



## Unfurling the wings of flight: clarifying 'the what' and 'the why' of mental imagery use in dance

Vicky J. Fisher

To cite this article: Vicky J. Fisher (2017): Unfurling the wings of flight: clarifying 'the what' and 'the why' of mental imagery use in dance, Research in Dance Education, DOI: [10.1080/14647893.2017.1369508](https://doi.org/10.1080/14647893.2017.1369508)

To link to this article: <http://dx.doi.org/10.1080/14647893.2017.1369508>



© 2017 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



Published online: 18 Sep 2017.



Submit your article to this journal [↗](#)



Article views: 250



View related articles [↗](#)



View Crossmark data [↗](#)

# Unfurling the wings of flight: clarifying ‘the what’ and ‘the why’ of mental imagery use in dance

Vicky J. Fisher 

Centre for Language Studies, Radboud University, Nijmegen, The Netherlands

## ABSTRACT

This article provides clarification regarding ‘the what’ and ‘the why’ of mental imagery use in dance. It proposes that mental images are invoked across sensory modalities and often combine internal and external perspectives. The content of images ranges from ‘direct’ body oriented simulations along a continuum employing analogous mapping through ‘semi-direct’ literal similarities to abstract metaphors. The reasons for employing imagery are diverse and often overlapping, affecting physical, affective (psychological) and cognitive domains. This paper argues that when dance uses imagery, it is mapping aspects of the world to the body via analogy. Such mapping informs and changes our understanding of both our bodies and the world. In this way, mental imagery use in dance is fundamentally a process of embodied cognition.

## ARTICLE HISTORY

Received 20 December 2015  
Accepted 16 August 2017

## KEYWORDS

Mental imagery; multimodal; analogy; embodied cognition

## Introduction

Dancers, teachers and choreographers have long made use of mental imagery to inform, inspire and influence movement performance and production. This is sometimes done with clear intent and specific outcomes in mind and, other times, instinctively and without conscious forethought. Within educational settings, connecting the body in motion to the world around us through mental imagery is a powerful phenomenon that warrants deeper exploration.

This paper begins with a discussion of the notion of mental imagery, followed by a review of literature of its use in dance contexts. The main body of the paper provides an analysis of the use of imagery in dance. Based on this analysis, I discuss imagery use in dance as a process of embodied cognition. The paper concludes with some reflections on possible implications of this topic for dance in educational contexts.

Dance and mental imagery are intrinsically linked – words, pictures, memories and ideas can be made corporeal through movement. Conversely, both dancing and observing dance, trigger associations and analogies. Some dance forms explore this interplay more actively than others but the innate connection between movement and thought is inescapable. Whilst the bi-directional relationship between imagery and dance is fundamental, in an attempt to

**CONTACT** Vicky J. Fisher  vicky.fisher@mpi.nl

© 2017 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.  
This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.

maintain clarity, this paper will focus primarily on the direction of ‘image to dance’ and the multitude ways that dancers, teachers and choreographers employ imagery of diverse types.

The overarching aim of this paper is to provide clarification regarding two key aspects of mental imagery use in dance – *the what* and *the why*. The *what*, refers to the types of imagery that are employed, defined by content, sensory modality and perspective. The reasons (*the why*) that imagery is employed in dance are both diverse and extensive, involving physical, affective (psychological) and cognitive domains.

The use of imagery in dance often follows the sequence of stimulus to mental image to action or effect (Figure 1).

Within the context of this paper ‘mental imagery’ refers to the mental simulation of a concept. Simulation is defined by cognitive scientist Lawrence W. Barsalou as ‘the [neuronal] re-enactment of perceptual, motor, and introspective states acquired during experience with the world, body, and mind’ (Barsalou 2008, 618). Antonio Damasio in his highly influential book *Descartes’ Error*, refers to these mental representations as ‘recalled images’ ([1994] 2006, 96) and goes on to argue that neural networks in the brain which are involved in perception of experiences are also activated, at least in part, in imagining experiences across sensory modalities.<sup>1</sup> This theory is supported by a growing body of research in the fields of cognitive neuroscience and psychology (see for example Barsalou 1999, 2008; Brunel et al. 2016, 108–124).

Some mental imagery used by dancers specifically concerns movement that is performed either by oneself or others. This is known as motor imagery. Marc Jeannerod produced a review of research in this field, which focussed on the brain networks that are activated (2001). This reveals that there is considerable overlap between the networks that are involved in covert (imagined) and overt (actualised) actions. He argues that because many of the same sensori-motor brain regions are activated in thinking about and planning action, as they are when action is occurring, such processes are part of the physical act. This mitigates against traditional dualist conceptions of thought being distinct from the body. However, there is a manifest distinction between imagined actions and concepts, and their embodiment (that is, their tangible, visible form).

Whilst bearing in mind what is known about the cognitive processes involved in mental imagery, this paper focusses primarily on the behavioural aspects of imagery use in dance.

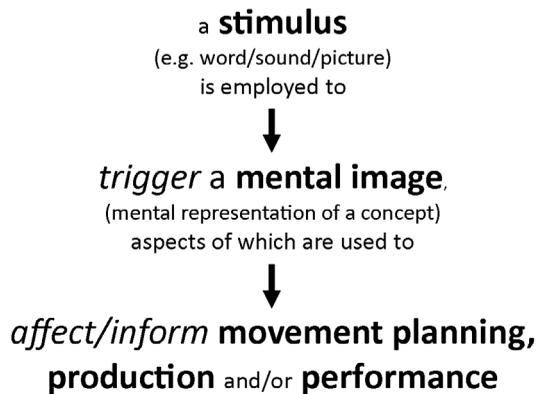


Figure 1. Stimulus-image-effect.

Establishing a clearer picture of the relationships between dance and mental imagery will hopefully help practitioners enrich their practice and provide a strong base for the effective exploration of the phenomenon. This can also provide the foundations for further research into the underlying mechanisms (the *how*) and significances (the *so what?/what next?*).

## Literature review

Research into mental imagery and dance is not new but ‘the what’ and ‘the why’ have been under-defined. Overby and Dunn summarised the history of the field in 2011. In their article they referred to distinctions between image type and intentions but did not expand significantly on the nature of either. Psychologists Nordin and Cumming (2005) carried out qualitative research into dancers’ use of imagery which they used to inform the development of a Dance Imagery Questionnaire (DIQ) (2006). This tool is similar to both the Movement and Sport Imagery Questionnaires (Hall and Martin 1997; Hall et al. 1998) which are used in Sports Psychology.

The DIQ focusses on what the authors refer to as types of images that dancers may engage in. They define this as ‘the content of an image’, as distinct from ‘imagery function (i.e. the role which an image serves)’ (Nordin and Cumming 2006, 87) Despite making this distinction, it can be argued that the questionnaire itself blurs the lines between them because the phrasing used in their prompts often imply goals or intentions, thus implicitly signposting function. This function bias is perhaps most significant in relation to the prompts pertaining to ‘Mastery’ and ‘Goals.’<sup>2</sup> These tend to refer only to what it is hoped will be achieved, such as reaching goals and being ‘psyched up’, giving no clear indication of what is specifically being imagined.

The model that I am proposing attempts to clearly differentiate between image types and image use. The analysis is based on a wide range of examples gleaned from literature pertaining to dance and related somatic practices. Some examples were presented as formalised resources, such as Sweigard’s Human Movement Potential: Its Ideokinetic Facilitation (1974) and the ‘specific’ and ‘totality’ imagery used in Skinner Releasing Technique™ (SRT) (as outlined in Skinner et al. 1979). Some were less formalised illustrations and suggestions, such as in The Franklin Method® (Franklin 1996).<sup>3</sup> Others still, were gleaned from spontaneous utterances observed and employed in teaching and choreographic practices. For example in discussing the making process of ‘Without’, choreographer Rosemary Lee gave examples of the imagery that she shared with the dancers: ‘I worked, as I always do, with the elements so that ... there are air dances, fireworks and explosions. Throwing a dove up into the sky and letting it go was one of their favourites’ (in Hutera 2014).

