



Familiar Capers. Dancers: Shailer Kern-Carruth, Ariel Zablocki, Alison Liney. Philadelphia, USA. Photo © Bill Herbert (2011) CC-BY-NC

# CREATIVE COGNITION IN DANCE CHOREOGRAPHY: A REVIEW

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## Abstract

What does it mean to be creative in dance? Cognitive psychologists have studied creativity for over fifty years, yet little has focused on dance. This chapter offers a review of existing research on creativity in contemporary dance choreography. After offering a selection of creativity models previously applied to dance, it presents findings from the Unspoken Knowledges project, studies supporting social theories of creativity, research stemming from Wayne McGregor|Random Dance, and some perspectives from somatics. Drawing from this nexus of research, this chapter illustrates the strides made in choreographic creativity research and highlights some areas in need of further attention.

## Introduction

Cognitive psychology is the study of higher order mental processes<sup>1</sup> like attention, reasoning, decision-making, problem-solving, analysis, synthesis, evaluation and so on. These processes combine to form the act of creative generation. Therefore, creativity, as a research discipline unto itself,<sup>2</sup> is situated in the field of cognitive psychology. Choreographing dance is a creative act, yet there has been relatively little research to understand creativity in dance.<sup>3</sup> The existing research on creativity often lacks definitional rigour,<sup>4</sup> and, when considering dance, fails to examine cognitive processes involved in producing creative choreography.<sup>5</sup>

However, there is a small but growing body of research examining creative cognition in dance, and this chapter offers a narrative, status quo review of existing research with a specific focus on creativity in contemporary dance choreography.<sup>6</sup>

First, I offer a selection of influential models of creativity. This is not an exhaustive list – such an undertaking would be beyond the scope of this chapter – but rather it focuses on the models which have been applied to dance: Geneplore, evolutionary (Blind Variation and Selective Retention) and social and distributed theories. Second, I outline the existing research applying these models to dance and have categorised this research into four groups:

- Unspoken Knowledges
- Support for Social Theories
- Wayne McGregor | Random Dance
- Perspectives from Somatics

This collation reveals a nexus of research that has been conducted across cognitive science, dance studies and somatics which illustrates the strides made in choreographic creativity research and highlights some areas in need of further attention.

## Creativity Research: Cognitive theories

Following J. P. Guilford's<sup>7</sup> address admonishing psychology's neglect of creativity, research in the area has blossomed since the 1950s. In its "first wave" (1950s and 1960s), creativity research was dominated by a focus on individual/personality traits.<sup>8</sup> In the following decades (1970s and 1980s), the "second wave" focused on individuals' mental processes when they are involved in creative thought or behaviour.<sup>9</sup> The "third wave" approach, in the 1980s and 1990s, incorporated the sociocultural contexts for creative generation. Today, this third wave also includes "interdisciplinary"<sup>10</sup> or "confluence" approaches,<sup>11</sup> combining elements of both the cognitive and sociocultural approaches as well as research from other disciplines. Throughout this history, *creativity* is defined as producing something that is a) useful and b) novel.<sup>12</sup> This definition offers a domain-general understanding, meaning it is applicable to studying creativity across a wide variety of 'output' or product forms, including dance.

Originally, as in cognitive psychology, creativity research in dance was largely focused on individual accounts; since the 1980s, research into creativity in dance has moved beyond anecdotes and personal accounts, but still is heavily qualitative and descriptive<sup>13</sup> with little consideration for embracing empirical traditions of cognitive research.<sup>14</sup> These descriptive methods offer little assurance that the findings are generalizable to large populations, and are therefore viewed of as less valid by the social sciences. However, recent research has attempted to bring together qualitative subjective experience with (often quantitative) empirical testing methods. This cross-disciplinary approach draws on many pre-existing models, often stemming from research into other art forms.<sup>15</sup> These studies mostly look at the generative process in dance – i.e. creativity in dance as occurring in the choreographic process – drawing on theories emphasising divergent thinking and ideological variation (SOI, BVSR), generative and exploratory processes (Geneplore) and situated cognition.

### *Structure of Intellect Model and the Evolutionary Approach (BVSR)*

Historically, many theories of creativity are grounded in Guilford's<sup>16</sup> Structure of Intellect model. Guilford introduced the concept of divergent thinking, an approach to problem solving where individuals seek

unconventional responses that are useful, numerous and varied instead of the convergent (one, usual or 'correct') answer. Divergent thinking is to this day commonly used as a measure of creative potential.<sup>17</sup> Variation in thinking also plays a role in subsequent creativity models, such as the evolutionary model of Blind Variation and Selective Retention (BVSR).<sup>18</sup> BVSR is a two-step process of creativity: a non-teleological variation in idea production (blind variation), followed by a test of the idea's applicability and the progress resulting from it (selective retention). BVSR remains an important model today.<sup>19</sup> Perhaps the most salient aspect of the BVSR theory's application to studying choreographic creativity is the importance of variation – or the ability to generate a wide range of movement possibilities from which to selectively retain the most novel and useful option.

