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Embodied Cognition in Dance and Choreography

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Abstract

Humans are generally equipped with a capacity for cognitive function at birth, meaning that each person is capable of learning or remembering a certain amount of information. This paper, therefore, joins in the growing discussion on the mental process involved in the creation, learning and execution of dance movements. This process is referred to as the cognitive process which borders on the basic phenomena of cognition: perception, attention, memory and imagination. This interdisciplinary research establishes the place of psychology in dance scholarship.

Introduction

Dance as an art of the theatre cannot be adequately defined, based on the differing perspectives from which individuals and groups see it. Dance means different things to different people, and that largely depends on the purpose for which it is being done. Sociologists, philosophers, archaeologists, therapists all see it based on their professional biases.

Dance can easily be defined as the movement of the body in time and space in relation to music, heard or unheard, to communicate an emotion, idea, or tell a story. It goes beyond this, of course. As a matter of fact, dance expresses some locked-in desires, ideas and hopes. However, in sport kinesiology, a discipline that relies heavily on movements just like dance, it is likely to be seen as a form of exercise that helps in keeping the body in shape. Dance is the creation of a metaphor in movement that communicates to an audience in the very language the audience understands. The dance art, outside its entertainment function, seeks to communicate. The choreographer creates semiotics that communicates between: the dancers and the audience, the dancer and fellow dancers, the dancers and the

choreographer, the dancer and the immediate community – a metaphoric negotiation. In Ivar Hagendoorn's opinion,

> ...dance as metaphor may highlight the fact that dance employs gesture to express and communicate intention and emotion. People gesture when they speak, raise their fists in anger, shrug their shoulders in doubt, frown upon a question, jump with joy and use elaborate body movements to make themselves clear when misunderstood. As a whole, these gestures are sometimes referred to as body language and we may then subsume dance under this more general notion, except, of course, that the term body language is itself a metaphor in need of explanation (2010:221).

Every movement, like punctuation mark in written language, has its function and extensively its meaning(s): Some movements are for emphasis, others as conjunctions or cues for the movements to come. No matter how abstract a dance piece may be, it is meant to say something other than what can be easily perceived. Dance in its non-verbal form always seeks to communicate, concretise and make real the abstract and the ephemeral.

Stevens *et al* give a more concise, but thought-provoking opinion, by describing dance as "a form of artistic communication that becomes itself through experimentation of itself" (2003:299). This connotes that meanings and interpretations of dance pieces and performances, cannot be entirely exhaustive so much so that an analysis gives rise to other inherent meanings and questions based on the experiential judgments of the analyst/critic. Furthermore, dance can only be referred to as dance by its being done and that it is in its doing that its meanings and interpretative forms can be discovered and established. Dance is a 'gestural art' based on its means of communication. Kraus, citing Arbeau in *Orchesography*, says that "dancing... is to jump, hop, to prance, to sway, to tread, to tip-toe and to move the feet, hands and body in certain rhythms, measure and movements consisting of jumps, bending of the body, straddling, limping, bending of the knees,

rising on tip-toe, throwing-forward of the feet, changes and other movements" (1991: 12). The degree and manner by which these actions are carried out suggest to an observer the cultural gestural configurations of a society which in essence suggests that cultural peculiarities of a people are easily traceable through their dances.

Dance is a non-verbal art that communicates through the use of bodily images to transpose its meaning and intent to an audience. Judith L. Hanna is of the opinion that "dance is a whole complex of communication symbols, a vehicle for conceptualisation. It may be a paralanguage, a semiotic system, like articulate speech, made up of signifiers that refer to things other than themselves" (1983:3). These body languages can be referred to as gestures. Gestures, in reference to dance, signify that the art in discussion can only communicate through the extensive use of the body to create a language that can be understood. Hanna further says that "obviously, dance may not communicate in the same way to everyone. Within a culture, differential understanding of symbols may be based on, and sometimes be exclusive to, the dancer's age, sex, association, political status, groups and so on" (1983:3). This emphasises the fact that how gestures are perceived depends on the factors mentioned above and in the circumstances they occur.

When a dance performance is experienced by an audience, certain questions may readily come to the critical minds of some members of the audience: How were the dance movements created? How have the dancers been able to recall the so many dance sequences and prompts? How long did the dancers practice to attain such perfection as being displayed? What prompted the choreographer to have created such beautiful movements? For some, the questions remain unanswered for a very long time but, ultimately, whatever the audience may have witnessed is as a result of some thought, commitment and/or a desire for expression.