Written sources were considered alongside informal, personal observation, verbal testimonies and phenomenological (self-reflective) practice. Selected examples are presented in the section: ‘WHY – Roles, goals and functions of image use’ and at other points throughout the text. They are intended as illustrations rather than a comprehensive corpus.

## WHAT imagery types

The ‘what’ of imagery refers to not only image content (i.e. what the image is ‘of’), but also the sensory modalities involved and the perspective from which they are experienced. Questions such as the following may be useful and are discussed in further detail, below:

- *Sensory modalities* – what types of sensations are being imagined? Are they, for example, visual or kinesthetic?<sup>4</sup>
- *Perspective* does the subject perceive the image from an internal or external perspective?
- *Image content* what is the image of – oneself or something ‘other’? If it is of something ‘other’, what aspects are significant?

In mental imagery literature, the term ‘Visualisation’ is sometimes used interchangeably with ‘mental imagery’ but although having a visual picture in the mind is a common technique, much mental imagery takes place across *sensory modalities* (as argued by Iachini 2011 and Damasio 1994, 96), that is, it may consist of a combination of (primarily) visual, tactile and kinesthetic imagined sensations. For example a dancer may ‘see’ (visual) a body part, movement or performance space and feel (proprioceptive/kinesthetic) the body and its movements. An image such as water, is often multimodal – with a dancer seeing, feeling, hearing and even smelling or tasting the stimulus, drawing on varied and selected aspects according to what they are using the image for (see Figure 8, for examples of how such imagery may be used to inform movement).

The idea of *perspective* is also explored in sports based mental imagery literature (see for example Libby and Eibach 2011, 1889). The notion is however, problematic. Sports science research focusses almost exclusively on visualisation, a focus which is echoed in the following definitions presented by Overby and Dunn (2011, 10) in relation to imagery use in dance:

An external image involves imaging from the perspective of outside the body, as if observing oneself on video [or in a mirror]. An internal image involves imaging from the perspective of inside the body, as if observing through one’s own eyes.

This raises the question, regarding the internal perspective, of what it is that one is imaging, is it parts of the body at close quarters or the environment through which the body moves?

With imagery that concerns the felt sense of movement, distinctions in perspective are even harder to apply. Such (motor) imagery is by nature internal, having been directly experienced through one’s own senses. You cannot feel someone or something else’s movement although you can imagine what it feels like, as if you are being or performing it. The adopted sense of the movement of others in which observers ‘can experience physical and imaginative effects of movement without actually moving their bodies’ is known as kinesthetic empathy (Watching Dance: Kinesthetic Empathy, n.d.). This effect may arise from neuronal activation in the motor cortices that occurs when we observe movement of other people or things. These brain regions are known as both the Mirror Neuron System (MNS) and the Action Observation Network (AON) (Bläsing et al. 2012; Christensen and Calvo-Merino 2013).

The fact that many images are experienced across different sensory modalities perhaps renders the question of perspective redundant or even confusing. For example, take a moment to imagine your body moving as though you are surrounded by water. Do you feel as though you are experiencing the image from the inside whilst ‘looking’ out or the outside ‘looking’ in – or a bit of both?

All the images discussed above relate to the dancer’s body and immediate environment but such images form a small subsection of image content. There are two main types of *content* within imagery used in dance, that which refers directly to the body, its movements and (possibly) immediate environment, and that which refers to something ‘other’, aspects of which are applied to the body and its movements (Overby and Dunn 2011, 10).<sup>5</sup> The latter

is often referred to as either ‘indirect’ or ‘metaphorical’ imagery because one form is standing in for another, for example, imagining that the body is a firework or a slithering snake.

‘Direct’ imagery involves the dancer imagining their body performing actions and experiencing the environment *as if* they were actually happening. Direct imagery is highly prevalent in sports practices and has been the focus of many research studies (see for example Murphy 1990; Ross et al. 2003). A common form of Direct imagery is known as *mental rehearsal* and involves creating a mental simulation of a movement, sequence or complete performance, perhaps including the performance space and the audience.

Other Direct images used by dancers focus on anatomy, and are important in somatic practices such as Alexander technique,<sup>6</sup> BodyMind Centering<sup>7</sup>, experiential anatomy,<sup>8</sup> Feldenkrais Method<sup>9</sup>, the Franklin Method<sup>10</sup>, Ideokinesis<sup>11</sup> and Skinner Releasing Technique™.<sup>12</sup> With *anatomical imagery*, the subject imagines the bones, tissues and/or organs of their body, drawing attention to their perceived form and movement potential. Anatomical imagery often combines internally sourced proprioceptive and kinesthetic memories and sensations with external visual and/or tactile cues (such as pictures or 3D skeletons). Thus, anatomical imagery differs from mental rehearsal in that the subject is combining an internal sense of their body with an externally originated image. Such dual imagery, which involves direct mapping between an external entity and the body could be termed ‘semi-direct’.

Augmented anatomical imagery can be seen as one end of a continuum of externally sourced images. The continuum is defined by the way in which the source image maps to the body. When a dancer draws on an image to inform their movement, they are establishing an *analogy*. Analogising involves comparing two or more ‘entities’ by *mapping* their characteristics at multiple levels (Gentner and Smith 2013). In this context, dancers are highlighting or exploring the ways in which the source entity (encapsulated in the image) is like the body or possible movement. The characteristics that are embodied can vary between simple, surface attributes such as shape and size, through relational structures (the ways in which one attribute relates to another), to conceptual organising principles such as ‘Flow’. This hierarchy of *attributes – relational structures – organising principles* is known as the structure-mapping<sup>13</sup> framework, as outlined in Gentner (1983) and Gentner and Smith (2013) and is illustrated in Figures 2 and 3.

The Figure 2 provides an example which maps characteristics of an image to its correlates in movement. A basic analysis of the Franklin Method® image of ‘Central axis is a rocket booster!’ shows a range of shared characteristics between the image and movement, especially at the relation level i.e. the source image and the movement share similar combinations of and interactions between attributes. (Heiland and Rovetti 2013; see Franklin 1996, chapter 11 for further ‘jump’ related images).

Figure 3 is a more abstract version of the framework, which foregrounds the different levels, with reference to descriptors from dance analysis methodology (Action-Space-Dynamics) as presented by Janet Adshead (1988).

Drawing on terminology used in the context of analogies, anatomical imagery provides a ‘literal similarity’ in which the surface attributes are important characteristics. To illustrate the continuum, Figure 4 provides three images that can be used with the intention of increasing awareness of the pelvis and exploring/expanding a dancer’s range of movement.

Image 1 – ‘Skeletal structure’ is a semi-direct, anatomical image, encouraging the dancer to think about the bones of her/his body and ways that the pelvis can move. Image 2 – ‘Bowl

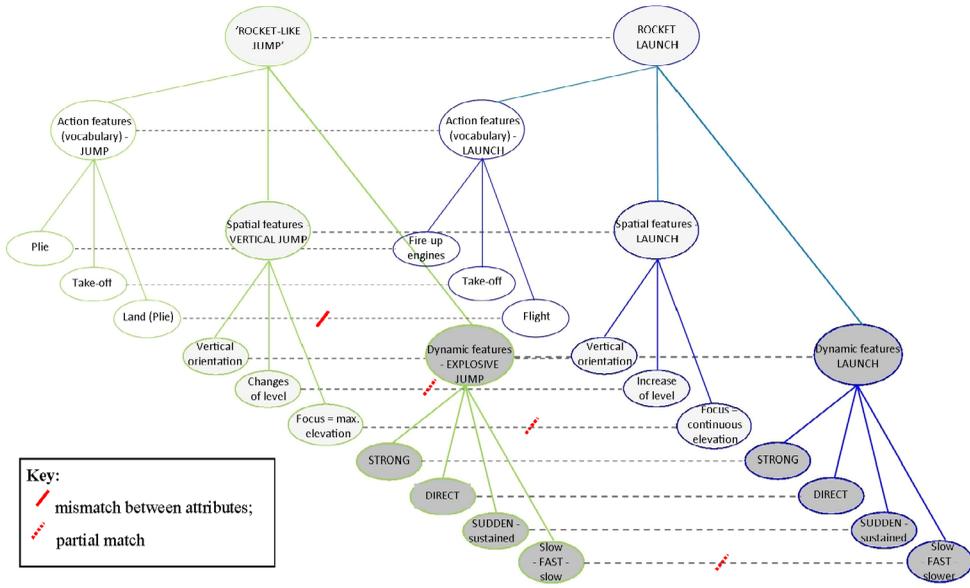


Figure 2. Analogous mapping example 'Rocket booster' image – vertical jump.