### *The Geneptore Model*

Another process-based creativity theory is the Geneptore model of cognitive functioning.<sup>20</sup> The Geneptore model "was intended as a broadly descriptive, heuristic model rather than an explanatory theory of creativity."<sup>21</sup> It is characterized by a two-stage model of creative process: the generate stage, or "initial generation of candidate ideas or solutions," followed by an extensive exploration of those ideas.<sup>22</sup> Finke et. al.<sup>23</sup> claim that the initial ideas are "preinventive," or an untested germ of an idea that has potential to prove novel and useful. Though in the model, these processes are not discrete but cyclical, in dance we might consider this the generation of ideas (intentions, problems) and exploration of resulting movement options or "solutions."

### *Social Models of Creativity*

Most of the approaches in the second wave of creativity research accepted as standard that creativity is an intrapsychic – that is, occurring within the mind, psyche, or personality – process. Questioning that assumption, the sociocultural approach to creativity was pioneered by Teresa Amabile in the 1980s.<sup>24</sup> She introduced a consensual definition of creativity: that a product is creative when domain experts agree that it is as opposed to a purely intrapsychic process. Likewise, Mihaly Csikszentmihalyi<sup>25</sup> posited that creativity went beyond the individual, and was a property of societies,

cultures and the historical zeitgeist within which individuals are embedded. He created the systems model of creativity,<sup>26</sup> in which the social organization – or gatekeepers of an entire discipline, similar to Amabile's domain experts – determine the value, or usefulness, of a creative product.

### *Distributed Systems*

*Situated cognition* is a term for theories that claim cognitive processing occurs beyond the brain alone.<sup>27</sup> These include *embodied cognition*, or the theory that the body plays an integral role in cognitive processing, and *distributed cognition*, the claim that cognitive systems themselves extend beyond the boundary of the individual organism. Distributed cognition is another theory that attends to the impact of the sociocultural environment.<sup>28</sup> In this view, features of an agent's physical, social and cultural environment can do more than distribute cognitive processing: they partially constitute that agent's cognitive system. Distributed cognition has been a focus of a large portion of research into creativity,<sup>29</sup> and, as I will present in the following section, in creativity in dance.

## Creative Cognition Research in Choreography

### *Unspoken Knowledges*

Unspoken Knowledges, a project developed by Robin Grove and Shirley McKechnie,<sup>30</sup> investigated cognition in the choreographic process and produced a small body of research.<sup>31</sup> Two Australian choreographers' creative processes were documented using digital camera, logbooks, interviews, discussions and workshops. Sue Healey in conjunction with performer Michelle Heaven created a 20-minute solo, *Not Entirely Human*, while Anna Smith composed *Red Rain*, a 40-minute ensemble piece for seven dancers. Cognitive psychologists Kate Stevens and Steven Malloch joined Grove and McKechnie in observing Smith's process and analysing it using phenomenological methods and the Geneplore model of creativity.<sup>32</sup> Stevens et al<sup>33</sup> argue that some issues with studying creativity may be resolved by approaching research in large-scale contexts and over an extended time when artistic work is developed. The creation of *Red Rain*, they state, "may be summarized as a cycle of generative and exploratory actions."<sup>34</sup> They give examples of generative ("retrieval, association,



synthesis, analogical transfer and categorical reduction”) and exploratory (“attribute-finding, conceptual interpretation, functional inference, contextual shifting, hypothesis testing and the search for limitations”) aspects within Smith’s process.<sup>35</sup> The authors argue that the cyclical nature contributes to the resultant work being more than a collection of initial movement sequences generated, and they point to the importance of connecting movement sequences to an overarching, unified whole. They claim, “thus creativity in composing dance lies as much in sequencing, melding and linking the parts of the work, as in the creation of the parts themselves,”<sup>36</sup> pointing to the importance of not only generative aspects but of elaborative ones in choreographic creativity.

Throughout the Unspoken Knowledge project’s outputs, the authors assert that, “Dance phenomena challenge existing cognitive theories that assume only propositional or verbal forms of imagery and knowledge in human creativity.”<sup>37</sup> Proposing a more holistic theory, Stevens et al (2000) introduced a coupling of perceptual, cognitive and emotional processes involved in dance creation, termed *choreographic cognition*. The theory argues that contemporary dance’s movement vocabulary, form and structures are the bodily expression of mental processes in space and time,<sup>38</sup> therefore situating their theory within situated cognitive approaches that consider multimodal aspects of cognition extending beyond the mental. Indeed, Stevens et al<sup>39</sup> make a case for dance as embodied cognition. This claim is echoed in a subsequent 2005 article, in which Stevens and McKechnie claim that contemporary dance, whether professional or pre-professional, involves both declarative and procedural knowledge and operates as a non-verbal and multimodal language, stating that in choreographic practice, “Declared through movement, the idea becomes a visible thought.”<sup>40</sup> Continuing a predilection for situated cognitive approaches, the researchers outline a dynamical system, composed of the choreographer, performer and audience each as actors, to conceptualise choreographic cognition.<sup>41</sup> They emphasise not only the individual contributions to a creative product, but also the context inherent in dance creation, stating, “An explanation of creativity in choreography must therefore address the complex of dynamics and interactions among dancers and choreographer in this community of creative minds.”<sup>42</sup> Their

dynamical system highlights the social nature of choreographic creative process and outcomes.

