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Embodied Cognition And Mental Imagery

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Abstract

The referenced study explores Embodied Cognition through the lens of multiple-model approach. Additionally, it tracks the function of Mental and Visual imagery in science and psychological study. Embodied cognitive science comprises a loose network of cognitive science study projects that share a willingness to challenge and even substitute conventional approaches to perception and cognitive function. This paper discusses Visual Imagery as one of those emerging themes. Visual imaging has played a key part in the debate about mental activity and plays a central role in multiple behavioural health conditions and plays an extremely significant role in their care.

The paper also addresses certain theories of embodies cognition. Traditionally, the cognitive approach has resisted the analysis of internal images, particularly visual imagery. These restrictions are currently being removed, with more advanced analysis methods contributing to many new findings in imagery. Clinical evidence centred around linkages between cognitive, perceptual behaviour systems. Hence, the paper also focuses on the bio-mechanical aspects of Embodied cognition and Imagery.

Finally, the study has identified two key components pertaining to the cognitive framework. Firstly, the human psychological cognition highlighting the modal information as opposed to amodal (abstract) conceptual themes. Secondly that perception is significantly dependent on one's awareness of the subjective concepts as opposed to internal images or ideas of the concept one holds. Keywords: embodied cognition, mental imagery, modal information, amodal concept

Introduction

The embodied cognition is a concept that the mind is not only alluded to the physical body, but also that body affects the mind (Mahon, 2014). It is one of the most counter-intuitive concepts of cognitive psychology, that elates the co-dependency of the two aspects. In strong comparison to this, exists the notion of dualism, a philosophy of thought originally brought forth by Rene Descartes in the 17th century when he argued that "there is a significant distinction between mind and body, since by definition the body is still divisible and the mind is indivisible. The spirit or consciousness of man is completely separate from the body" ("Embodied Cognition (Stanford Encyclopedia of Philosophy)", 2020). The idea of disembodiment of the two persisted in the years prior. From this, western philosophy established two fundamental ideas: the reason is

disembodied as the consciousness is disembodied and reason is transcendent and common amongst all.

Cognition is embodied as it becomes profoundly reliant on the properties of the individual's physical anatomy, that is, as elements of the individual's anatomy outside the brain perform a major causal or physical function in cognitive functioning. Prevailing theories of the theory of mind and cognitive science have seen the body as incidental to knowing the essence of consciousness and intellect. Proponents of embodied cognitive psychology find this to be a significant misunderstanding. Often the complexity of the reliance of consciousness on the body is very surprising and provides different forms of conceptualizing and investigating the processes of cognitive functioning. Embodied cognitive science comprises a loose network of cognitive science study projects that also share a willingness to challenge and even substitute conventional approaches to perception and cognitive function. This approach has the ground to add depth to the themes in psychology by bringing into account of external environment and nature and nurture into the questions which widen the discourse. One such theme that this paper will be discussing is based on visual imagery.

Visual imaging has played a key part in the debate about mental activity. Many claimed that it was one of the key human cognitive experiences that help one to recall, plan for the long term, communicate and make choices. In comparison, visual imaging plays a central role in multiple behavioral health conditions and plays an extremely significant role in their care. This naturally brings up the question that addresses the connection between mental imagery and physical body, or embodied cognition of an individual.

The term “visual imagery” is used to apply to perceptions and underlying perception of sensory input without a clear external stimulus (Borst & Kosslyn, 2008). Such interpretations are retrieved from memory and lead us to re-experience a variation of the initial stimulus or other novel mixture of stimuli. Noticeably, not all visual imaging can be voluntary; external experiences or internal interactions can often activate a mental picture, even though one may not wish to encounter the memory at the time. This can be understood with the context of Post-Traumatic Stress Disorder, or Panic disorder. Mental imagery will explicitly include all the senses, although this analysis focuses on visual mental imagery, considering that most scientific research has struggled with this sensory realm.