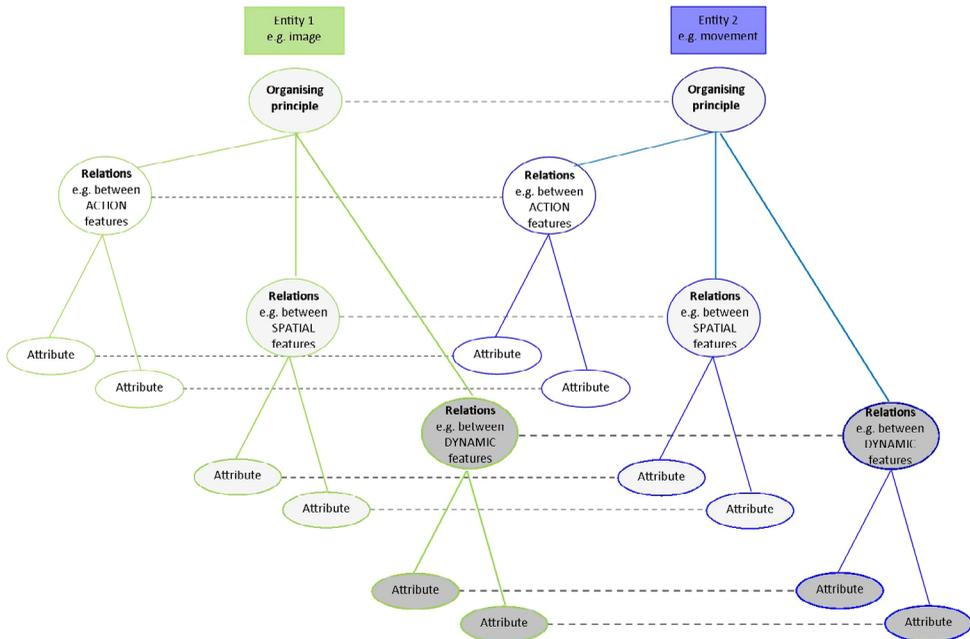


Figure 3. Structure mapping framework, using descriptors from dance analysis.

of the Pelvis' uses close physical mapping, with the source and target sharing size and basic shape but in addition, the role of a bowl as a smooth surfaced container of liquid can be transferred across to the body to inform the movement. Image 3 – 'shoal of fish' is less

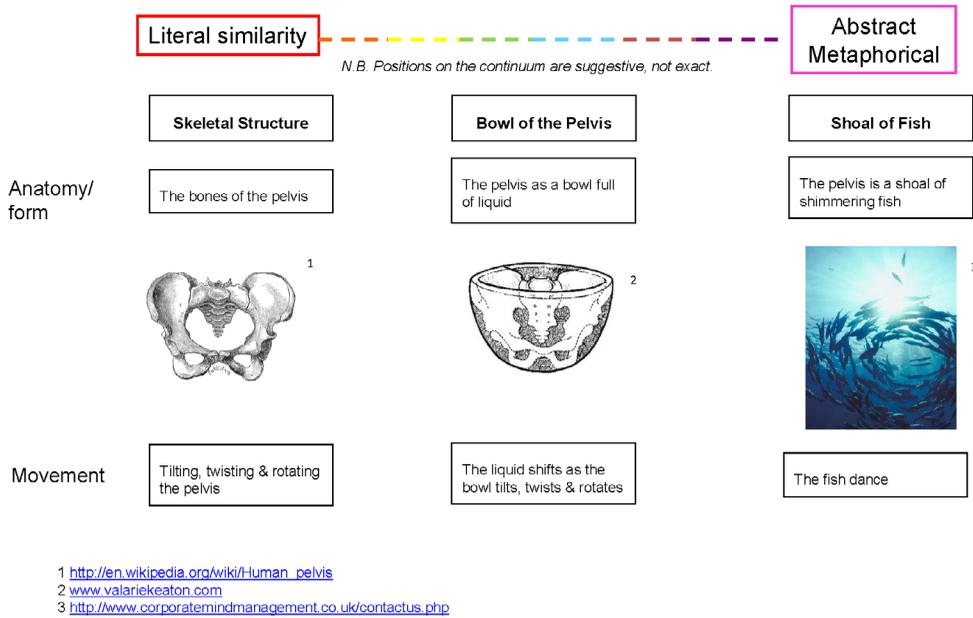


Figure 4. Example images on the analogy continuum. Pelvic Bowl image used with kind permission of Hellerwork.

Image/Analogy Type	Image content	Attributes that are shared with/distinct from pelvis	Key transferable relations
1: SKELETAL STRUCTURE Semi-direct Literal similarity	Bones of the pelvis and their role in supporting & framing the organs	shape, size, structure, material	Support & framing; potential movement range
2: BOWL OF THE PELVIS Semi-direct Mid-similarity & 'relationality'	A smooth sided semi-spherical bowl containing liquid	<del>outline</del> shape, size, <del>structure</del> , <del>material</del>	Finding pathways; works with gravity – ability to pour from one point to another; no sharp movements or instantaneous changes
3: SHIMMERING SHOAL OF FISH Metaphorical Highly relational	A shoal of fish, catching the light as it shifts direction, supported by the ocean	Basic outline shape, <del>size</del> , <del>structure</del> , <del>material</del>	Finding pathways; multidirectional potential; dynamic diversity; supported but unrestricted

Figure 5. Example images – content, attributes and relations.

closely mapped at the superficial attribute level but suggests the potential of finding multi-directional, dynamically varied pathways. These three images and some of their attributes and relations are presented in Figure 5.

As discussed previously, neurologically, a mental image is a partial reactivation of sensori-motor neural networks associated with past experience. Electrical activation occurs in both the brain and muscles, without movement taking place (Jeannerod 2006; Schmidt and Lee quoted in Hamilton 2015). How an image affects movement, that is, what neurological and physiological mechanisms are involved in applying imagery to movement, is beyond

the scope of this paper. However, the following reflections on modality in sensori-motor mapping may be of interest:

- (1) *Direct recall* – of somatosensory experiences that can be directly recalled and represented such as movement of one's own body in water; i.e. physical perception<sup>14</sup> of movement, represented as movement.
- (2) *Copying* – involves re-creating observed actions with adjustments of scale such as a firework shooting into the sky – this example involves spatial copying and the embodiment of dynamic elements such as speed and force; i.e. non-physical (visual) perception of movement, represented as movement.
- (3) *Translation* – involves the translation of characteristics that are perceived in one sensory mode into another using analogous (relational) mapping; examples include the embodiment of colour or musical qualities. Images that are perceived primarily visually are often employed cross-modally i.e. it is not a visual representation that predominates (so that the movement superficially looks like the source image) but some form of embodied translation. For example embodying the image of 'a bright light shining from the center of your chest, illuminating the space like a powerful spotlight' (Franklin 1996, 227) establishes a sense of directional energy. i.e. nonphysical (e.g. visual, emotional/affective) perception of non-movement, represented as movement and/or performance quality.

Before exploring the *why* of imagery, here is a summary of *what* imagery is used in dance:

- Mental imagery engages different *sensory modalities*, often simultaneously.
- Images may flip between or combine internal and external *perspectives*.
- Image *content* exists on a continuum ranging from purely internally sensed, body oriented (direct) to abstract metaphorical;
- The relationship between imagery and dance movement is primarily one of *analogy* in which attributes, relations and organising principles of a gestalt<sup>15</sup> entity are, echoed, reflected or applied to the body and its movements.

## WHY – roles, goals and functions of image use

As noted previously, the following framework regarding the roles, goals and functions of image use in dance is derived from analysis of a wide range and ever growing selection of images from dance literature (both academic and anecdotal) and phenomenology (first person experiences). It is important to recognise, as others have (Nordin and Cumming 2005), that part of the nature of image use is that a single image can have varied and multiple impacts, dependent on the exact framing and context.

