide new challenges for dance teaching, and for theorising the ways in which dance communicates and engages audiences.

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Notes

[1] The pARF tool differs from the ART tool, which collects open ended, qualitiative data retrospectively, i.e. after the participant has seen a dance. The pARF tool measures quantitative responses in 'real time', i.e. as the observer watches the dance.

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