Choreographic Cognition: Investigating the Psychological Processes Involved in Creating and Responding to Contemporary Dance

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Abstract

Dance is a rich, complex and challenging phenomenon for psychological science. It epitomizes qualities of human behaviour that defy observation, measurement, and analysis. For example, choreographic cognition is non-linear; memory for movement is non-verbal and kinaesthetic; audience response is temporal, multi-modal and multi-dimensional. Theories of cognition that have been developed and tested in the context of verbal patterns, in a single modality, with little consideration of temporal and cumulative processes are inadequate.

This paper describes different empirical methods and tools of analysis to investigate the cognitive processes involved in creating new movement material – choreographic cognition – and to capture psychological responses elicited by live performance of contemporary dance. Methods include a case study of choreographic cognition and development and application of a psychometric instrument – the Audience Response Tool (ART) – to measure psychological reactions to dance. Themes and movement motifs that emerged as central to the creation of a new dance work (Anna Smith's *Red Rain*) were echoed in interpretations of the work provided by expert and novice audience members. The development of continuous measurement devices is also outlined. Implications of the ART results for industry and ideas for further research are discussed.

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During 1999 and 2000 a collaborative research team in Australia involving the Victorian College of the Arts, dance industry partners (Australian Dance Council, The Australian Choreographic Centre), and researchers from MARCS Auditory Laboratories at the University of Western Sydney captured on video the evolution of new dance works by two elite choreographers. The large amount of video material as well as journal notes document a nine-month project led by choreographer Anna Smith and seven highly experienced professional dancers. The research project, *Unspoken Knowledges,* was motivated by the observation that the creation and development of significant works takes time. Composition and preparation in Australia is assigned, most often, three to four weeks with little recognition of the need for time to explore, test, and revise creations. A costly but short-lived production most often results. One aim of the industry-funded research partnership was to provide lengthier periods of creative time, comparable with that enjoyed by Germany's Pina Bausch, France's Maguy Marin and America's William Forsythe.

The video and written data present a rare glimpse of artists at work as they conceive, develop, reject and refine movement material for a new work, *Red Rain*. The interactive nature of choreographer and dancers working together to develop a work ensured the recording of discussions and the sharing of ideas both in words and movement. In the first part of this paper we summarise the findings of our analysis of this particular creative journey. A detailed analysis may be found in Stevens, Malloch, McKechnie & Steven (2003).

Our current industry-supported research project, *Conceiving Connections,* includes the Australia Council as an industry partner and focuses on the psychological responses of audience members – both novices and experts – to contemporary dance. In the second part of this paper, we describe a new psychometric instrument developed to measure cognitive, affective and aesthetic responses to contemporary dance – the Audience Response Tool (ART). The ART has been administered to over 300 audience members after they had watched different performances of Anna Smith's *Red Rain* or Sue

Healey's *Fine Line Terrain* (Healey, 2004). Here we outline responses and reactions from audience members who had relatively little experience with contemporary dance and suggest ways in which information and perhaps the tool itself might engage new audience members' interest in contemporary dance.

Choreographic Cognition

In 1999, as the *Unspoken Knowledges* research team observed choreographer Anna Smith and her team of dancers create, experiment with and refine movement material for what was to become *Red Rain,* we coined the term "choreographic cognition" (Stevens, McKechnie, Malloch, & Petocz, 2000a,b). Choreographic cognition refers to the cognitive and mental processes involved in constructing and refining movement material with the intention of creating a work of art.