An example of the multi-layered impact of imagery arose in a workshop led by the author (2014) in which participants<sup>16</sup> explored the three pelvis images cited above. The 'Shoal of Fish' image, which was the least body-oriented and most metaphorical, was found by many, to have the broadest impact both physically and emotionally. One participant reported that as well as extending the range and quality of her movements, the image produced a profound, spontaneous metaphorical response drawing attention to her need to find release from feeling trapped in her work and life.

It is difficult to select the best overarching terminology related to ‘why’ images are used in dance. Sometimes dancers, teachers or choreographers employ an image with a very specific goal in mind, such as modifying hip alignment in plies; at others the role is more general or instinctive such as helping a dancer to relax and release tension in their movement. The function, benefit or impact of an image may be both multifaceted and have an effect that was not predicted. The terms roles, goals, functions, benefit, impact, use and effect are used interchangeably, as appropriate to the context.

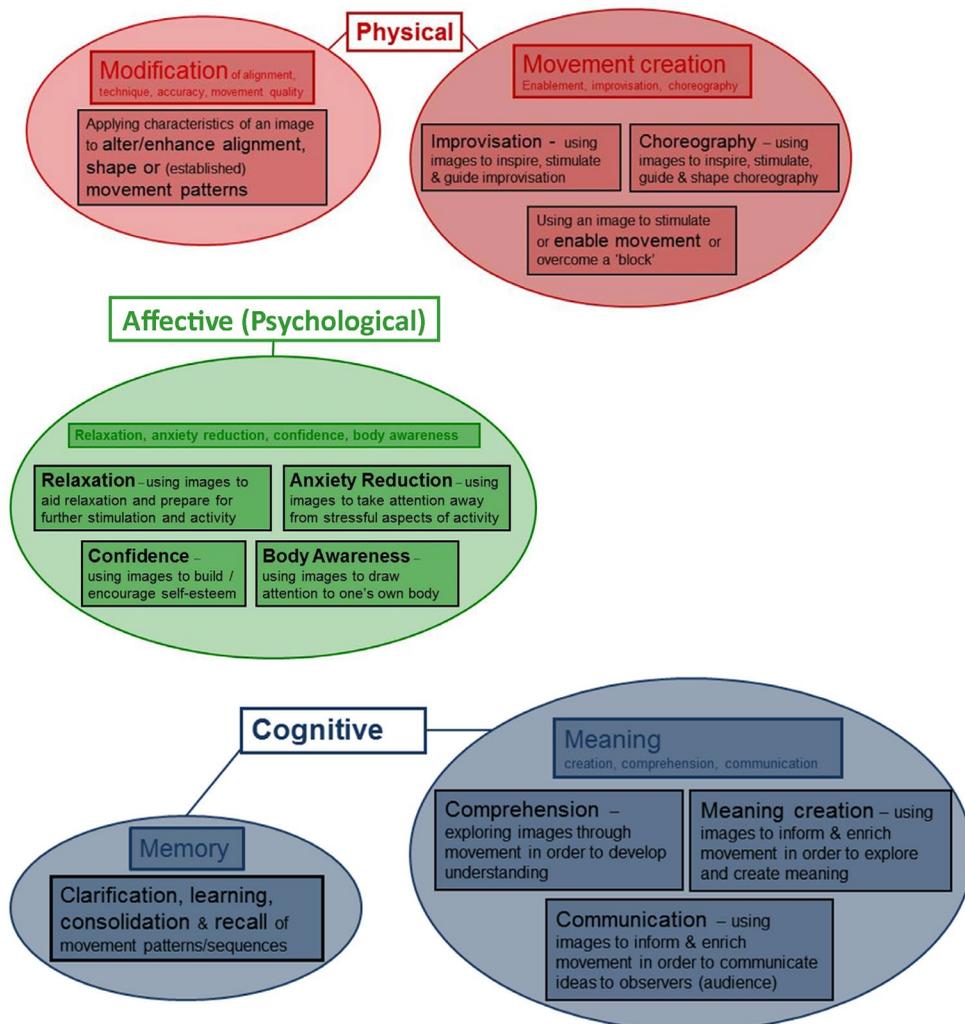
The primary roles of imagery use can be divided across three (overlapping) domains: PHYSICAL, AFFECTIVE (PSYCHOLOGICAL) and COGNITIVE.<sup>17</sup> These labels are used here as follows:

- PHYSICAL – intended to have a direct impact on the body and/or movement.
- AFFECTIVE (PSYCHOLOGICAL) – pertaining to emotions and awareness of the self.
- COGNITIVE – relating to memory and ‘meaning’.

These categories are expanded and illustrated in Figure 6.

These domains can be further expanded as follows, with illustrative examples involving varied and often combined modalities – please note that this is a suggestive rather than a definitive analysis:

- Physical – modification<sup>18</sup> or changes: imagery that specifically helps dancers to alter alignment and movement patterns.
- Alignment – i.e. the relationship between one body part and another. Alignment modification is perhaps the most formally developed use of imagery and is the main focus of many of the somatic practices listed earlier (1): e.g. ‘*Lengthen the spine by imagining a string attached to their heads, gently lifting and elongating*’ (Overby and Dunn 2011, 9) or similarly, to aid the vertical posture required in Argentinian Tango ‘*imagine yourself suspended from a string attached to the top of your skull*’ (Kimmel 2012, 91)
- Technique – i.e. a proscribed or codified pattern of movement that has requirements that are specific to a particular dance style. The use of imagery to assist in technical attainment is becoming more common across dance styles due in part to engagement with somatic practices: e.g. ‘*Central axis is a rocket booster!*’ – an image from the Franklin Method® which was found to be highly effective in improving jump height (Heiland and Rovetti 2013)
- Accuracy similar to technical modification but pertaining to any desired movement pattern. Accuracy is one of the common desired outcomes of mental rehearsal: e.g. ‘*I image performing the most difficult parts in a sequence*’ (Nordin and Cumming 2006, 89, Table 2)
- Movement quality – the use of imagery to affect how a movement is performed, the efforts and qualities involved. Quality oriented imagery is frequently used by teachers and choreographers. It links closely with imagery related to ‘meaning’ and is an aspect of dance practice that distinguishes it from non-aesthetic physical activities: e.g. ‘*Let your spine flow like a river... slither like a snake ... undulate like sea grass*’ – an image from Alexander Technique, employed by dancers (Gilmore 2005, 143)
- Physical – creative: imagery used to inspire and guide the creation of movement



**Figure 6.** Roles, goals and functions of imagery in dance.

- Enablement – this pertains to imagery that is specifically used to overcome a ‘block’. Examples have been cited in the context of neurological conditions such as strokes in which an image like ‘draw a snowman in the air’ is often easier to achieve than following a direct movement instruction like ‘reach towards the ceiling’ (Devlin and Schanche 2011, 32).
- Improvisation – almost any image can be used as a stimulus for improvisation. The focus can be primarily on exploring physical aspects of movement or may be closely linked with meaning making and conceptual understanding (see ‘Cognitive – meaning’): e.g. ‘*imagine oneself tumbling in an environment of moving air ... currents of air are moving the body*’ (Hanrahan and Salmela 1990, 19)
- Choreography – image use for choreography is very similar to improvisation but with the end goal of setting material, it may therefore also involve using imagery to develop and modify movements and ideas: e.g. *as part of the choreography of Red Rain by Anna*

*Smith, a phrase consisting of 'a repeating pattern which appeared to circle back and forth around itself' was devised in response to a text that referred to the cyclical nature of life and the circulatory system (Stevens et al. 2003, 306)*