All of human activities are hinged on the need to satisfy a desire and achieve a goal, irrespective of race, orientation or profession. Some of the movements carried out are on impulse, while some are accustomed practices over time. In the case of

dance it comes in two ways: it is either based on observation of established cultural knowledge, which is usually an activity that is learnt through the continuous act of being part of a society, or an organised form of learning which is usually subjective to the thoughts and ideas of an artistic leader known as the choreographer. Learning, as it has been emphasised, depends on the ability to imagine, perceive, memorise and recreate. A dancer who intends to perfectly replicate a given movement, one way or the other, employs the above-mentioned cognition for proper execution. The way a movement is perceived is the exact way the brain processes the information and works it through. The body may be a tool in carrying out dance movements; however, the bulk of the work is done by the brain. The brain processes what is seen, and alerts the body according to how it has been able to decode the movements. Recent scientific research by Steven Brown and Lawrence M. Parsons describe the basic activities by which the brain decodes and executes dance movements.

> In a simplified version, a region called the posterior parietal cortex (toward the back of the brain) translates visual information into motor commands, sending signals forward to motion-planning areas in the pre-motor cortex and supplementary motor area. These instructions then project to the primary motor cortex, which generates neural impulses that travel to the spinal cord and on to the muscles to make them contract. At the same time, sensory organs in the muscles provide feedback to the brain, giving the body's exact orientation in space via nerves that pass through the spinal cord to the cerebral cortex. Subcortical circuits in the cerebellum at the back of the brain and in the basal ganglia at the brain's core also help to update motor commands based on sensory feedback, and to refine our actual motions (2008:79).

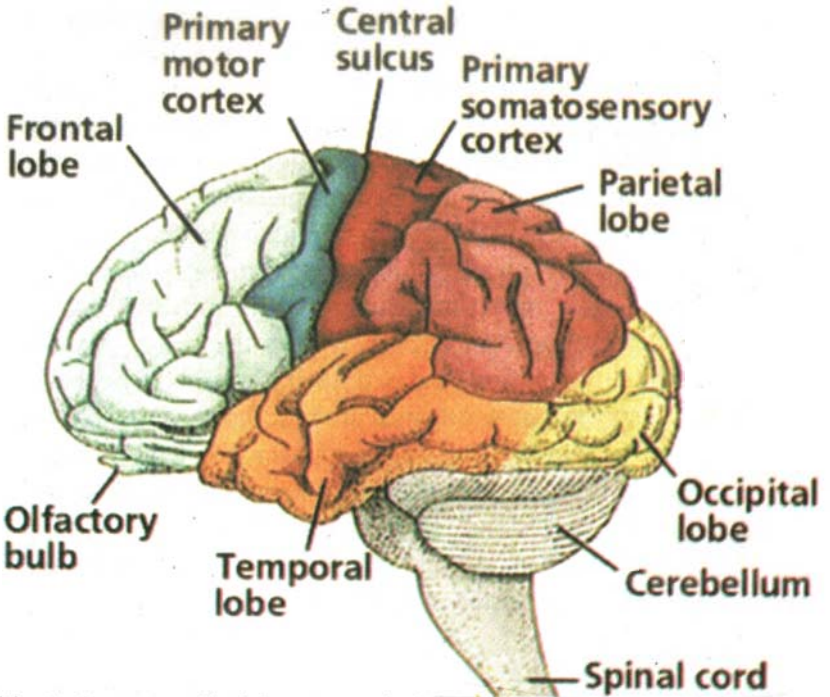

Fig 1. Image culled from www.uic.edu

Basically, the major tool in narrating a story in a dance performance is the body of the dancer through the actions, gestures, use of space and the dynamics involved in carrying out the dance movements. There is an artist who is behind these creations known as the choreographer. Therefore, choreography is the art of creating or making danceable movements that are interpretive and appealing to sight. It is, according to Burrows (2010), a negotiation with the patterns your body is thinking. Choreography requires that the choreographer creates movements and images that can easily communicate an intention to a viewer. It is important for a choreographer to understand the details about the society or idea that is being presented, because the work will be the root for knowledge and material for further research. Baston and Wilson state that dance creation demands a deep immersion into

the system's complexity as researchers strive to capture and describe its dynamic process (2014:16).