From the point of view of experimental cognitive psychology, choreographic cognition is a complex and problematic phenomenon as the underlying processes are hidden, rapid, multimodal, and non-verbal. These latter qualities bring into relief the paucity of many psychological theories in explaining human creative behaviour. Specifically, the majority of theories in cognitive psychology assume that human memory and cognition involves verbal and/or visual representation (e.g., Anderson, Budiu, & Reder, 2001; Collins & Loftus, 1975; Raajimakers & Shiffrin, 1981), whereas creativity in contemporary dance is movement-based and material evolves from experimentation and exploration in the medium itself (Foster, 1976; Gardner, 1993; Hanna, 1979; Healey, 2004; Humphrey, 1959; Limon, 1955; McKechnie, 2002; Vaughan, 1990). The source of an idea in a new work may be drawn from any modality – visual image or space; heard or felt rhythm, beat, texture; visual, auditory, muscular, or psychological tension; emotion; sound; word; concept (Foster, 1986; Stevens, Malloch, & McKechnie, 2001; Stevens, Malloch, McKechnie, & Steven, 2003). The idea is then expressed through movement, tension, and stillness. Second, most theories of cognition derive from studies of static items and objects such as words or pictures. Generating, performing or observing contemporary dance defies this too – movement production and perception processes are visual, spatial, temporal, and kinesthetic.

Analysing Creative Processes in Choreographic Cognition

Our first method to study choreographic thought used the case study paradigm which enabled the tracking and analysis of behavioural markers of creative processes. Data for the case study included studio video footage and journal notes made by the choreographer and one of the dancers. A 24-week chronology of the work *Red Rain* was detailed. An analysis of the main themes of the work using a method of description and analysis borrowed from musicology (Schenker, 1979) was provided. The creative work of the choreographer and dancers was described using the Geneplore model of creative cognition (Finke, Ward, & Smith, 1996).

The case study brought to light a cycle of generative and exploratory processes of problem finding, problem solving and metaphorical thinking. More specifically, and guided by the Geneplore model, we identified generative phases or pre-inventive structures with properties that promote discovery (Finke, et al., 1996). Cognitive processes and examples of pre-inventive structures from *Red Rain* include retrieval (red images – tomatoes, blood, red earth, red wax, red kidney beans), association (concept of blood led to associated concepts of life, veins, arteries, spine, death, ritual), synthesis (blend breathing, blood with red/blue paper), and analogical transfer (paper sculpture as spine or personal history; helix analogy to DNA). Pre-inventive properties in creative cognition of which evidence was found in the development of *Red Rain* include novelty, ambiguity, meaningfulness, emergence, incongruity, and divergence. Exploratory phases and examples from *Red Rain* included attribute finding (red/blue paper as a womb, nest), conceptual interpretation (beans as blood-flow or aurally as rainfall), functional inference (book/spine paper sculpture), and hypothesis testing (helix pattern problem and solution).

Description of Red Rain

The 40-minute work *Red Rain* begins with the delicate sound of water dripping gently through a dancer's fingers into a hidden pool. It ends with a torrent of 'red rain' pouring over bodies and falling in huge droplets of sound. There is something archetypal about the complex of image and sound, an evocation of ancient memories, perhaps of sacrifice and renewal. Between these powerfully conceived images the work unfolds in finely wrought structures that suggest the cycles of experience in which rituals of birth and death, isolation and community, mark the passing of women's lives.

In keeping with the scientific or hypothetico-deductive method on which experimental psychology is based, future investigations are needed to document the evolution of other new works by different choreographers and dancers. The content is likely to differ radically from *Red Rain*. However, if the Geneplore model has *psychological validity* for contemporary dance, then commonalities in the processes and stages should be observed across a range of works, contexts, and choreographers.

Recording Audience Response to Dance

Our research into audience response has been designed to i) investigate the psychological processes involved in observing non-verbal forms of communication; and ii) help bridge the gap between the dance industry and its consumers. The long term goal is to provide information about the spectator's psychological processes that can be used to direct practical solutions to the ever-increasing problem of "audience attendance rates". The second author's invention, the Audience Response Tool (ART), records cognitive, aesthetic, and affective responses of audience members who have, versus those who have not, attended a pre-performance information session. The effect of

dance experience and/or training on cognitive and affective reactions has also been manipulated and analyzed.

It has been suggested that some members of Australian audiences are left baffled and confused after observing a dance performance and they have little idea about the purpose or intent of the work (*Australians and the Arts: A Report to the Australia Council* by Saatchi & Saatchi, 2000; *Made to Move, Research Report,* 2000). It is possible that the "communication loop" that connects performers and observers may be incomplete. In this section we will shed light on the performer–audience connection beyond anecdotal accounts. Specifically, this research examines comments from audience members when there appears to be a performance-observation disconnection and it identifies likely causes and reasons for confusion and dissatisfaction as reported by observers.