### *Social Theories of Creativity in Dance*

Recent dance cognition research emphasises the social aspects of choreographic creativity, supporting distributed cognition theories. One study on undergraduate dancers argues that dancers practice “embodied creativity,” physically solving problems through their bodies-in-motion;<sup>43</sup> it argues that dance improvisation is a co-agentive, supportive process, distributed across interactions within the group. Another study<sup>44</sup> on creativity in improvisational movement generation gave ten professional dancers from the Australian Dance Theatre (ADT) improvisational tasks; these were undertaken either alone, with a familiar partner, or in an unfamiliar pairing. Sharing a framework with divergent thinking theories, dancers were asked to self-identify the number of movement ideas they generated, as well as rate their experience during the choreographic tasking exploration. The study reported slight but likely insignificant increases in number of movements generated. However, dancers reported a difference in subjective, qualitative assessment of the movement generated. They rated the movement generated in pairs as more interesting and enjoyable, carrying implications for the “usefulness” criterion for choreographic creativity, and supporting a social theory of creative movement generation. Further, a study on creative choice-making in dance rehearsals argued dancers are impacted by the collaborative environment.<sup>45</sup> Arguing that rehearsals are a distributed cognitive system, the study claimed that patterns of interactions shape individual creative choices in producing movement, and that choreographic instructions are necessarily socially interactive.

### *Wayne McGregor | Random Dance*

Cognitive psychologist David Kirsh<sup>46</sup> researched social choreographic interaction in a longitudinal cognitive study also grounded in theories of distributed creativity and embodied cognition. In the study, established choreographer Wayne McGregor and his contemporary dance company were observed over the course of a month-long creative process. The study argues dancers use embodied cognition to translate information from

one form to another. It suggests that dancers not only use their body as a medium in which to think when creating choreography, but also that they think in various, non-propositional (that is, not-verbally-reportable, non-rational) sensory modalities. Multimodal transfer between various forms of mental imagery (aural, visual, spatial and more) becomes the impetus for movement generation in McGregor's process. As such, the study both suggests engaging in lesser-used modes of imagery may offer ways of providing more variance in generated movement and places it within a distributed social system.

The 2011 Kirsh study stems from a decade of collaborative research on creativity and cognition in contemporary dance between McGregor, his company Random Dance<sup>47</sup> and its research branch R-Research, cognitive psychologists, a social anthropologist and neuroscientists.<sup>48</sup> The interdisciplinary collaboration aimed to "develop new understandings of the choreographic process" and involved the Choreography and Cognition project<sup>49</sup> which led to the creation of McGregor's *AtaXia*<sup>50</sup> and development of the *Choreographic Thinking Tools*<sup>51</sup> still used by the company. The project also included studies using data collected throughout McGregor's creation of a new dance work in 2009.<sup>52</sup> The research led to several articles<sup>53</sup> and follow-on research is continuing.<sup>54</sup> Much of this research supports theories of situated cognition. In one example, Kirsh argues that in "marking" (or "dancing a phrase in a less than complete manner") during rehearsals, "dancers think better about their full-out phrase. Physical movement replaces mental computation in the rehearsal process."<sup>55</sup> In Kirsh's argument, bodily movement and form serve as external, representational vehicles, therefore supporting embodied cognition models. Marking is not only used in rehearsals for memory, but also in choreographic problem-solving to select appropriate movement in generative or exploratory phases of creativity. That is, choreographers may use their bodies, and the bodies of their dancers, as external representations of ideas to be conveyed: dancing is the way choreographers work out creative solutions to their 'problems.' They may 'try out' various movement options, selectively retaining the most novel and useful possibilities. The choreographer's awareness of the movement affordances<sup>56</sup> occurs through the process of dancing itself.



Looking at the same choreographic process, Kirsh et al<sup>57</sup> analysed the video footage, interview data, observations, motion capture, reflective journals and testing on the company, and found three main methods that the authors argue McGregor uses to produce high quality and novel content. These were showing (e.g. demonstrating), making-on (“using the bodies of specific dancers as targets on which to shape the form and dynamics of a move or phrase,” for themselves or as a model for others) and tasking (posing a choreographic problem).<sup>58</sup> Both the Kirsh study and a subsequent study by Muntanyola<sup>59</sup> on the same data demonstrate congruence with the Stevens et al<sup>60</sup> and Stevens and McKechnie<sup>61</sup> findings by emphasizing that choreographers, in the process of creating dance, engage in multimodal direction. That is, “choreographers communicate with their dancers in diverse physical ways,”<sup>62</sup> including through the common modes of talking, gesturing, positioning, or demonstrating physically, but also through touch and sounding – forms determined to be “uncommon outside the dance domain.”<sup>63</sup> They argue that these choreographic generation methods and multimodal forms of communication reveal that the choreographic environment is an example of a distributed creative system.

