Stillness, breath and the spine - Dance performance enhancement catalysed by the interplay between 3D motion capture technology in a collaborative improvisational choreographic process

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ARTICLE INFO

ABSTRACT

We propose that Motion Capture (MoCap) in dance is part of, but distinct from, the traditional use of film or video as an archival and indexical instrument. Furthermore in the move from the recording of framed and temporally consistent slices of linear film or video 'footage' to the collection of profoundly mutable digital data utilising an Omniscient Frame, there is a fundamental conceptual shift in the creative re-shaping of the performance through a shared choreographic process. In the improvised choreographic and live performance process, qualitative differences in evaluating MoCap were identified. *Study #1* (2015) is a collaborative screendance work by the authors, dancer (Author One), and digital artist (Author two). This piece utilises 3D Motion Capture technology and 3D digital animation software as part of a series of dance and moving image experiments. MoCap offers enhanced perspectives towards compositional awareness and evaluation between live and digital platforms. The human movement material produced in response to the MoCap technology optimises the potential of the technology and the human, moving body, with a catalysing force. We propose that what is transferred from live to digital via the omniscient motion capture camera informs what we see towards creative possibilities. We identify that the live performer as movement data does manifest as digital presence. We propose that we can view dance data and that this does aid performance – not towards quantitative evaluation but in capturing specific, human movement qualities towards qualitative artistic evaluation and critique.

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1. Methodology: collaboration through improvisation and digital media

Motion Capture (MoCap) offers perspectives towards dance composition, performer-awareness and evaluation, aimed at critique and decision-making between live and digital platforms. The human movement material (be it live or digital) produced with, by, or in response to the MoCap technology may/may not result in a later showing/screening of the work, with or without live/digital material. Regardless, the presence of the technology and the human, moving body, optimises dance performance with a catalysing force. Technological instruments used in choreographic process can result in oscillations between tension and trust. This is a state of constant and ideally productive negotiation between dancer, choreographer and technology. This negotiation between the live and digital appears in an endless range of possibilities, as suggested and critiqued by literature and notes on practice as choreographers engage with virtual environments, contributing to process and outcomes. As Whatley, Brown, and Alexander (2015) suggests, there may be benefits to "viewing" our avatar performing bodies, particularly in subtleties such as stillness within a phrase. As co-choreographers sharing digital dance-making and writing, we propose that viewing stillness, breath and the spine in the digital body, increases our sensorial awareness of somatic characteristics, otherwise less apparent.

Building on three key distinct but intermeshing guiding principles: an improvisational choreographic method; a transparent, interdisciplinary approach to collaboration; and a core engagement with the possibilities of the digital augmentation of the live (and vice versa), this project allowed for the exploration of, and reflection on a range of issues pertaining to the creative possibilities of performance enhancement and evaluation of creative outputs.

Central to our study is the role of MoCap technology in the choreographic and performance process in the production of *screendance* as performance.

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As a digital artist (Author Two) and a dancer (Author One) we collaborate between human movement and digital platforms, based on emergent methods of improvisation (improv) and collaboration. As co-creators, we improvise in the Motion Capture suite with dancer Author One in the suit and designer Author Two initiating improv prompts. It is Author One who moves, but as co-creators, the choreographic process is that which occurs not only in the capture space but in the shared editing process to follow. This is where we identify the methodological reflection referred to in this writing as co-choreography. Our methodology is a combination of three interrelated determinations. (1) Discipline knowledge and scholarship leads us through ongoing experiments towards questions. The aim in these experiments was to test and interrogate our questions through the conduit of dance improvisations in the MoCap studio, the subsequent post-processing and manipulation of recorded 3D motion data, its selection and re-formation through re-visualisation and editing as a moving image sequence; and then for these choices to inform our approach to qualitative evaluation of a moving image dance sequence. In turn, to inform the return to studio for the purpose of creating further choreography.

With this objective we (2) propose to engage in live and digital platforms in order to experiment across and beyond discipline confines towards creating a collaborative lexicon in studio and the editing process; (3) as a way to enter into collaborative practice towards furthering and enhancing the live and digital process and creative outcomes, with the goal of discovering new ways of making and fostering a collaborative dialogue through a determinedly interdisciplinary approach (Sullivan, 2010). We propose that dance performance enhancement and choreographic process are interlinked. The moment of the 'live event' of physical improvisation taken through to post-production and the final *screendance* outcome represents an ongoing performance enhancement process.