In creating dances, the choreographer is merely satisfying a yearning within him, a search for an artistic satisfaction that is some of the time fantastic. Philosopher E. Trias, cited by Fiorini, asserts that the creative psyche, the drive to create, is hinged on certain modes. The modes, he says, are "(1) what one wishes to be; (2) what one has to be; (3) what one is; and (4) what one can be."(1995:11). These, naturally, are the core of human existence. This suggests that in the creation of dance movements, the choreographer relies heavily on the experience he has amassed over time to be able to create movements that will communicate exactly what is intended. Experience in this sense is based on fantasy or desire – what one wishes to be; artistic/societal expectation – what one has to be; status – what one is; and possibilities – what one can be. The process of thinking through what is to be created and how to recreate can be simply referred to as the cognitive process.

Concepts and Theories of cognition

Cognitive psychology is the study of knowledge representation and use in human beings. Cognitive function refers to a person's ability to process thoughts. Cognition primarily refers to phenomena like memory: the ability to learn new information, speech, and reading comprehension. It is concerned with understanding of how people represent, process, and store information. According to Ulric Neisser, "cognitive psychology refers to the processes whereby the sensory input is transformed, reduced, elaborated, stored, recovered and used" (1967:15). However, Thinus-Blanc and Gaunet are of the position that cognition "is a dynamic process of knowing" (1999: 294). The above assertions explain the meaning of cognition from different perspectives, but all pointing to the fact that cognition is a mental process of acquiring, storing and processing information. Bearing these assertions in mind, some of the phenomenological factors which are imagination, perception, memory and recreation factors in cognition will be considered in

the course of this work. Imitation requires attention, observation and perception. For instance, when students are learning how to spin, they first pay attention to people doing it. Next, they try to do one spin, and might lose balance. Later, after practice, they can do two or three spins, and after they have developed these skills they should be able to do three or four spins to the timing of music. Humans learn through different processes but, importantly, most of it comes from an understanding of the environment they live in. They observe their surroundings to be able to get clues and cues to the kind of lifestyle expected of them. In most healthy individuals, the brain is capable of learning new skills especially in early childhood, and of developing personal and individual thoughts about the world. This is so because, as Batson and Wilson opine, "cognition results from experience – from dynamic worldly engagement and interaction. The brain needs a world to make thoughts. Dance making is a particular kind of worldly engagement" (2014: xiii). As can be rightly said, a man is a product of his society within which he may find himself whether as a dancer or a choreographer. His training, experiences, and observation are the factors that contribute to his creative abilities.

This highlights the fact that the environment of an artist, especially a choreographer, has a huge influence on the dances he creates. This environment is not particularly the immediate, where he finds himself but an accumulation of different paths of learning either in choreography or in other relevant courses. The choreographer has a drop-box of ideas where he consciously and unconsciously stores mental images of his experiences: imagined, seen or felt. Therefore, it suffices to say that creation and execution of dance requires a thinking process which can be referred to as choreographic cognition. Choreographic cognition, in the opinion of Renee Glass and Catherine Stevens, "refers to the cognitive and mental processes involved in constructing and refining movement material with the intention of creating a work of art" (2005:3). This thinking process takes a lot from the experiential. This is not to say that dances cannot be motivated by theories, but in the end, the foundation is always on the personal encounters and

interactions of the choreographer and his or her ability. A dance performance starts with the clicking of an idea, a thought, an assumed possibility which then sprouts into a performance by careful thinking and immaculate execution. These ideas are then expressed through movement, tension, space, stillness, sound and gestures.

For the choreographer, thinking means to create or recreate dance movements and, for the dancers, learning means to emulate and/or recreate. The ability to create and recreate is a cognitive function which helps in solving the question of learning. Mental images play a major role in determining how dance is composed and conceived by the choreographer, the dancer and, ultimately, the audience, for whom the art work is being created. What readily drives a choreographer in creating dance movements can easily be at least one of the following factors: the urge to fulfil a function with the dance, to embellish an opera, a response to an outside stimuli, the need to work with a particular dancer or the need to move to the structure of movement suggested by a piece of music. Ultimately, there is a craving that needs to be satisfied. Mason opines that the processes of dance making have been likened to an irrepressible evolutionary urge (2009:27). Creativity always seeks to do certain tasks in different manners rather than adhering to conventions. Choreographers also employ such in creating movements and/or when reworking conventional dance sequences to allow for freshness and newness in performance.