Multimodal perspective of embodied cognition and mental imagery

Background

Historically, behavioral imaging work has struggled for both functional and theoretical purposes. Methodological limitations related to the intrinsically private existence of the imagery placed realistic and ethical restrictions on the kinds of experiments that may be carried out on humans. Moreover, the second half of the 20th century witnessed the emergence of behaviorism in psychology. This cognitive approach has resisted the

analysis of internal images, particularly visual imagery. The convergence of these two impediments is primarily responsible for the comparative scarcity of mental imaging studies concerning relevant topics such as sensory concentration and sensory working memory.

These restrictions are currently being removed, with more advanced analysis methods contributing to many new findings in imagery. In recent years, modern analytical analysis approaches have provided for a more vivid examination of mental imaging pathways and neural substrates. The findings of these approaches shed light on the role of visual imagery in vision, memory, and mental well-being. Findings also strengthened the definition of conceptual mental imagery as a depictive internal depiction with powerful and unforeseen connections to external experience, essentially resolving the "imagery debate" (Pearson & Kosslyn, 2015). There is a strong trend of western philosophy that assigns importance to the motor and perceptual elements of cognition and rejects rationalistic, dualistic strategies. Visual imagery is included as an example of this practice. The theories and methods are closely linked to paradigms and premises characteristic of different ages in cognitive psychology and, more broadly, cognitive science. This has resulted in an interesting debate about this topic.

Research has found that visual imaging plays a key function in psychiatric conditions in disorders such as anxiety and panic disorders. This increase in basic and clinical research of mental imagery shows the essential position that mental imagery plays in daily actions as well as in human mental activity and disorder. It also proves a significant relationship between embodied cognition and the mental imagery that the individual holds (Pearson, Naselaris, Holmes & Kosslyn, 2015).

Biological foundation of mental imagery

Imagery, of the well-researched case of visual imagery, and also the category of auditory imagery (Reisberg, 1992) and kinesthetic imagery (Parsons et al., 1995), is a simple illustration of the unconscious representation of real occurrences. It is a reflection on the historical power of the non-embodied standpoint, though, that in the 1980s, the analysis of imagery was overshadowed by a controversy as to whether images were image-like in any practical way. The comprehensive response needed to be built to prove that the imagery contained parallel images that fundamentally retain the physical and other attributes of the real universe, rather than a series of subjective opinions (Kosslyn, 1994). Currently, this problem has been largely settled in favor of the symbolic essence of images, and research tends to create a near connection between visualization, which takes place in the absence of appropriate external stimuli, and the mechanism of ordinary interpretation (Farah, 1995; Kosslyn, Pascual-Leone, Felician, & Camposano, 1999).

Throughout the traditional approach to cognitive science, perception is focused on amodal, abstract, and subjective representations that can be interpreted in a language-like way (Fodor & Pylyshyn, 1988). External information gained by sensory processes is converted into amodal symbols that reflect an awareness of semantic memory

experience. Since the opinions are amodal, they have no relationship with the actual referents they stand for. For certainty, the only way to express sense is through an abstract process. Such representations can be used in a variety of ways- such as function lists, cognitive schema, semantic nets, sequential structures- for use in a wide range of cognitive tasks.

Mental imagery and embodiment

In the development of cognitive psychology, visual perception work first demonstrated the shortcomings of the logical or abstract interpretation of cognition. A well-known concept of mental imagery defined it as a poor reactivation of sensation in the absence of a corresponding stimulus (Holt, 1964). The imagery was classified as a vision-like mental phenomena whose resemblance to sensory-motor processes is focused on the existence of shared pathways between imagination and vision. The first step of mental imaging work centered on clinical evidence as the foundation for cognitive models. Then, in line with the increasing significance of neuropsychological evidence, the second step centered on neural processes as a central demonstration of their analog existence. Although the discourse on imagery has developed over time, the emphasis has often remained on the essence of the internal meanings that underlie the perception of visual images (Tye, 1991).