Additionally the research has investigated the impact of pre-performance information sessions on observer reactions. Psychological theories predict that spectators with prior knowledge will respond differently to naïve spectators. Priming an individual about a particular work should assist spectators' semantic access to the work. We ask: does presenting information about a work before its performance increase the level of insight and enjoyment reported by participants? Is this one strategic avenue that the dance industry might explore in an attempt to make new works accessible to Australian audiences?

Method

A large-scale study was conducted using 472 participants residing in various city and regional locations around Australia including Melbourne, Canberra, Geelong and Launceston. Participants varied in education, sex, age, experience and expertise in dance and other art forms. Participants were divided into 3 groups. Thirty-seven percent were given specific information before the performance of a work that included details of the choreographic process as well as possible strategies to help interpret the work. Twenty-one percent were given generic information preceding the performance of a

work. General information about contemporary dance was stressed as well as a general theoretical comparison between contemporary dance and classical ballet. Forty-two percent were given no information prior to the performance.

Two contemporary dance works were used to examine responses and the effect of information on such responses. Approximately 65% of participants observed Anna Smith's *Red Rain* (see above for a description of this work). The remaining 35% of participants observed Sue Healey's *Fine Line Terrain*.

Description of Fine Line Terrain

Fine Line Terrain explores the fragile spaces we inhabit - fine lines separating order from chaos, gravity from levity. The movement explores the physical and emotional human experience of moving or changing from one place to another…. The ways in which human actions and interactions affect us all….. Individual, pair and group dance sequences….explore themes of restriction, freedom, community and the individual (http://www.sydneyoperahouse.com).

Audience responses were measured using the Audience Response Tool (ART). The ART assesses various psychological responses including cognitive reactions such as interpretation and enjoyment, as well as affective reactions including emotional response and visceral sensations. The newly developed questionnaire incorporates five sections including qualitative questions and quantitative scales measured on a 7-point Likert-type rating scale. The present research examined the research questions using two open-ended questions. To examine whether current audiences respond with insight, participants were asked how they interpreted the work. To measure whether current audiences respond with enjoyment, participants were asked whether they enjoyed the work, and were asked to state particular reasons for their enjoyment or lack thereof.

Results

Insight and interpretation. In summary, the study found that approximately 90% of participants formed an interpretation. Information sessions did not impact on the

tendency to interpret the piece. However, *specific information sessions* did impact on the content of interpreted responses where participants presented with specific information about the choreographic process and 'ideas' on how one may interpret the piece were more likely to echo those ideas expressed in the information session. Of the 10 % of respondents that did not interpret the work, responses fell into one of two broad categories:

1) Deliberate choice not to interpret the work

Anecdote from a participant who observed Fine Line Terrain "I actually don't want to. For me to enjoy it is enough. For me (an engineer) performance can be spoilt by attempting to intellectualise and project on to the performance a rational story".
Anecdote from a participant who observed Fine Line Terrain "I find it hard to read so soon after watching a performance. There were so many levels of enjoy and receive…..To give an answer so soon is limiting for me….. Because this was such an imaginative performance I need to distance myself before fully answering this question".

2) Inability to interpret the work

Anecdote from a participant who observed Red Rain "I was totally confused and didn't understand what was going on".
Anecdote from a participant who observed Red Rain "I am not sure. I couldn't really follow the piece".

Enjoyment. In terms of enjoyment, 76% of participants enjoyed the work, 3% did not enjoy the work, 21% enjoyed some elements but not all parts of the work. The information sessions did not impact considerably on the tendency to enjoy the piece. Responses from participants that did not enjoy the work or parts of the work fell into six broad categories:

1) A lack
of understanding or
inability to make sense of the work

Anecdote from a participant who observed Red Rain
"No. The piece did not seem to incorporate a theme/subject purpose. As an uneducated non-dancer, I found it difficult to relate or interpret".