Our study will firstly outline the MoCap process itself employed for *Study #1* (2015), with close reference to the specific technical set-up and configuration of the Motion Capture studio itself, and the subsequent digital post-production pipeline. We will then trace the relevant historical trajectories underpinning our approach to technology and transformation of choreographic practice, providing particular examples of the technological 'enhancement' or 'augmentation' of the dancing body itself. This will also include consideration of distinct qualitative features of the dance performance evaluation as mediated by the MoCap process. The choreographic approach we employed will also be elucidated with close reference to improvisational and collaborative methodologies. Reflecting the collaborative and inter-disciplinary nature of our project, our discussions will draw on concepts, theories and terminology from dance and choreography, film history and the language of digital media.

2. Motion capture pipeline

Motion Capture is a process which allows the recording of the live movement of people, animals or objects in space as 3D digital data, which can then be stored and played back in the virtual XYZ space of 3D software, most commonly 3D animation software. In the entertainment industry MoCap data is collected from performers and used to animate digital characters for animation, visual effects and gaming. The MoCap system employed for this project was an optical MoCap system consisting of 24 infrared cameras placed around the walls and ceiling of a 9 m × 9 m space. 49 highly reflective spherical markers attached to a MoCap suit worn by the performer are tracked by the cameras, their position in 3D space calculated from the overlapping viewpoints of two or more cameras at any one time. In this case only body movement was tracked. Facial expressions and finger and thumb movements are

particularly technically challenging so were not attempted at this stage.

An important distinction from film or video recording is that the physical appearance of the performer is not recorded. Only their movements in 3D space are recorded. This difference is distinct to the process of viewing footage as an evaluative tool. Re-viewing MoCap movement data carries an uncanny presence. The subsequent visualisation of dance movements in the digital realm can take any number of forms depending on the creative or practical requirements of a production outcome.

When considering MoCap and its technological mediation of live movement the issue of movement "quality" and manifest "physicality" in what is preserved and/or lost in the transfer from live to digital becomes key.

Rotoscoping, a technique in drawn animation whereby live film footage of a performer is traced frame-by-frame to create more "fluid, life-like" movements than traditional animation technique, is often cited as a direct antecedent to MoCap. Bouldin (2004) identifies a particular qualitative phenomenon in the rotoscope as a by-product of its production and origin in an indexical image:

> the rotoscope facilitates an indexical transference of reality and materiality from an original body into its filmic copy, and then again into its animated incarnation. . ... Through this "material connection" the rotoscoped animated body is able to conjure the uncanny, supplemental presence of an absent body, the body of the original. . .. This dual presence, this corporeal haunting, this cadaverous persistence of the original body insinuates a kind of ontological ambiguity and uncertainty into the animated body (p. 11).

This uncanny presence in MoCap is one of the characteristics that makes the process of evaluation distinct from the process of viewing video footage of documentation of a performance. Whatley (2012) identifies the differences between watching real and virtual dance that we refer to in the "uncanny." The 'viewer' in some contexts is the audience of the digital product or outcome. In this context, the 'viewer' is the co-creator/choreographer/editor post-improvisation that is us, in the editing suite. When we return to the unpredictable footage in order to choose *this over that* as we edit, we view the dancing body differently. Whatley (2012) refers to the term "empathy" as the experience of watching virtual visualisations of live dance. She asks how do "gravity, skin, tactility and materiality, communicate through visualisations made for immersive environments? And how might they awaken the senses through a sense of orientation, dislocation or displacement?"(p. 265).

We identify that in the process of returning to the captured footage, we view a heightened specificity in movement quality; the use of breath, the exertion of the dancer and the articulation in her spine, in the digital capture. We argue that the gravity of her body, her tactility and materiality are distinct from an animation avatar, in that seeing the body who was previously in improvisation, now in animation, is identifiable. Her stillness also reveals her use of breath, articulation in her spine and her centre of gravity as a recognisable transfer in the visualisation of her somatic essence, in digital form.

We are interested in *how does this initiate a response in the viewer otherwise not experienced*? MoCap traces nuances in the human form, an articulation that in the editorial stage of viewing footage, may resemble but be isolated from the live choreographic space and seeing the subtlety of movement, eye to eye with the moving dancer. In our collaborative process this has had an impact on making our work whereby we view the footage from our captured studio improvisation and respond to the movement nuances and subtleties to make editorial choices towards a screen outcome.