Dancers and choreographers, logically, regularly use their bodies as a tool to think with. They spend much of their time thinking non-propositionally. Thinking in this sense is a continuous effort, even through performances. Unlike drama in which the playwright thinks and expresses himself in words, dancers' and choreographers' thoughts and expressions are principally in movements. It is not just about the creation of movements but creating a world that lives, a world that the audience can identify and empathise with. In corroborating this idea, Sheets-Johnstone says that thinking in movement "is not the assemblage of discreet gestures happening, one after the next, but

an enfolding of all movement into a perpetually moving present (2011: 425). It is not just about creating movements that give definitive linkages to what is intended, but a suggestion, a signifier to that which can easily prompt a line of thought both for the performer and the audience. This, therefore, emphasises the need for the choreographer to be attuned to current developments of his art to enhance his communicative horizon for the creation of movements that can at least be suggestive of what is intended. Sheets-Johnstone further states that

> thinking in movement is not the work of a symbol-making body, a body mediating its way through the world by means of language... It is the work of an existentially resonant body – such thinking is different, not in degree, but in kind, from thinking in words. Words are not sharper tools, but more precise instruments by which to think about dynamics, by which to hone our sense of space, time, energy, causality or 'agentivity' (2009:47).

Whether or not the audience understand the underlying factors that may have led to the creation of a dance piece as a whole, they are willing to accept it in as much as it communicates with them in a way, aesthetically or culturally, thus leading to communication between the performers (dancers) and the audience, which usually is borne out of creativity. Baston and Wilson suggest that thinking-while-dancing expands our understanding of the human capacity for creativity in communication (2014: 18).

When trying to create new movements, dancers use their bodies as a cognitive medium, much the way a graphic artist uses drawing as a cognitive medium or a pianist uses the sound resonating from his piano as a cognitive medium. Just as an artist or musician develops a close coupling with their tools – pencil and paper for artist, piano for pianist – so a dancer must have a tight control relation between body-as-tool and body-as-display-medium. In the view of this, it is probable to state that there are

two distinct types of embodied cognition at play. Using the body as a medium to think in – dancers do not think in words, they think physically, through their bodily forms. The other process involves using the sensory systems to think, as dancers do not think in words, but in visual or perceptible forms. "As a communicative body-based art, dance engages all of cognition: perception, attention, intention, intuition, decision-making, memory and more" (Baston and Wilson, 2014:37)

Appearance bears on dance the way instruments bear on artistic or musical product. Change the instrument and you may change the form or style of the output. So too in dance, restriction of the body as a tool, say by making parts of it rigid or fluid, leads to a change in form and style of dance. This places the mechanics of the body in front and central in the generation of danceable movements.

Both choreographer and dancer rely on imagery in the visual, somato-sensory, demonstrative, and motor systems to create novel movements. The choreographer explicitly gives his dancers tasks that require them to shift between modalities. For instance, he might ask them to imagine that their bodies are made of fragile materials, or that they should imagine the feeling that the parts of their bodies are being dismembered. Their task is to translate those feelings into movements. One reason to see this process of simulating in one sensory modality and then translating to another modality as embodied cognition is that it relies on each modality having its own way of coding input and 'concepts'. Although embodied cognition has different meanings, a common element across most versions is that cognitive processes are grounded in specific brain systems. The way we acquired concepts through sight, sound, touch, and so on, continues to affect our understanding of those concepts, long after they have been abstracted from specific senses. The idea of running is abstract but we ground our understanding of that idea in the physical activity of running which we experience when running.

In dance, the tenets of embodied cognition may explain how choreographers invent danceable movements. An illustration is to

imagine what it is like to have a rope connected to your shoulder. The rope is pulled and released. To solve this problem a dancer works with a partner some distance away. That partner is notionally holding the rope and pulling it. The dancer then generates mental imagery associated with the movement of the rope. Much of this imagery will be about the somatic or kinaesthetic feelings of being pulled and released. The pattern of somatic or kinaesthetic priming of these images created serves to bias the next somatic or kinaesthetic images in dancers' imagination. Batson and Wilson are of the opinion that researching dance cognition utilises two main methodologies: direct and indirect. Direct analysis requires technology and other methods that capture neural activity online. Indirect methods include movement observation and analysis (2014:14). The latter is the approach this work adopts after careful observation through dance rehearsals, workshops and performances.