May et al<sup>64</sup> offer a further example of creativity research that supports a theory of embodied cognition. This research features two studies. In the first, McGregor’s company dancers recorded the forms of mental imagery they engaged during choreographic processes using experience sampling methods. In the second, fMRI was utilized to study the neural underpinnings of choreographing movement tasks. Dancers reported using a variety of forms of mental imagery, and found that reflecting on their own mental habits of how they approach movement creation offered more variation in movement generation. Greater variation was achieved by consciously choosing a less-frequently used form of imagery – a possibility that may have implications for the Variation and Selective Retention in a BVSR model or the Generation-exploration processes in a Geneplore model. Which is to say, if dancers are able to consciously select and explore less-common forms of multimodal inspiration for their movement generation, then presumably they may generate more divergent, and thus more creative, movement options. The impact on training in metacognitive awareness of mental imagery is currently being researched with

undergraduate choreographers<sup>65</sup> with initial analyses offering encouragement that such training may increase choreographers' creative aptitude.<sup>66</sup> May et al also describe differences in dancers' thinking patterns when they were physically active as opposed to static, passive states during thinking, further supporting the theory that "choreographic movement creation is an embodied cognitive activity" and thus theories of embodied cognition.<sup>67</sup>

Other studies<sup>68</sup> from collaboration between McGregor and cognitive scientists looked at how dancers view and parse movement material (or identify and break up into smaller units or 'phrases') and how interdisciplinary research collaborations can not only contribute to scientific knowledge, but also help to create new choreographic work.<sup>69</sup> Cognitive psychologist Phil Barnard and interdisciplinary dance researcher Scott deLahunta developed a theory of creative development, the Process Model. It models creative development as a process of design that bridges inspiration and artistic product – a process presented through choreographic processes in dance, but which can be applied to other creativity domains.<sup>70</sup>

A 2012 article, deLahunta and Barnard discuss the generation phase of McGregor's process with noted contemporary dancer, educator, activist and somatic practitioner Gill Clarke. The article covers how their research on imagery involved in choreographic creativity led to the development of the *Choreographic Thinking Tools*,<sup>71</sup> how these ideas relate to somatic practices and the scientific theory underpinning each of these perspectives. Here, Clarke suggests that somatic practices, a field of mind-body integration techniques that emphasize the first-person, subjective experience,<sup>72</sup> help to train dancers' perceptual systems. She claims that somatic practices may offer the "experiential time and space to explore sensations and images that might invite a non-habitual and more subtle movement response."<sup>73</sup> Therefore, Clarke implies that such awareness may avoid habit to increase novelty, and thus creativity – a claim I examine in my current research.<sup>74</sup>

## *Somatic Practices*

Clarke's claims that training in somatics may impact dancers' creativity is a commonly-held belief in the somatics community, though little research has considered cognitive perspectives. However, as a field invested in enhancing one's sense of embodiment, somatic approaches emphasize sensory, perceptual processes underlying movement skill<sup>75</sup> and sensitivity to intricate bodily relationships.<sup>76</sup> Some research<sup>77</sup> suggests that embodiment facilitates creativity in the classroom, regardless of discipline. Other research shows that somatics also gives rise to a deeper sense of embodiment, one that allows for a focused attention, enables a greater sense of autonomy and allows dancers to exercise greater choices in dance making<sup>78</sup> – further supporting Clarke's claims. Furthermore, Somatic Movement Education pedagogy allows for individual authority in exercising greater choices in dance making,<sup>79</sup> which carries implications not only for variation in divergent thinking, but also the choice-making inherent in *selective* retention in the BVSR model. I have recently argued that refined perceptual ability, combined with an increased sense of agency developed in somatic practices may facilitate greater creativity in dance choreography.<sup>80</sup> I offer a cognitive audit-trace<sup>81</sup> of the ways in which somatic practice may facilitate choreographic creativity.<sup>82</sup> Indeed, my earlier research on integrating somatics into dance education illustrates that, in both student and teacher's perspectives, training in somatic practices increases students' creativity in dance.<sup>83</sup> Further, Jill Green's postpositivist, qualitative research on the intersections between creativity and somatics suggests that somatic practices may facilitate change (or, in the cognitive psychological terms, novelty) on not only a personal level, but potentially on a sociopolitical level as well.<sup>84</sup> Though she does not engage cognitive psychological paradigms, Green proposes a posthumanist reconceptualization of creativity that situates a changing self-in-process in relationship to the sociopolitical world. Green's somatics research reflects the shifts within cognitive science's creativity research towards a situated, social and potentially distributed understanding of creative cognition: cognitive processes involved in choreographic creativity are not only mental, but embodied and social as well.