2) Preference for other styles of dance

Anecdote from a participant who observed Red Rain
"Unfortunately, no. Having seen Lord of the Dance, Spirit of the Dance, Hot Shoe Shuffle, Man of La Mancha, and River Dance, and other musicals/dances I have a decided preference for smoother, popular dance movements. This piece was much too disturbing and performative for personal enjoyment".

3) Boredom

Anecdote from a participant who observed Red Rain
"I like the dance moves and I thought the body structure was interesting but parts of it I felt a bit bored because I didn't know what was going on".

4) Inability to focus or to
concentrate on the work

Anecdote from a participant who observed Fine Line Terrain
"I enjoyed some of it, and in some found my attention wandering. The parts I enjoyed were mainly those with two or more dancers interacting, cleanly and physically. I was annoyed and eventually bored by parts which I found neither aesthetically pleasing nor emotive - just movement filling up time".

5) Lack of emotional connection

Anecdote from a participant who observed Fine Line Terrain
"I could not connect intellectually or emotionally to the piece, I felt lost trying to make sense of the work. I did like the sections where the 5 dancers used the frame of cord with the one dancer in the middle; many of the ideas were intriguing but also distracting, that is, dancers at different parts of the space in unrelated movements".

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6) A specific structural element in the work

Anecdote from a participant who observed Red Rain
"I found it complex and while I enjoyed certain parts of it, I found myself drifting off. The music I found too harsh, maybe the time of day, after a day at the office".

Some Conclusions About Audience Response to Contemporary Dance

In this section we have touched on some of the factors likely to contribute to an apparent breakdown in communication between performance and observation of a contemporary dance work. By focusing on a relatively small percentage of *negative* responses, the results presented here may appear unbalanced. However, the aim has been to consider the reasons why people may fail to attend and support contemporary dance from the starting point that the problem occurs once observers are in the theatre.

After a thorough empirical investigation the results suggest the problem appears not associated with the performer/audience relationship. A staggering 90% of observers, regardless of expertise, held some level of insight. Whether consistent with the choreographer's intent/ideas or whether the ideas were completely novel, it would seem for a large majority of spectators, contemporary dance offers a chance for intellectual stimulation. Of those observers who did not interpret the piece, one prevailing reason for their lack of insight was because they either chose not to assimilate an intellectual component as part of their overall experience with the work, or needed more time to gather their thoughts. And while the information sessions did not impact considerably on responses, the specific information sessions could be used in future performances to offer those observers, particularly those who are not familiar with dance nor confident in their ability to make sense of a work, ways to interpret and understand the work.

Additionally, 97% of observers found some, if not all, parts of the particular performance enjoyable. These results suggest that the interplay between performance and observation is a vigorous relationship and as such cannot be solely held accountable

for the consumer interest in contemporary dance. Regardless of experience and expertise, most observers respond with some level of insight and enjoyment.

There are several explanations for, and implications of, the results. It may be the case that *once individuals are seated in the theatre* the experiences that dance produces are universal and that most people appreciate and enjoy. If this is the case, perhaps the problem lies outside the realm of the immediate dance environment. Audience awareness and motivation may be candidates for future refinement and improvement.

Another plausible explanation may be that an important part of the process is for the audience member to be given a chance to reflect on the particular dance work in a positive environment. The questionnaire used in this research (ART) created a secure and anonymous environment in which to explore thoughts, opinions and feelings in relation to the work. Instructions to complete the ART stated that there was no right or wrong response and that all responses were valid. Perhaps what is currently lacking in the present set-up of dance performances is a chance for all willing audience members to reflect and become active intellectual participants in the dance event.

The research presented here, it has been argued, represents a starting point to facilitate the accessibility of new contemporary dance works to Australian audiences. The study has raised additional questions and it is suggested that further research explore the above speculations including the possibility that the questionnaire may be an appreciated aspect in the dance experience.

Interim Summary

Analyses of choreographic processes using a case study approach and perceptual and cognitive responses of audience members using psychometric methods reveal contemporary dance to be a rich behavioural phenomenon deserving of attention from cognitive, social and developmental psychologists. Our methods converged in that movement motifs, features, and themes of *Red Rain* described in the case study were echoed in interpretations of the work provided by audience members using the ART.