- Affective (Psychological): imagery used to directly affect (awareness of) how a dancer 'feels' about their body and movements.
- Relaxation – imagery techniques such as those used in meditation are often used by dancers to relax the body and focus the mind both before and after dancing, enabling effective, safe practice and expanded creativity: *e.g. '[I] feel my body getting heavier and imagine that falling into the sand'* (Nordin and Cumming 2005, 403)
- Anxiety reduction – Perhaps as a specific application of relaxation techniques, some dancers employ imagery as a distraction i.e. by focussing on an image, their attention is taken away from concerns about 'getting it right'. This may also be closely linked with imagery use for aiding memory. (Suggested by Cecilia Macfarlane in conversation 14 July 2015): *e.g. When performing the role of Juliet, ballerina Gelsey Kirkland often focused on key lines from the play to take her attention away from the anxiety inducing technical and pragmatic concerns and into embodiment of the character. 'Juliet's voice returned: My only love sprung from my only hate! That line carried me through the curtain.'* (Kirkland and Lawrence 1990, 100)
- Confidence – both mental rehearsal and metaphorical imagery can boost confidence through consolidating memory and understanding of dance material. Targeted confidence boosting imagery as used by athletes, such as *imagining the feelings associated with accurately completing a complex performance*, are also sometimes employed to this end in dance (Hamilton 2015; Nordin and Cumming 2006)
- Body awareness – both anatomical imagery and mental rehearsal in particular, can increase insight into one's own body. This in turn can have a positive impact on relaxation and confidence, in addition to physical effects such as movement modification: *e.g. Body awareness is one of the central concerns of Ideokinesis which is packed full of pertinent images, such as imagining you are an empty suit that requires de-wrinkling. Sweigard provides around twenty suit related imagery exercises to help the dancer mentally release their body. It is important to note that Ideokinesis specifically discourages physical movement, claiming that purely imagined action is more effective.* (Sweigard 1974, 2326)
- Affective (psychological) – Memory: imagery used specifically to aid thought processes related to learning and memory.
- The use of imagery to aid clarification, learning, consolidation and recall of movement patterns/sequences. This often involves labelling movements and phrases thereby providing associations and meaning intentions which are easier to recall than counts or a purely abstract sequence: *e.g. The following description was used to aid accuracy and recall of a squat-stand-jump-kneel sequence for children: 'A flower is in bud. Soon it will open. A butterfly is fluttering. It has an afternoon nap on the flower but it falls from there'* (Sawada, Mori and Ishii quoted in Overby and Dunn 2011, 11)
- Affective (psychological) – Meaning: imagery used specifically to aid thought processes involved in comprehension, creation and communication of meaning.

- Comprehension – The use of imagery by dancers, choreographers, teachers or others, to gain insight into aspects of the world. This may be incidental to other foci or may be the main goal as in the use of dance to teach scientific principles: *e.g. Using dance to 'explore the properties of solids, liquids and gases ... keeping focussed on the meaning-making that underlies the task'* (Thomson 2011, 89)
- Creation – The use of images to develop and structure material, choreographically<sup>19</sup> creating meaning through internal logic and reference to, suggestion of, or association with external entities and ideas (closely linked with the 'physical – creative' domain): *e.g. 'Jules Got Off The Couch' by Stein Fluijt 2015 was inspired and informed by Banksy's Girl with Floating Balloons (Figure 7). In the choreographic process and in the final work, many references were made to expansion/contraction, floating, bouncing, containment etc. creating a work rich in imagery and meaning.*



**Figure 7.** Girl with Balloons by Banksy (photograph Bruce Krasting 2012).

- Communication – using imagery in performance work – this category is simply a shift of perspective, placing attention on the audience or observers: *e.g. During an improvisation workshop using found objects, led by Chris Crickmay, Miranda Tufnell and Eva Karzcg, observers were encouraged to identify images / potential meanings that emerged. The following is an example from the author's own notes:*

S. carried the bundle on her back like a burden, she cradled it in her arms like a child, it hung down from her waist like a skirt, covered her face and hair like a pool of emotional suffocation and was ejected like vomit or a desperate, freeing exhalation.

Whether or not the specific images were consciously intended, the choices that the dancer made combined with the author's cultural and artistic heritage resulted in the communication of these ideas. (Author, Observation notes, Arnhem, May 7, 2014)

These various aspects of imagery use in the 'Cognitive – meaning' domain all involve an exploration of what the ideas embedded in the image are, in physical form. Dancers continuously investigate what it means to stretch, to turn, to fall, to be aware of the sensations in their bodies, in the moment. To apply a metaphorical image, is to gain insight into what the image 'means' in physical terms for example, what does it 'mean', physically to move as if surrounded by water or for the pelvis to open out like a shower curtain on a rail (Sweigard 1974, 239). How does the source image connect to what the body knows about stretching, turning, falling etc. and how can physical exploration of the image extend and change that knowledge?

To illustrate some of these uses of mental imagery, Figure 8 outlines examples of how the image of flowing water can be used in each of the different domains.

It is important to note that although these examples all refer to flow/fluidity, which is only one of the characteristics of water, simply focussing attention on the idea of flow would not yield the same effects. It is the contextualised nature of a high order relational structure within a gestalt that seems to give imagery its power. 'Flowing water' not only entails the 'continuous directional motion of molecules' (as flow could be defined) but there is also for example, viscosity, resistance and support. Our bodies 'know' this even as we may struggle to find the words to describe it.

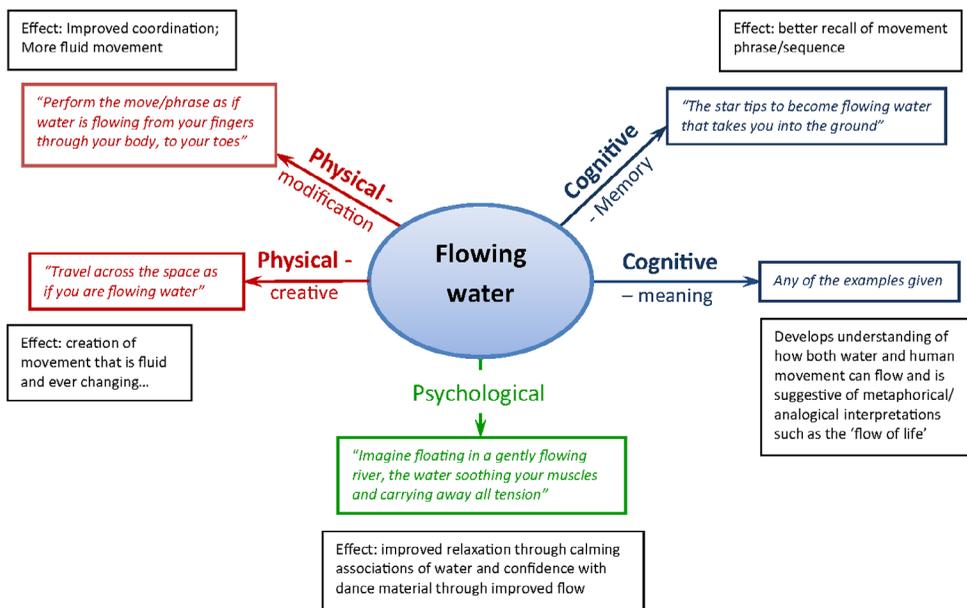


Figure 8. Example of image use across goal domains.

## Mental imagery use in dance as a process of embodied cognition

The argument that the use of mental imagery in dance is primarily one of analogising, places the phenomenon within the framework of embodied cognition. In brief, the embodied cognition paradigm initially put forward by Lakoff and Johnson (1980), proposes that human understanding of the world is initially and primarily established through bodily experiences (see Anderson 2003; Barsalou 2008; Gibbs 2005 and Wilson and Foglia *Forthcoming*, for reviews of the field from a range of perspectives). For example, our concept of containers and containment emerges from our experiences of both our bodies as bounded objects that contain our skeletons and organs and of external containers such as bowls. Each individual's personal concept of containers/containment is built-up from many and varied experiences including sensori-motor (i.e. from sensory input) and cultural components (such as containers being used to protect or transport their contents) (Lakoff and Johnson 1980, 58).

The innate and primarily subconscious ability to form and explore analogies is a key human cognitive function, in which, building understanding of the world through mapping and comparing characteristics between entities and experiences allows us to make essential predictions that inform our behaviour (Bar 2007). Image use in dance, in which cross-modal analogical processes are used to map the perceived world to complex bodily movement, therefore holds significant potential for investigating the role that bodily exploration plays in human cognition and is an example of embodied cognition in action.<sup>20</sup>

Designing valid and robust research methodologies is one of the greatest challenges in this evolving field and can usefully draw on previous studies in other branches of embodiment research. Co-speech gesture research is particularly pertinent as it is also centrally concerned with the role of bodily action in cognition and communication (McNeill 1992).