## Conclusion

The kinetic, multilayered nature of dance challenges existing methods of cognition; as Wachowicz and Stevens emphasize, “There is no single method to study choreographic cognition.”<sup>85</sup> The compilation of research presented in this chapter reflects this diversity of perspectives, influences and multi- and inter-disciplinarity needed to approach a holistic understanding of creativity in choreography. Furthermore, research into choreographic practices and the complexities within movement generation support a variety of creativity theories including: stage models explaining the generation and exploration of ideas, the processes involved in variance of idea generation, and social processes involved in the generation, selection and retention of appropriate solutions.

As mentioned earlier, however, though this area of research is burgeoning, it is new and therefore limited in scope. Firstly, it is mostly focused on the creation of choreography, not creativity in the *performance* of movement or as viewed from audiences’ perspectives. As noted above, the forms of dance considered in this research have been limited to Western, contemporary, performative dance and therefore excludes other forms of choreography in more traditional Western forms (like ballet) or social, popular/urban, non-Western cultural and indigenous forms that warrant further investigation. Also, even in contemporary dance, the choreographer’s role ranges in hierarchical positioning, from executive to collaborative approaches to making; an awareness of this range is missing in much of this research, particularly those focused on individual artists’ creative processes which cannot represent the full spectrum of choreographic practice. Furthermore, existing research, when not on student populations, has mostly been done on these well-known (and well-funded) professional choreographers; a gap concerning independent artists and smaller-scale companies/choreographers is apparent. Such a focus may even shed more light on, and potentially problematize, the “big-C/little-C” debate in creativity research,<sup>86</sup> where greater creativity is linked to expertise, genius and fame.

This focus on expertise and fame also points to a question of who determines whether a product (in this case, a dance work) is creative or not. As noted above, Amabile<sup>87</sup> has proposed a form of inter-rater reliability, where experts in the field judge the creativity of works – yet even this consensual definition begs the question of who determines who the “experts” are? Indeed, some research shows experts often have implicit theories of creativity, yet are not often offered opportunities to articulate these.<sup>88</sup> The question of taste or aesthetic preference of “experts” is one that has yet to be considered in creativity studies, much less in dance, where such experts often serve as gate-keepers for assessing creative work (as educators in choreography and composition courses, as presenters, or funders of work). I suggest that somatic practices, focused as they are on subjective experience and internal authority, question the necessity of external expertise in the context of meeting the “useful” criterion for creativity.<sup>89</sup>

Finally, though it is beyond the scope of this chapter to discuss in depth, the field of creativity research is closely linked to empirical scientific traditions; thus, assessing creativity, even in some of the above studies,<sup>90</sup> is often linked to psychometric testing. Yet, the bevy of research I have presented here argues, in dance, creative generation is not only a cognitive act, but also a kinaesthetic one, a form of embodied cognition.<sup>91</sup> Embodied cognitive processes are not captured by the verbal, propositional and written forms of input typical to psychometric testing. As such, I have argued that, to fully understand creative cognition in choreography, future research must not only take on complex, mixed-method forms, but perhaps even develop discipline-specific measurements to reflect the forms of cognition choreographers are engaging and more accurately test their creative development.<sup>92</sup>

Though more research remains to be done to fully understand the complexity of creative choreographic cognition, it is clear from the literature thus far that dance is a highly multimodal, embodied and inherently social art form. It follows, then, that the cognitive processes involved in making novel and useful choreographic decisions would also be multimodal, embodied and affected by the wider sociocultural contexts within which dance is created. This is reflected in the trends, in both cognitive science



and dance research, towards frameworks which emphasise more embodied, and more social, understandings. The nexus of research presented in this chapter, collectively, offers support for situated perspectives on creative cognition while suggesting exciting areas for future development.

## Notes

- <sup>1</sup> Stevens, Malloch, and McKechnie, “Moving Mind.”
- <sup>2</sup> Isaksen and Murdock, *The Outlook for the Study of Creativity*.  
[www.cpsb.com/research/articles/creativity-research/Outlook-for-Creativity.html](http://www.cpsb.com/research/articles/creativity-research/Outlook-for-Creativity.html).
- <sup>3</sup> Press and Warburton 2007. This is true even in arts-focused texts. For example, Winner 1982, Sternberg 1999 and Runco 2007 each make no mention of dance, while it is mentioned only in passing as a creative domain in Weisberg 2006 or Kaufman 2016. Even in an effort to create an ‘interdisciplinary’ overview, Sawyer 2012 features art forms such as visual arts, writing, music, and theatre, but lacks dance entirely.
- <sup>4</sup> Plucker, Beghetto, and Dow, “Why Isn’t Creativity more important.”  
[www.researchgate.net/publication/233298152\\_Why\\_Isn't\\_Creativity\\_More\\_Important\\_to\\_Educational\\_Psychologists\\_Potentials\\_Pitfalls\\_and\\_Future\\_Directions\\_in\\_Creativity\\_Research](http://www.researchgate.net/publication/233298152_Why_Isn't_Creativity_More_Important_to_Educational_Psychologists_Potentials_Pitfalls_and_Future_Directions_in_Creativity_Research).
- <sup>5</sup> Press, *The Dancing Self*, is one example. It explores personality traits, individual processes, and pedagogical approaches associated with creativity, but lacks a clear definition of *creativity* and often conflates creative engagement or creative process with the core concept of *creativity*.
- <sup>6</sup> This is primarily because the existing research on the intersection of dance and cognition has looked at contemporary dance in particular. By which I mean current, often fusion or hybrid styles from the post-post-modern era, sometimes, especially in the US put under the umbrella of more general ‘modern’ dance (though separate, in practice, from the modern-era roots of the form), which is often also identified on a spectrum alongside ‘new dance’ or ‘experimental’ dance. A fuller discussion of dance genres is beyond the scope of this chapter. There is also a particular lack of research on creativity in classical, popular/urban, non-western, social, and cultural or indigenous forms. Further, the