It appears that creation of contemporary dance is a generative process that may be applied to a pulse, rhythm or gesture abstracted from visual, auditory, kinesthetic or tactile modalities. The artistry of choreographer and dancer is to express these ideas in bodily form. Cognition in dance is quite literally embodied knowledge. By embodied knowledge we mean procedural memory for sequences and movements (Solso & Dallob, 1995; Smyth, Pearson & Pendleton, 1988; Smyth & Pendleton, 1990, 1994; Starkes et al., 1990) and embodied in the sense of the body as a medium whose movements carry information, for performer and observer, about physical, conceptual, and psychological aspects of the world (Ayres, 1973; Iyer, 2002; Sloboda, 1998; Thelen, 1995). Framed this way, choreographic cognition provides a litmus test for psychological theories that purport to explain human memory, creativity, communication, and language. Work remains to develop psychological theory that can explain the parallel, multidimensional, and ineffable processes at work in choreographic cognition. In the next section we consider methods for capturing responses of audience members in real-time as a performance unfolds.

Developing New Methods to Investigate Contemporary Dance

There are other aspects of choreographic cognition that deserve analysis and require the development of new investigative methods (see Stevens, 2004). For example, the dynamic and temporal nature of contemporary dance requires the recording of cognitive, affective, aesthetic and physiological reactions through time as creation, performance, or observation of movement unfolds. Second, the impact of dance exposure and training on development from the perspective of social processes, personality, self-esteem, memory and spatial abilities, could shed light on developmental processes across the lifespan from new and emerging artists, to established and later-career artists.

Recording On-Line, Continuous Responses to Dance

The Audience Response Tool (ART), as we have seen, provides comprehensive recording of open-ended and discrete (rating scale) responses. However, the ART is retrospective and relies on human memory. The latest version of the ART consists of an on-line, continuous measurement device programmed to record cognitive or affective responses along one or two dimensions while a work is performed. The hardware for such a system consists of a hand-held computer with an external input device (stylus) and a twice-per-second sampling rate. The system was trialed successfully during a performance of Sue Healey's *Fine Line Terrain* at the Sydney Opera House Studio, July 2, 2004.

Schubert (2001) and Cowie, Douglas-Cowie, Savvidou, McMahon, Sawey and Schroeder, (2000) have used continuous sampling methods to record emotional two-dimensional responses to affective stimuli such as music and faces. For example, Schubert's (2001) Two-Dimension Emotion Space (2-DES) consists of a computer screen that depicts emotional labels in 2-D space with one dimension referring to valence and the other to arousal. As a musical piece plays, participants use a computer mouse to move the cursor around the four quadrants to indicate either the emotion they recognize is expressed by the music or to indicate the emotion they feel in response to the music. The data gathered using this method is in the form of a time series. A trajectory through the 2-D/four-quadrant emotion space is derived and emotional reactions can be related to the structure of the musical piece. Methods gleaned from time series analysis are available to gauge the lag between significant structural, melodic, rhythmic, dynamic or harmonic points in the music, and listeners' points of change in emotional response (Schubert, 2001; 2004).

A similar procedure has been adapted to record continuous responses to contemporary dance. Observers respond using a single dimension from low to high that represents grades of qualities such as happiness or enjoyment, or judgments of complexity or predictability. A two-dimensional representation of emotion may also be used (Cowie, et al., 2000; Schubert, 2001). Sessions commence with training and practice trials to

ensure that participants are familiar with the recording device and that the method does not distract attention or interfere with reaction to the work. The data can be analyzed as a time series and compared with the sequence of events in the work. Consistency in type and intensity of response across audience members may also be deduced.