## Implications for dance education

As stated previously, imagery use already pervades dance culture and is the core business for many dance artists. The aim of the framework of image types and usage put forward in this paper, is to help dancers, teachers and choreographers make more strategic and effective use of imagery. The paper also argues that imagery use in dance, fundamentally involves acts of cognition, which has significant import for the ways that we engage with dance in artistic and educational contexts, and as both a tool and subject for empirical research.

This paper concludes with some reflections on imagery use across different areas of dance education. Although not distinctly focused upon, implications for dance as an art form permeate the text and are closely entwined with those of dance education in all its forms.

## Technical training and excellence

There is a small but growing body of research that supports the claim that application of images, acquired through knowledge of the world, enables dancers to refine their technical and performance skills (for example Bläsing et al. 2012; Hanrahan and Salmela 1990; Heiland and Rovetti 2013). Analogising is so central to human thought that pertinent images often arise instinctively and instantaneously but teachers can also spend time crafting rich and well-fitting analogies and images with specific goals in mind related to performance enhancement (technical and aesthetic), injury prevention and rehabilitation. As mentioned

previously, there are also many formalised training systems such as Ideokinesis and Skinner Releasing Technique, which are rich in imagery and are used to inform the curricula in many dance schools around the world, either as stand-alone courses or embedded in the work of individual teachers.

On-going professional development of teachers is invaluable and organisations such as the International Association for Dance Medicine and Science (IADMS), are involved in research projects and dissemination of information about good practice. Dance Science courses (such as the MSc at Trinity Laban, UK) play an important role in expanding knowledge of the theoretical foundations and developing empirical research. Research models and practices informed by sports psychology, which primarily focus on the visualisation and 'direct' imagery end of the spectrum, could valuably be complemented by investigation of the analogy and structure-mapping model proposed here.

Technical training and excellence are deeply entwined with qualitative and aesthetic features of movement and gestalt imagery excels at enabling this integration. The multimodal, multi-dimensional features of imagery can be exploited to enrich technical and artistic excellence. For example the anatomical image of 'each vertebrae rotating as you curve down the spine' (Nordin and Cumming 2005, 404) can involve visual, proprioceptive and kinesthetic sensory reactivation, affecting alignment and co-ordination with qualitative effects beyond those inherent in a more mechanical, less imagistic instruction such as 'curve your spine forwards'. More metaphorical imagery such as the vertebra being 'shiny pearls on a chain' (Franklin 2012) allows us to draw instantaneously on interwoven characteristics invoked by the image of a shifting, rolling, folding string of pearls.

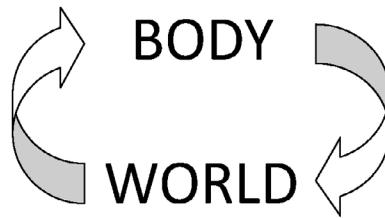
### Education in dance as an art-form

Reflective and analytical skills related to the art-form of dance, can be enhanced by drawing awareness to the images and associations made by students and other artists. Dance is never devoid of meaning to human beings in that we constantly categorise and re-categorise every experience, be that in relation to internal, formalist logic or diverse external contexts. These cognitive acts do not require verbalisation (such as mental narration) and can occur at different levels of abstraction from literal surface similarities to purely formal and abstract organising principles. Knowledge about how analogies function can provide insight into the multi-layered meaning-making inherent in dance.

The following is an example of how the exploration of embodied, analogical mapping has been used to inform choreography (from conversation with dance artist and educator Noa Simons, November 2016). Working from postcards (diverse visual stimuli including abstract art, portrait photographs and propaganda images), a group of young students were given a series of creative tasks to physically explore:

- (1) Instant response – what actions are suggested? What are the dynamic qualities?
- (2) Explore the spatial design (form) – lines, shapes and relationships.
- (3) What emotion/meanings/story are evoked?

In this way, the dancers embodied a range of characteristics and related concepts that were triggered by the stimuli, both developing artistic interpretations and deepening their understanding of the source images.



**Figure 9.** The circular relationship between the Body and the World.

### Education through dance<sup>21</sup>

The way that dance allows individuals to explore aspects of their world through movement, embodying concepts and making sense of them through visceral experience is at the core of imagery use in dance. This concept is not new but has incredible scope. From Maths to Science to Poetry, History and Politics, embodied analogy can help us understand and shape the world in which we live. It can help us in ‘understanding uncertainty through chance’ (Schaffer, Stern, and Kim 2001, 31), get to grips with how the behaviours of substances in different states arise from the changes in bonds between molecules (Thomson 2011), comprehend why ‘grasping’ an idea is more powerful than ‘touching upon’ it (Fisher and Foolen 2016), or experience ‘the way[s] that faith and obsession can both unite and divide the world’ (Mackrell 2004).

An example of this approach is seen in a lesson demonstrating the use of ‘dance and movement to express global issues’ (Charelbois 2012)<sup>22</sup> in which students employ dance tools to explore themes such as racism and bullying and to structure them coherently for in-class performance. One technique used is *bodystorming*, which involves trying to embody the concepts in frozen poses, as a form of physical, improvised brainstorming. What can be seen in the work produced is that students uncover and deepen their understanding of complex interpersonal relationships by distilling them down to essential interactions.

### Conclusion

This article provides an overview of ‘the what’ and ‘the why’ of mental imagery use in dance. It proposes that mental images are invoked across sensory modalities and often combine internal and external perspectives. The content of images ranges from ‘direct’ body oriented simulations along a continuum employing analogous mapping through ‘semi-direct’ literal similarities to abstract metaphors. The reasons for employing imagery are diverse and often overlapping, affecting physical, affective (psychological) and cognitive domains. Imagery is a much used tool across dance practices but it is in fact simply a conduit, a means by which something is transmitted; when dance uses imagery, it is mapping aspects of the world to the body via analogy. Such mapping informs and changes our understanding of both our bodies and the world, in this way, mental imagery use in dance is fundamentally a process of embodied cognition.

Imagery use in dance reveals a circular process in which our conceptualisation of the world around us informs our bodies which in turn alters and expands our understanding of the world. This circular relationship is illustrated in Figure 9.

Hofstadter and Sander claim that categorisation and ‘analogy [are] the core of cognition’ (2013, prologue). Developing understanding of the physical analogising that occurs in dance will provide valuable insight into the body’s role in how we think.

## Notes

1. ‘Sensory modalities’ refers to the different senses through which we perceive information from our bodies and the world around us. Sensations are perceived through complex networks of neurons involving receptors in the sense organs, including eyes, skin, muscles and joints. These send messages to the primary sensory cortices, which link to the association cortices for further processing such as integrating input from different senses, identifying significance and planning behavioural responses (Purves et al. 2001). Mental imagery involves the re-activation of neurons within these networks.

There is a great deal of variation across different disciplines, regarding what constitutes a sense and different ways of referring to them. Key terminology includes: The ‘traditional’ five senses of vision/sight, audition/hearing, gustation/taste, olfaction/smell and touch. This latter sense is multifaceted and includes awareness of heat, pressure and pain. *Somatosensation* (body sensation), is a broad term covering a range of senses that provide feedback about our bodies and movement. These include: *proprioception* – the internal awareness of the body and movement (Batson 2008; Proske and Gandevia 2016); *kinesthesia* – internal awareness of movement from ‘kinein’ – to move and ‘aesthesia’ – to perceive (through the senses). Proprioception and Kinesthesia are sometimes conflated, with one used to include the other – in both directions. Other relevant terms include: *haptic* sense – (to be able to) touch or grasp; *equilibrioception* – balance; *interoception* – the internal awareness of sensations used primarily to refer to one’s own physiological and emotional state (Craig 2003; Seth 2013).