Perception and dance cognition

Perception plays a major role in the way dance movements are conceived and recreated. The art of learning dance is imitative which calls for acute observation and attention. Perceptual learning is, according to Gibson, "an increase of the ability to extract information from the environment, as a result of experience and practice with stimulation coming from it" (1979: 3). According to the Gestalt theories of perception stated by Benjamin B. Lahey, "some of the fundamental ways in which the eye and brain organise visual sensation were described about 75 years ago by Gestalt psychologists in their pioneering writings on perception." He further claims that "the following are the so-called five principles of perception: Figure ground, Continuity, Proximity, Similarity, and Closure" (2004: 144). Reactions to what is seen despite these principles are experiential.

Putting these into consideration, the first principle listed by Lahey basically refers to what has been chosen to be seen in a given picture or image. He claims that "when we perceive a visual stimulus, part of what we see is the centre of our attention"

(2004:144). In a picture comprising two images embedded in one another, one is always readily seen; consequently, the other forms the background, and vice-versa. In the art of dance also, the movements created by the choreographer may just not be seen in the same light by the different dancers who are learning these dance movements; rather, the dance may, based on his perception, make the less emphatic movements the focal point, thereby prompting the dancer to execute an entirely different movement altogether.

Continuity, on the other hand, borders on the principle that individuals tend to follow images that appear in a single pattern. This can also be referred to as Assimilation Effect. It is easy to unconsciously predict the sequence of an image based on its most recurring form. Galotti opines that "the principle of good continuation, states that we group together objects whose contours form a continuous straight or curved line" (2013: 42). Due to the fact that certain movements have been done with a specific rhythm, dancers may be forced to think that the next movement, which may be very similar in rhythm and time, will follow in a similar pattern. It is not impossible that this happens but, often times, for the purpose of not giving the audience a definitive feeling that it is a one directional rhythm performance, choreographers apply the principle of variety in the design of their works.

For dancers, in particular, perception leads to action, and the interpretation of the dancer depends heavily on the meanings they have been able to accord such creation that is being perceived. For example, traditional West African dancers may not be able to perform the lifting of leg and stamping of the feet as common with the Zulu dancers, but an attempt may end up being woeful or less than expected, based on the level that part of the body travels through space, or the attitude with which the movements are performed. This may be hinged on the fact that the West African dancers can only see such dance in the light of their abilities and cultural acts. In the opinion of Ross & Nisbett, "social psychological view has been that differences in the way different

people react to the same stimulus or situation are attributable to the different attitudes, beliefs, emotional states, motives, and past experiences that have shaped their construals of the environment" (1991: 15).

In Gibson's theory of cognition, he emphasises the aspect of perception which further touches down on the subject of affordances. Perceptible affordance in this sense is the ability to ascribe certain qualities to perceived objects. As mentioned earlier, mental images play a major role in the creation of movements; therefore, when dance movements are created, dancers sometimes liken these images to objects they have come in contact with, or specific movements they may have performed at some point, as a prompt to recollect these movements, or create a quick link to them in order to enhance assimilation. Perception is a means to action; action, a means to perception, and the brain has been programmed to transform information between the two modalities. By this, it is easy to recreate or replicate movements based on the functionalities of the object being perceived. Gaver is of the opinion that "when affordances are perceptible, they offer a link between perception and action; hidden and false affordances lead to mistakes." (1991:79). Images created in choreographic pieces are subject to the interpretation of the dancer; however, the intention of the choreographer is ultimate and dominant. He often links such images to the things that surround him to be able to interpret them, accord some meaning to them, based on their functionality, and recreate with this judgment in mind.

Memory and attention for dance movements

It is puzzling to sit in the theatre and observe a dance performance go on and on for a long period of time without any erroneous repetition of an already performed sequence. For novices in the art of dance, it appears like an act of genius out of the blue, but the fact remains that countless hours of practice must have been put into what is being observed to have resulted in the apparently ingenious act. Attention and memory are some of the cognitive phenomena that dancers put into play in the course of learning

dance movements. Learning is the ability to absorb information to the effect of a change in attitude or behaviour, whereas, the ability to learn depends heavily on the capability of any individual to retain what has been taught. Memory, in psychology, is the ability to retain events, teachings and information that have been observed. In the assertion of what is being postulated, Revlin remarks that "this learned information must be stored within us in order to be retrieved later. This process of storage is memory: the mechanism that allows us to retain and retrieve information over time. Memory is an essential underlying, cognitive process that supports learning, and makes it possible for us to acquire new knowledge, and remember new information as we encounter new situations" (2012:119). It is necessary to emphasise that the ability to retain information is a process; a step-by-step process that comes in stages. There are three basic stages of memory: sensory register or sensory memory, short-term memory, and long-term memory (Lahey 2004, Revlin 2012) and, as it will be explained, each stage of memory serves as a prerequisite for the other.