existing research largely focuses on the generative aspects of making movement for choreography as the subject of inquiry. I acknowledge the limitations inherent in that focus later in this chapter.

<sup>7</sup> Guilford, "Creativity."

<sup>8</sup> Albert and Runco, "A History of Research on Creativity," 28, and Sawyer, *Explaining Creativity*.

<sup>9</sup> Sawyer, *Explaining Creativity*.

<sup>10</sup> Ibid.

<sup>11</sup> Sternberg and Lubart, "The Concept of Creativity," and Weisberg, *Creativity*.

<sup>12</sup> Amabile 1996, Campbell 1960, Kaufman 2016, Kirsh et al. 2009, Koestler 1964, Runco 2007, Sawyer 2012, Sternberg 1999, Stevens, Malloch and McKechnie 2001.

<sup>13</sup> Press and Warburton, *International Handbook*, 1274.

<sup>14</sup> Though it is beyond the scope of this chapter to discuss these, Clements and I, in "Making Space for Creativity," offer some explanation of the myriad reasons for why there has historically been a lack of such creativity research into dance, which is partially due to this tension between subjective/qualitative and objective/empirical positioning.

<sup>15</sup> Wachowicz and Stevens, "The Role of Attention," 218.

<sup>16</sup> Guilford, *Intelligence*.

<sup>17</sup> Wallach and Wing 1969, as cited in Runco, *Creativity Theories*; Wallach and Kogan, *Modes of Thinking*.

<sup>18</sup> Campbell, "Blind Variation."

<sup>19</sup> Simonton, "Creativity as Blind Variation," and "Creative Thought as Blind-Variation."

<sup>20</sup> Finke, Ward, and Smith, *Creative Cognition*.

<sup>21</sup> Ward, Smith, and Finke, "Creative Cognition," 191.

<sup>22</sup> Ibid.

<sup>23</sup> Finke et. al., *Creative Cognition*.

<sup>24</sup> Amabile 1982; Amabile 1983; Amabile 1996; Sawyer 2012.

<sup>25</sup> Csikszentmihalyi, *Flow*, and "Implications of a Systems Perspective."

<sup>26</sup> Feldman, Csikszentmihalyi, and Gardner, *Changing the World*.

<sup>27</sup> Gibbs, *Embodiment*; Robbins and Aydede, "A Short Primer."

- <sup>28</sup> Wilson and Foglia, *Embodied Cognition*; Robbins and Aydede, “A Short Primer.”
- <sup>29</sup> Kirsh 2011; Robbins and Aydede 2012; Sawyer 1999; Ward, Smith and Finke 1999; Wilson and Foglia 2011.
- <sup>30</sup> Grove and McKechnie, “Introduction.”
- <sup>31</sup> Including, as relevant to this review: Grove, Stevens and McKechnie 2005; Stevens and McKechnie 2005; Stevens et al. 2003; Stevens, Malloch and McKechnie 2001; McKechnie and Grove 2000; Stevens et al. 2000; McKechnie & Stevens 2009. A more comprehensive list of outputs can be found in Grove, Stevens, and McKechnie 2005, 200-202.
- <sup>32</sup> Stevens et al. 2003. Available online at [www.researchgate.net/publication/233690236\\_Choreographic\\_Cognition\\_The\\_Time-Course\\_and\\_Phenomenology\\_of\\_Creating\\_a\\_Dance](http://www.researchgate.net/publication/233690236_Choreographic_Cognition_The_Time-Course_and_Phenomenology_of_Creating_a_Dance); Stevens 2005a and Stevens 2005b, both available online at [www.katestevens.weebly.com/uploads/5/3/0/6/5306174/thinking\\_entire\\_book.pdf](http://www.katestevens.weebly.com/uploads/5/3/0/6/5306174/thinking_entire_book.pdf).
- <sup>33</sup> Stevens et al., “Choreographic Cognition.”
- <sup>34</sup> Ibid., 318.
- <sup>35</sup> Ibid.
- <sup>36</sup> Ibid. This argument is also echoed in Stevens et al., “Moving Mind,” 60.
- <sup>37</sup> Stevens, Malloch, and McKechnie, “Moving Mind,” 63. Available online at [katestevens.weebly.com/uploads/5/3/0/6/5306174/stevens\\_malloch\\_mckechnie\\_brolga\\_2001.pdf](http://katestevens.weebly.com/uploads/5/3/0/6/5306174/stevens_malloch_mckechnie_brolga_2001.pdf).
- <sup>38</sup> Stevens, Malloch, and McKechnie, “Moving Mind.”
- <sup>39</sup> Stevens et al., “Choreographic Cognition,” 319-320. Available online at [www.researchgate.net/publication/233690236\\_Choreographic\\_Cognition\\_The\\_Time-Course\\_and\\_Phenomenology\\_of\\_Creating\\_a\\_Dance](http://www.researchgate.net/publication/233690236_Choreographic_Cognition_The_Time-Course_and_Phenomenology_of_Creating_a_Dance).
- <sup>40</sup> Stevens and McKechnie, “Thinking in Action,” 244. Available online at [www.researchgate.net/publication/5611890\\_Thinking\\_in\\_Action\\_Thought\\_Made\\_Visible\\_in\\_Contemporary\\_Dance](http://www.researchgate.net/publication/5611890_Thinking_in_Action_Thought_Made_Visible_in_Contemporary_Dance).
- <sup>41</sup> Stevens et al., “Choreographic Cognition.” Available online at [www.researchgate.net/publication/255609603\\_Choreographic\\_Cognition\\_Composing\\_Time\\_and\\_Space](http://www.researchgate.net/publication/255609603_Choreographic_Cognition_Composing_Time_and_Space).
- <sup>42</sup> Ibid., 2.
- <sup>43</sup> Lucznik, “Between Minds and Bodies,” 303.