2. The DIQ divides image types into four categories: ‘Technique’, ‘Mastery’, ‘Goals’, ‘Role and movement quality’.
3. Formalised exercises and guiding suggestions can be viewed as lying along a continuum, with their degree of conventionality being in part dependent on how they are presented.
4. The selected spelling of ‘Kinesthetic’ pertains clearly to the felt sense of movement (‘kines’) without reference to ‘aesthetics’ – ‘concerned with beauty or the appreciation of beauty’ (oxforddictionaries.com retrieved 24 November 2016) as can be implied by the alternative spelling (Kinaesthetic).
5. Overby and Dunn also refer specifically to *contextual* and *character imagery*, both are predominantly forms of Direct imagery in that one imagines the environment or character as they are or hoped to be.
6. For further information see: <https://www.alexandertechnique.com/at.htm>
7. See: <http://www.bodymindcentering.com/>.
8. See Olsen [1991] 2004.
9. See; <https://www.feldenkraisinstitute.org/> and Feldenkrais 2010.
10. See: [www.franklinmethod.com](http://www.franklinmethod.com) and Franklin 1996.
11. See: [www.ideokinesis.com/](http://www.ideokinesis.com/) and Sweigard 1974
12. See: <https://www.skinnerreleasing.com/> and Skinner et al. 1979
13. This term is sometimes written as ‘structure mapping’ within the literature. The structure-mapping paradigm has also been applied to analysis of *iconicity* in gestures (Emmorey 2014). Iconicity is the similarity between a sign and the act, object or concept to which it refers and is therefore of interest to dance and the themes discussed in this paper.
14. Physical perception denotes sensory input through touch, proprioception and/or kinesthesia.
15. A gestalt is an entity perceived of as a whole rather than a collection of parts and is a reflection of the way humans tend to perceive the world.
16. This free workshop was open to all staff at the MPI and other contacts who had expressed an interest in Dance and Mental Imagery. The thirteen participants were a mix of male and

female administrators and researchers in linguistics and associated fields aged between early 20s and mid-60s. Notes were taken by the author.

17. Health benefits have been identified (Nordin and Cumming 2005) as being a distinct focus of imagery use in dance, however, these appear to arise from shifts in one or more of the first level domains identified here. For example, a reduction in pain can result from both shifts in alignment and general relaxation. Imagery can be employed to directly reduce pain such as through meditation but such techniques though used by some dancers, are distinct from dance specific practices.
18. The term 'modification' can be seen as having a 'corrective' intent. However, most definitions refer primarily to change or adaptation, without associated value judgements. This is the spirit in which the term is used here although there are certainly instances of imagery use in dance, in which 'improvement' is intended especially in relation to alignment and technique. In other instances, especially in relation to movement quality, it is more often the case of 'what if' i.e. exploring possibilities.
19. 'Choreographically' is used here in its broadest sense and includes the instantaneous meaning making that can occur during improvisation.
20. Other forms of embodied cognition or 'thinking in movement' that are evident in Dance practices include 'marking' (Kirsch 2011) and 'improvisation' (Sheets-Johnstone 2009, chapter II). Additionally, Giguere (2011) has identified a range of cognitive strategies employed by children during the process of group choreography, such as paying attention to structure and meaning. These paradigms explore ways in which cognitive acts such as problem solving and decision-making can occur within movement activities.
21. 'Education through dance' is used here to denote the use of dance practices and methodologies, to enable learning in diverse areas of the curriculum.
22. The session is part of Canada's Learning Through the Arts<sup>®</sup> (LTTA), a 'transformative educational program that uses arts-based activities to teach the core curriculum by providing teachers with creative tools to engage all students in math, science, language arts, social studies, and more' (The Royal Conservatory, n.d.).

## Acknowledgements

The author has received support from many people during the process of researching and writing this paper. In particular, she would like to thank Liesbeth Wildschut and the Multimodal Language and Cognition group for invaluable insights, and Ad Foolen for generously sharing his knowledge of linguistics and cognitive psychology and providing nurturing guidance. Special thanks are also given to dance artist, teacher and community practitioner, Cecilia Macfarlane for astute and invaluable feedback on the draft manuscript.

## Disclosure statement

No potential conflict of interest was reported by the author.

## Notes on contributor

*Vicky Fisher* (MA, PGCE) is a dancer, researcher and participatory dance practitioner based in the Netherlands. Originally from the UK, she was a founder member of both CandoCo and Crossover Intergenerational Dance Companies and taught dance theory and practice in Further Education colleges for 15 years. She is an affiliated researcher with the Multimodal Language and Cognition Group based at the Max Planck Institute for Psycholinguistics and the Centre for Language Studies, Radboud University in Nijmegen. Her research investigates dance as a form of embodied analogy using approaches from cognitive linguistics and psychology combined with post-modern dance practices.

## ORCID

Vicky J. Fisher  <http://orcid.org/0000-0002-6607-6417>

## References

- Adshead, Janet, ed. 1988. *Dance Analysis: Theory and Practice*. Hampshire: Dance Books.
- Anderson, Michael L. 2003. "Embodied Cognition: A Field Guide." *Artificial Intelligence* 149: 91–130.
- Bar, Moshe. 2007. "The Proactive Brain: Using Analogies and Associations to Generate Predictions." *TRENDS in Cognitive Science* 11 (7): 280–289. doi:10.1016/j.tics.2007.05.005.
- Barsalou, Lawrence. 1999. "Perceptual Motor Systems." *Behavioural Brain Science* 22: 577–660.
- Barsalou, Lawrence. 2008. "Grounded Cognition." *Annual Review of Psychology* 59: 617–645.
- Batson, Glenna. 2008. *Proprioception*. Ipswich: International Association for Dance Medicine and Science.
- Bläsing, Bettina, Beatriz Calvo-Merino, Emily S. Cross, Corinne Jola, Juliane Honisch, and Catherine J. Stevens. 2012. "Neurocognitive Control in Dance Perception and Performance." *Acta Psychologica* 139: 300–308. doi:10.1016/j.actpsy.2011.12.005.
- Brunel, Lionel, Guillaume T. Vallet, Benoit Riou, Amandine Rey, and Rémy Versace. 2016. "Grounded conceptual knowledge: Emergence from sensorimotor interactions." In *Conceptual and Interactive Embodiment: Foundations of Embodied Cognition Volume 2*, edited by Martin H. Fischer, and Yann Coello, 108–124. Abingdon: Routledge.
- Charelbois, Brooke. 2012. "Creative Movement to Express Global Issues." *The Teaching Channel*. California Public Benefit Corporation. Accessed March 17, 2017. <https://www.teachingchannel.org/videos/teaching-elementary-dance>
- Christensen, Julia F., and Beatriz Calvo-Merino. 2013. "Dance as a Subject for Empirical Aesthetics." *Psychology of Aesthetics, Creativity, and the Arts* 7 (1): 76–88. doi:10.1037/a0031827.
- Craig, A. D. 2003. "Interoception: The Sense of the Physiological Condition of the Body." *Current Opinion in Neurobiology* 13 (4): 500–505. doi:10.1016/S0959-4388(03)00090.
- Damasio, Antonio. [1994] 2006. *Descartes's Error: Emotion, Reason and the Human Brain*. London: Vintage Books.
- Devlin, J., and C. Schanche. 2011. "Moments of Breath and Hand Jive." *Animated: The Community Dance Magazine*. Autumn: 29–32.
- Emmorey, K. 2014. "Iconicity as Structure Mapping." *Philosophical Transaction of the Royal Society B* 369: 20130301. doi:10.1098/rstb.2013.0301.
- Feldenkrais, Moshe. 2010. *Embodied Wisdom: The Collected Papers of Moshé Feldenkrais*. Edited by Elizabeth Beringer. Berkeley, CA: North Atlantic Books.
- Fisher, V. J., and A. Foolen. 2016. "Hold That Thought: The Role of Proprioceptive Experience in Perception Metaphors." *Perception Metaphor Workshop*. Nijmegen: Max Planck Institute for Psycholinguistics.
- Franklin, Eric. 1996. *Dance Imagery for Technique and Performance*. Champaign, IL: Human Kinetics.
- Franklin, Eric. 2012. "Roll Down." blog post. *Franklinmethod.Com*. Accessed March 13, 2017. <https://franklinmethod.com/latest-news/roll-down>
- Gentner, Dedre. 1983. "Structure-Mapping: A Theoretical Framework for Analogy." *Cognitive Science* 7: 155–170.
- Gentner, D., and L.A. Smith. 2013. "Analogical Learning and Reasoning." In *The Oxford Handbook of Cognitive Psychology*, edited by Daniel Reisberg. New York: Oxford University Press. Oxford Handbooks Online. doi:10.1093/oxfordhb/9780195376746.013.0042.
- Gibbs, Jr, Raymond W. 2005. *Embodiment and Cognitive Science*. Cambridge: Cambridge University Press.
- Giguere, Miriam. 2011. "Dancing Thoughts: An Examination of Children's Cognition and Creative Process in Dance." *Research in Dance Education* 12 (1): 5–28. doi:10.1080/14647893.2011.554975.
- Gilmore, R. 2005. "Decoding Dancerspeak: Practical Language and Body Mapping for Dancers." In *The Congress Papers: Exploring the Principles 7th International Congress of the F.M. Alexander Technique*, 16–22 August 2004. London: Stat Books.