Sensory register can be described as a 'snap-shot' of a perceived image, not the total information about a perceived event. Lahey claims that "the information stored in the sensory register does not last for long, but it is apparently a complete replica of the sensory experience" (2004; 237). It is like an echo in the auditory sense that needs proper attention to be understood. Stevens and Wachowicz are of the opinion that sensory memory is pre-attentive, and this form of memory lasts only a fraction of a second. In addition, sensory memory is part of a brief memory system that receives auditory or visual stimuli and preserves them for some amount of time (2011: 215). A dancer may practically be in a rehearsal, watching the choreographer create movements but may find it hard to take in the movements. His eyes may be open but he may have his mind focused on other matters outside of what is being done. In this situation, his sensory organs are at work but the mind is not encoding the information for further processing in the brain. This is not to say, however, that the information cannot be retained momentarily but with other incoming stimuli it is likely

that the existing information vanishes. By paying attention to the creation, he most likely will have a chance to take the acquired information to the next stage which is short-term memory. Attention in this instance is the ability to focus on the present stimulus while suppressing other stimuli. It is the "limitations in our perceptual processing and response generation: to attend to one and not attend to others" (Suthers 1996: 1). Inability to transfer information to the next stage is one of the reasons a dancer will keep asking the same question about a movement over and over again without signs of improvement.

Short-term memory, or working memory, which is also referred to as 'chunk', in cognitive psychology, is the next stage of memory. This stage of memory is achieved through paying attention to information that is being received and, furthermore, attaching such information to more relevant information in the residual memory faculty. For easy access to information from the short-term memory (STM), it is expedient that stimuli are grouped in such a way that they form a cluster of ideas, a sequence, a thought with a definitive boundary for easy reference. This is termed 'chunking'. Revlin asserts that to be a chunk, something needs to fit together readily as a pattern distinct from the things around it. If the (s)pacing of the items is broken up with pauses between every third and fourth items, the person's memory span will be greater than if no pauses are inserted (2012:123). For dancers to be able to remember movements, they have to come in chunks, sequences or phrases which can easily be achieved through pauses or changes in the rhythmic flow and tempo of music. Sometimes, the ability to remember is dependent on prior knowledge on the subject matter which inadvertently suggests that STM depends heavily on the next stage, long-term memory (LTM), to function.

There are varying conclusions concerning how long information can be stored in the STM: Atkinson and Shiffrin (1971) are of the opinion that information can last between 15 and 30 seconds, while Revlin (2012) suggests that information in the STM can last for 18 seconds. Therefore, it can be argued that,

based on Baddeley's model of working memory, information stored in the STM can last between 15 and 30 seconds if they are not attended to (Baddeley & Hitch, 1974). Rote learning helps dancers retain dance movements for much longer and this subsequently channels the route in committing information to LTM. Long-term memory is a substantially permanent type of memory that can hold information for as long as it can be recalled. This can only be made possible by the meaningfulness of such information, i.e. meanings are accorded to it, and there is much relevance to the immediate environment of the receiver of the information. Lutz and Huitt are of the view that "long-term memory houses all previous perceptions, knowledge, and information learned by an individual, but it is not a static file system that is used only for information retrieval" (2003:5). Abbot suggests that "long-term memory is that more permanent store in which information can reside in a dormant state out of mind and unused until you fetch it back into consciousness" (2002:1).

Dancers are prone to repeating movements over and over again to make it stick; however, the pressure of performance can, in a way, enhance the level of attention directed at learning new dance movements. Two major factors can truncate the process of learning and commitment of dance movements into memory: retroactive and proactive interferences. Retroactive interference occurs when newly learnt set of movement interferes with an attempt to recall previously learnt movements. This sort of interference occurs when originally known dance movements interfere with newly learnt dance sequences due to the similarities in movement patterns, or due to the fact that the music is the same. Chances are that occasionally, the originally residual knowledge would burst into life when trying to recall what is being newly learnt. For instance, a *bata* dancer who has worked with different choreographers is likely to have different versions of the dance sequence. In this case, there may be situations when he may practically execute the most recent of the previous versions during the course of learning the new sequence. Proactive interference in dance occurs when dancers try to execute particular kinds of

movement sequences that have been learnt but find the newly learnt popping up.