- <sup>44</sup> Stevens and Leach, "Bodystorming." Available online at [www.researchgate.net/publication/280613436\\_Bodystorming\\_effects\\_of\\_collaboration\\_and\\_familiarity\\_on\\_improvising\\_contemporary\\_dance](http://www.researchgate.net/publication/280613436_Bodystorming_effects_of_collaboration_and_familiarity_on_improvising_contemporary_dance).
- <sup>45</sup> Muntanyola Saura, "Expanding the Space." Available online at [csjarchive.cogsci.rpi.edu/proceedings/2011/papers/0414/paper0414.pdf](http://csjarchive.cogsci.rpi.edu/proceedings/2011/papers/0414/paper0414.pdf).
- <sup>46</sup> Kirsh, "Creative Cognition." Available online at [adrenaline.ucsd.edu/Kirsh/Articles/CreativeChoreography/Creative\\_Cognition\\_in\\_Choreography\\_Final.pdf](http://adrenaline.ucsd.edu/Kirsh/Articles/CreativeChoreography/Creative_Cognition_in_Choreography_Final.pdf).
- <sup>47</sup> In this research, the company is called Random Dance, however it has recently been re-named Company Wayne McGregor.
- <sup>48</sup> Barnard and deLahunta, "Intersecting Shapes."
- <sup>49</sup> Liquid Press/i-DAT and the Journal of Performance Research 2005. Choreography and Cognition was "a joint research project initiated by arts researcher Scott deLahunta and choreographer Wayne McGregor to engage practitioners from the field of cognitive science in seeking connections between creativity, choreography and the scientific study of movement and the mind" (Liquid Press/i-DAT and the Journal of Performance Research 2005). More info can be found at [www.choreocog.net](http://www.choreocog.net).
- <sup>50</sup> McGregor and Random Dance, *AtaXia*.
- <sup>51</sup> deLahunta, Clarke, and Barnard, "A Conversation about Choreographic Thinking Tools." Available online at [curve.coventry.ac.uk/open/file/084aa003-3d21-a8f8-9293-ae4c55ed1d8b/1/delahuntaconvcomb.pdf](http://curve.coventry.ac.uk/open/file/084aa003-3d21-a8f8-9293-ae4c55ed1d8b/1/delahuntaconvcomb.pdf).
- <sup>52</sup> Kirsh, "Thinking with the Body," 2865. Available online at [quote.ucsd.edu/cogs1/files/2012/09/reading\\_kirsh.pdf](http://quote.ucsd.edu/cogs1/files/2012/09/reading_kirsh.pdf).
- <sup>53</sup> deLahunta and Barnard 2005, deLahunta, Barnard and McGregor 2009, deLahunta, Clarke and Barnard 2012, Kirsh et al. 2009, Kirsh 2010, Kirsh 2011, Kirsh 2014.
- <sup>54</sup> *In the Dancer's Mind* and May, "In the Dancer's Mind."
- <sup>55</sup> Kirsh, "Thinking with the Body," 2864.
- <sup>56</sup> Affordance is a concept first introduced in James Gibson's (*The Ecological Approach, The Senses Considered*) theory of embodied cognition, which focuses on high-quality, direct perceptual access to the world; this direct perception, in his theory, replaces traditional mental

representations. Affordances are directly perceivable attributes which offer functionality to organisms.