Responses to dance by expert and novice observers may include sympathetic neural, visceral and/or somatic reactions (Castiello, 2003; Decety & Chaminade, 2003; Decety et al., 2002; Glass, 2004; Lee, Kim & Woo, 2001). It is well established that people entrain to a beat or rhythm (Jones, 1976; Large & Jones, 1999; Wing, 2002). For example, children and adults accurately synchronize a motor response such as finger tapping to the pulse of auditory isochronous sequences, rhythmic sequences, and music (Drake, Jones & Baruch, 2000; Large, Fink & Kelso, 2002), and adults adapt their breathing according to actions they observe (Paccalin & Jeannerod, 2000). It should also be the case that observers of dance entrain to the various timescales of movement in dance. Anecdotally, dancers report that when they watch dance, they have a sense of dancing themselves (e.g., Marie Rambert in Foster, 1976, p. 44; Hanna, 1979). To test this hypothesis empirically it is necessary to measure physiological responses such as heart or breath rate that may synchronize to music and movement, and that signal or correlate with emotional and/or somatic reactions. The technology for recording and analyzing multivariate time series data is readily available. The challenge for this research is the development of testable theories that guide interpretation and explanation of inter-relations between the affective, cognitive and physiological data, and the multiple timescales to which individuals of differing levels of knowledge and expertise may entrain and respond.

The Effect of Dance on Development, Identity & Memory

The effect of participation in contemporary dance programs on child and adolescent development, personal identity, and cognitive abilities, also warrants systematic investigation. Anecdotal reports of the personal and social benefits of active arts programs exist but there are few controlled longitudinal studies of the effects, or theories to explain possible underlying mechanisms.

A spin-off study from the *Conceiving Connections* research project is underway examining self-concept, self-esteem, identity and personality attributes of adolescents participating in the Quantum Leap Youth Dance Program at the Australian Choreographic Centre. Scores on a range of social and personality scales (e.g., Marsh, 1999) will be measured at the beginning and end of the Quantum Leap program. The intention is to capture development over the 12 month period, to document the program and process, and disseminate findings nationally and internationally so that similar programs may be implemented elsewhere.

Given the wealth of non-verbal material in contemporary dance it is surprising that only a few researchers have used dance as a medium for the examination of temporal, kinesthetic and spatial cognitive processes (Hanrahan, et al., 1995; Smyth & Pendleton, 1994; Solso & Dallob, 1995; Starkes, et al., 1987). A new project will investigate the nature and mechanisms of short- and long-term memory for movement and spatial and temporal stimuli among new and expert dancers and choreographers. Whether movement material is coded and/or transformed in verbal, spatial or kinesthetic terms will also be investigated.

Conclusions

The multiple dimensions of creating, performing, and appreciating contemporary dance make its analysis from a psychological perspective compelling and challenging. Movement material that is created, performed or observed engages motor and kinesthetic processes and leads to cognitive and affective reactions. Rich in gesture, expression and affect, contemporary dance is a heightened form of non-verbal communication.

A new psychometric instrument, the ART, has been constructed to measure psychological responses to contemporary dance. In results of the ART reported here, we have concentrated on situations where audience members do not or cannot engage with the work. It is encouraging that 90% of 472 participants responded positively to the experience of watching contemporary dance. Motifs, features and themes of Anna

Smith's *Red Rain* that were described in the case study of choreographic cognition (Section 1) were present in interpretations of the work provided by audience members using the ART (Section 2). Implications of the ART data include the fact that audience members – both novice and expert – appear to appreciate an opportunity to reflect on the performance and their response to it. Information sessions may provide useful examples of various interpretations and responses that are possible, and they may build confidence among audience members to engage with a work at different levels.

We have demonstrated a need for new and diverse methods to investigate and explain the complex psychological processes that underpin creation, performance and appreciation of contemporary dance. Creative processes in choreography have been considered using tools from psychology and musicology. Measurement and interpretation of audience response have drawn on techniques from psychometrics, sports psychology, and psychophysiology. Memory and personality issues may be examined using experimental methods and psychometric tools gleaned from cognitive, social and developmental strands of psychology. Two themes emerge. First, as human movement is defined by its passage in time, tools for analysis of time-varying events and multiple timescales are needed. Second, research questions relating to contemporary dance will only be answered using the breadth and complementarity of a trans-disciplinary approach. In many instances the technology and tools for interdisciplinary studies are available and we await specification of detailed and integrated theories from which precise, testable hypotheses may be derived. The descriptions and views promulgated by the *Unspoken Knowledges* and *Conceiving Connections* research teams, we hope, may go some way to realizing such a goal.

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