Constant recall and repetitive practice (verbally, mentally, or physically) is the bridge linking STM with LTM. This is referred to as rehearsal. Rehearsal in cognitive psychology is the process of renewing information in order for it to be available in the mental faculty for a longer period of time than the estimated short-term period mentioned above. Rehearsals come basically in two forms: maintenance and elaborative rehearsals. Maintenance rehearsal is the mental recall of information with little or no physical actions to it. Revlin is of the opinion that "maintenance rehearsal is typically accomplished by saying something repeatedly in order to keep it in mind" (2012: 126). Dancers apply this by mentally picturing themselves practising newly learnt movements and positioning by giving vocal prompt to punctuate beginning and end of dance phrases.

Choreographers employ such medium in the course of teaching dances by verbally classifying movements into phrases and sequences. Dancers tend to encode dance phrases in such manner that they can easily associate them with events, slangs and common features around them. Stevens C. et al suggest that "movements that can be verbalised are better recalled than movement that cannot" (2010:236). In African dances, where chants, cries, calls and ululations are prominent features, dancers may easily depend on these vocal prompts to recall dance phrases. The disadvantage of this, however, is emphasised by Allard and Starkes (1991) who claim that putting dance items together may lead to forgetting a large part of a dance routine if the prompt is forgotten.

Elaborative rehearsal is the attachment of meanings to movements and how they relate one with the other which allows for a solid configuration of memory. This easily allows for stimuli to be stored for a much longer period of time in the LTM. The striking difference between maintenance rehearsal and elaborative rehearsal is that the former helps to keep it alive while the later enhances long-term retention. Lutz and Huitt assert that:

> Maintenance rehearsal schemes can be employed to keep information in short-term memory, but more complex elaboration is necessary to make the transfer to long-term memory. It is absolutely necessary for new information to somehow be incorporated into the memory structure in order for it to be retained. (2003:4)

Dancers' approach to rehearsals in the context of cognitive psychology is sometimes hinged on the principle of thinking with the body, which has been stated earlier. Since the art of dance is not verbal in its act, dancers sometimes go through the process of recalling dance through marking. Marking is a rehearsal technique in dance that presents dance movements in miniature and representational forms to reduce the level of energy being exerted in executing dance movements. Dancers apply this technique especially when they are not in the ideal place for rehearsal. It can be done on the road, in the bus while travelling for performances and also in the studios where full recall of movements is not required. Kirsh is of the opinion that when dancers mark,

> ...they do not recreate the full dance phrase they normally perform; instead, they create a simplified or abstracted version, a model. Dancers mark to save energy, to avoid strenuous movement such as jumps, and sometimes to review or explore specific aspects of a phrase, such as tempo, movement sequence, or underlying intention, without the mental complexity involved in creating the phrase 'full-out' (2010: 1).

Physically, marking may not be demanding but mentally, it demands even more from dancers than it probably would while doing the physical work. During marking rehearsals, the sense of imagination is at its optimum. Dancers create all other objects, human and inanimate, to specify positioning and negotiation through space, at every point in time. Marking can be done in two ways: marking with the body and marking with the hands. In

marking with the hand, dancers perform a puppetry-like rehearsal of dance phrases and sequences. In this wise, fingers take the place of the legs and other dancers can be represented with the other hand to create an elaborative memory rehearsal by establishing relationship with other dancers and figures on stage. Marking with the body is more elaborate; it can be adequately described as thinking with the body. This creates an elaborate mental and physical imagery of dance phrases in its most representational form. Marking gives dancers an avenue to easily commit dance sequences, routine and phrases into the LTM which allows for permanency.

The research in embodied cognition in dance is a continuing discussion that cannot be exhausted in one academic work. A collaborative study with the pure scientists, neuroscientists, radiologists and other relevant disciplines, will further investigate the subject of embodied cognition as it relates to the arts and, in particular, dance and choreography. Such investigation will enable dancers to easily assume transmutable roles, such as dance teacher-scientist or dance artist-scientist (Batson & Wilson 2014).

End Note

Figure 1 is from
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