- <sup>57</sup> Kirsh et al., "Choreographic Methods." Available online at [adrenaline.ucsd.edu/kirsh/Articles/Interaction/kirshetal2009.pdf](http://adrenaline.ucsd.edu/kirsh/Articles/Interaction/kirshetal2009.pdf).
- <sup>58</sup> Ibid., 191.
- <sup>59</sup> Muntanyola Saura, "How Multimodality Shapes." Available online at [revintsociologia.revistas.csic.es/index.php/revintsociologia/article/viewFile/598/621](http://revintsociologia.revistas.csic.es/index.php/revintsociologia/article/viewFile/598/621).
- <sup>60</sup> Stevens et al., "Choreographic Cognition."
- <sup>61</sup> Stevens and McKechnie, "Thinking in Action."
- <sup>62</sup> Kirsh et al., "Choreographic Methods," 189.
- <sup>63</sup> Ibid.
- <sup>64</sup> May et al., "Points in Mental Space." Available online at [dro.deakin.edu.au/eserv/DU:30064425/may-pointsinmental-post-2011.pdf](http://dro.deakin.edu.au/eserv/DU:30064425/may-pointsinmental-post-2011.pdf).
- <sup>65</sup> In the Dancer's Mind.
- <sup>66</sup> May, "In the Dancer's Mind."
- <sup>67</sup> May et al., "Points in Mental Space," 429.
- <sup>68</sup> deLahunta and Barnard 2005, deLahunta, Barnard and McGregor 2009. The latter is available online at [dro.deakin.edu.au/eserv/DU:30064142/delahunta-augmenting-2009.pdf](http://dro.deakin.edu.au/eserv/DU:30064142/delahunta-augmenting-2009.pdf).
- <sup>69</sup> Ibid.
- <sup>70</sup> Barnard and deLahunta, "Intersecting Shapes."
- <sup>71</sup> More info can be found on the tools at [waynemcgregor.com/research/choreographic-thinking-tools-mind-and-movement](http://waynemcgregor.com/research/choreographic-thinking-tools-mind-and-movement).
- <sup>72</sup> Eddy, "An Overview of the Science and Somatics of Dance," ISMETA.
- <sup>73</sup> deLahunta, Clarke, and Barnard, "A Conversation about Choreographic Thinking Tools," 248.
- <sup>74</sup> Weber, "Interacting Cognitive Subsystems"; Weber "Somatic Movement"; Weber, *Somatics*.
- <sup>75</sup> Enghauser, "Developing Listening Bodies in the Dance Technique Class." Available online at [ccsesaarts.org/wp-content/uploads/2014/11/DevelopingListeningBodies.pdf](http://ccsesaarts.org/wp-content/uploads/2014/11/DevelopingListeningBodies.pdf).
- <sup>76</sup> Johnson, "Intricate Tactile Sensitivity."



- 77 Snowber, "Visceral Creativity." Available online at [www.academia.edu/29838354/\\_Visceral\\_Creativity\\_Organic\\_Creativity\\_in\\_Teaching\\_Arts\\_Dance\\_Education\\_](http://www.academia.edu/29838354/_Visceral_Creativity_Organic_Creativity_in_Teaching_Arts_Dance_Education_).
- 78 Batson and Wilson 2014, 129; Fortin, Long and Lord 2002, Fortin, Vieira and Tremblay 2009 (Available online at [www.seer.ufrgs.br/Movimento/article/viewFile/10243/27315](http://www.seer.ufrgs.br/Movimento/article/viewFile/10243/27315)), Fortin 1995.
- 79 Fortin, Vieira and Tremblay, "The Experience of Discourses in Dance and Somatics."
- 80 Weber, "Somatic Movement Dance Education."
- 81 In this, I propose a map of cognitive processing, e.g. the flow of information within the Interacting Cognitive Subsystems model, derived from dancers' reporting of their own experience.
- 82 Weber, *Somatics*.
- 83 Weber, "Integrating Semi-Structured Somatic Practices."
- 84 Green, "Choreographing a Postmodern Turn"; Green, "Moving through and Against...Part 1"; Green, "Moving through and Against...Part 2."
- 85 Wachowicz and Stevens, "The Role of Attention," 221.
- 86 Csikszentmihalyi, "Implications of a Systems Perspective for the Study of Creativity," and its offshoots such as Kaufman and Beghetto, "Beyond Big and Little," available online at [www.normanjackson.co.uk/uploads/1/0/8/4/10842717/the-four-c-model-of-creativity.pdf](http://www.normanjackson.co.uk/uploads/1/0/8/4/10842717/the-four-c-model-of-creativity.pdf).
- 87 Amabile, "Social Psychology of Creativity."
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- 89 Weber, "Somatic Movement."
- 90 *In the Dancer's Mind*, May et al., "Points in Mental Space"; May, "In the Dancer's Mind."
- 91 Batson and Wilson 2014, Huddy and Stevens 2014, Kirsh 2011, May et al. 2011, Stevens, Malloch and McKechnie 2001, Stevens et al. 2003, Tweney 2005.
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