- Hall, Craig R., and Kathleen A. Martin. 1997. "Measuring Movement Imagery Abilities: A Revision of the Movement Imagery Questionnaire." *Journal of Mental Imagery* 21 (1–2): 143–154.
- Hall, C. R., D. E. Mack, A. Paivio, and H. A. Hausenblas. 1998. "Imagery Use by Athletes: Development of the Sport Imagery Questionnaire." *International Journal of Sport Psychology* 29: 73–89.
- Hamilton, A. 2015. "Sports Psychology: Mental Imagery Can Improve Sports Performance." *Sports Performance Bulletin*. Accessed February 2. <https://www.pponline.co.uk/encyc/sports-psychology-mental-imagery-can-improve-sports-performance-41180>
- Hanrahan, Christine, and John H. Salmela. 1990. "Dance Images: Do They Work or Are We Just Imagining Things?" *Journal of Physical Education, Recreation and Dance* 61 (2): 18–21.
- Heiland, Teresa, and Robert Rovetti. 2013. "Examining the Effects of Franklin Method Metaphorical and Anatomical Mental Images on College Dancer's Jumping Height." *Research in Dance Education* 14 (2): 141–161. Accessed November 13, 2013. doi:10.1080/14647893.2012.712105
- Hofstadter, Douglas, and Emmanuel Sander. 2013. *Surfaces and Essences: Analogy as the Fuel and Fire of Thinking*. New York: Basic Books.
- Hutera, D. 2014. "A Gift to a City." *Animated*. Leicester: Foundation for Community Dance. Winter.
- Iachini, Tina. 2011. "Mental Imagery and Embodied Cognition: A Multimodal Approach." *Journal of Mental Imagery* 35 (3&4): 1–28.
- Jeannerod, Marc. 2001. "Neural Simulation of Action: A Unifying Mechanism for Motor Cognition." *NeuroImage* 14: S103–S109. doi:10.1006/nimg.2001.0832.
- Jeannerod, Marc. 2006. *Motor Cognition: What Actions Tell the Self*. Oxford: Oxford University Press.
- Kimmel, Michael. 2012. "Intersubjectivity at Close Quarters: How Dancers of Tango Argentino Use Imagery for Interaction and Improvisation." *Journal of Cognitive Semiotics* IV (1): 76–124.
- Kirkland, Gelsey, and Greg Lawrence. 1990. *The Shape of Love*. London: Penguin Books.
- Kirsch, David. 2011. "How Marking in Dance Constitutes Thinking with the Body." *Versus: Quaderni Di Studi Semiotici* 113–115: 179–210. Milan: Bompiani.
- Krasting, Bruce. 2012. "banksy-graffiti-street-art-palestine-girl-balloon." flickr. [https://www.flickr.com/photos/bruce\\_krasting/6857656826](https://www.flickr.com/photos/bruce_krasting/6857656826)
- Lakoff, George, and Mark Johnson. [1980] 2003. *Metaphors We Live by*. Chicago: University of Chicago Press.
- Libby, Lisa K., and Richard P. Eibach. 2011. "Visual Perspective in Mental Imagery: A Representational Tool That Functions in Judgment, Emotion, and Self-Insight." *Advances in Experimental Social Psychology* 44: 185–245. Accessed November 18, 2015. doi:10.1016/B978-0-12-385522-0.00004-4
- Mackrell, Judith. 2004. "The Power to Provoke." *The Guardian* (online). June 5. Accessed December 5, 2016.
- McNeill, David. 1992. *Hand and Mind: What Gestures Reveal about Thought*. Chicago, IL: University of Chicago Press.
- Murphy, Shane M. 1990. "Models of Imagery in Sport Psychology: A Review." *Journal of Mental Imagery* 14 (3–4): 153–172.
- Nordin, Sanna M., and Jennifer Cumming. 2005. "Professional Dancers Describe Their Imagery: Where, When, What, Why, and How." *The Sport Psychologist* 19: 395–416.
- Nordin, Sanna M., and Jennifer Cumming. 2006. "Measuring the Content of Dancers' Images: Development of the Dance Imagery Questionnaire (DIQ)." *Journal of Dance Medicine and Science* 10 (3&4): 85–98.
- Olsen, Andrea. [1991] 2004. *Body Stories – A Guide to Experiential Anatomy*. Lebanon, NH: University Press of New England.
- Overby, Lynette Young, and Jan Dunn. 2011. "The History and Research of Dance Imagery: Implications for Teachers." *International Association for Dance Medicine and Science Bulletin for Teachers* 3 (2): 9–11.
- Proske, Uwe, and Simon Gandevia. 2016. "Proprioception: The Sense within." *The Scientist*. <https://www.the-scientist.com/?articles.view/articleNo/46796/title/Proprioception-The-Sense-Within/>.
- Purves, D., G. J. Augustine, D. Fitzpatrick, et al., eds. 2001. *Neuroscience*. 2nd ed. Sunderland, MA: Sinauer Associates.

- Ross, Jeffrey S., Jean Tkach, Paul M. Ruggieri, Michael Lieber, and Eric Lapresto. 2003. "The Mind's Eye: Functional MR Imaging Evaluation of Golf Motor Imagery." *American Journal of Neuroradiology* 24: 1036–1044.
- Schaffer, Karl, Erik Stern, and Scott Kim. 2001. *Math Dance with Dr. Schaffer and Mr. Stern*. Self Published/Lulu.com.
- Seth, Anil K. 2013. "Interceptive Inference, Emotion, and the Embodied Self." *Trends in Cognitive Sciences* 17 (11): 565–573.
- Sheets-Johnstone, Maxine. 2009. *The Corporeal Turn: An Interdisciplinary Reader*. Exeter: Imprint Academic.
- Skinner, Joan, Bridget Davis, Sally Metcalf, and Kris Wheeler. 1979. "Notes on the Skinner Releasing Technique." *Contact Quarterly* V.1 Fall: 9–13.
- Stevens, Catherine, Stephen Malloch, Shirley McKechnie, and Nicole Steven. 2003. "Choreographic Cognition: The Time-course and Phenomenology of Creating a Dance." *Pragmatics and Cognition* 11 (2): 197–326.
- Sweigard, Lulu. 1974. *Human Movement Potential: Its Ideokinetic Facilitation*. New York: Dodd, Mead and Co.
- The Royal Conservatory. n.d. "Learning through the Arts." Toronto: The Royal Conservatory of Music, Telus Centre for Performance and Learning. Accessed March 17, 2017. <https://learning.rcmusic.ca/learning-through-arts/about-learning-through-arts>
- Thomson, Chris. 2011. "LearnPhysical Interactive: Nurturing 'Dancing Thinkers' in Primary Schools." *Dance UK News*. Spring: 8–9.
- Watching Dance: Kinesthetic Empathy. n.d. University of Manchester. Accessed December 2, 2016. [https://www.watchingdance.org/about\\_us/](https://www.watchingdance.org/about_us/)
- Wilson, Robert A., and Lucia Foglia. Forthcoming. "Embodied Cognition." *The Stanford Encyclopedia of Philosophy* (Winter 2016 Edition), edited by Edward N. Zalta. <https://plato.stanford.edu/archives/win2016/entries/embodied-cognition/>.