There has been an increasing understanding in all cognitive science fields that cognition cannot be effectively examined if the functions of the individual, the climate, and behavior are overlooked (Clark, 1997). The position assigned to the body may be divided between the first generation and the second generation in cognitive science. The first generation is focused on the disembodied concept of cognitive processes that, in the Cartesian sense, are abstract analytical machines, autonomous of brain, body, and the contact of the body with the world. On the other hand, the second generation may be identified as an embodied cognition method that focuses mainly on the linkages between cognitive, perceptual behavior systems.

By nature, cognitive disembodied science encompasses all disciplines which share the principle of mental representation through imagery (Collins, 1977). Similarly, an analog/proposal dispute sets up the possibilities of a modern philosophy of thought. This is evident that objects, whether propositional or symbolic, are known to be the foundation of cognitive processes.

Nevertheless, the meaning of an analog sign is ambiguous: the analog code is modal, it retains a connection with its sensory roots. It is not distinct from cognition but is perceptual, and is not subjective but is focused on a poor reactivation of sensory experience. Both attributes endorse the embodied perception of consciousness and visual thinking as an instance of embodied consciousness.

It is impossible to have a precise description of the embodied cognition. Several were earlier suggested however the research is still ongoing (Wilson, 2002). However, there is a cohesive juncture: instead of hierarchical functions on amodal objects, the

embodied method considers the systems to be directly related to the person, the environment, the movement and the sensory-motor awareness (Feldman & Narayanan, 2004). As a consequence, embodiment theories consider the anatomy as the center of cognitive operations, and not merely as an outlet tool for principles and strategies created by complex patterns in the mind (Goldman & de Vignemont, 2009).

Cognition is rooted in the organism in two ways: it arises from the central nervous system, and it develops through complex contact with the individual and the world. A cross-sectional claim in embodied cognition hypotheses is that learning is rooted in the cortex region of the brain. This suggests that thought arises from neuronal stimulation and is affected by cortical structure and physiology; it means that cognitive models will be restricted by neuronal evidence based on the concept of neural credibility. However, it is important to address the relationship as bilateral: not only does neural evidence impose limitations on cognitive structures, but cognitive approaches are central to the development of neuroscience (Barsalou, 2010). The theory of embodiment, therefore, means that thought is rooted in the forms in which we perceive the world through experience and execution, and that we intend/execute to accomplish our objectives. The world contains the knowledge essential for our existence, for which we have evolved a special ability that represents our sensory systems, and we satisfy our goals, desires, and wishes by behaving within a framework. It follows from this, that perception is influenced by the internal nature of the whole human body and its position in the actual world.

Perception, cognition, and behavior are also strongly linked to each other (Barsalou, 2008). Because cognition is focused on awareness and behavior, the perspective of the embodied consciousness is fundamentally non-dualistic: the intellect is not isolated from the brain/body system (Damasio, 1994). Apart from consensus on the role of the brain and body mechanism and the sensory-motor modalities in the understanding of cognitive functions, embodied cognition hypotheses vary in their definition of what is embodiment and what type of expression promotes cognitive function (Goldman & de Vignemont, 2009). When the fundamental concepts have been developed, the main aim of the embodied cognition theories is to describe how cognition functions. In the cognitive method, the solution was clear: perception functions through interpreting abstract symbols. However, if abstract representations are dismissed, we look for an alternative to further understanding. Today, that data suggests that simulation is a fundamental brain computational system that facilitates cognitive function (Barsalou, 2009); i.e., cognition operates by modal simulation mechanisms focused on selective reactivation of visual, motor and introspective states (Barsalou, 2008). Based on how the concept of embodied consciousness is viewed, various forms of simulation are suggested.

Relationship between Mental imagery and motor cognition

The prior distinction of behavior to describe cognition can also be found in the developing area of motor cognition (Haggard, 2005). Motor cognition, according to Jeannerod (2006), research about how behaviors are conceived, designed, expected, arranged, interpreted, recognized, observed, imitated, and credited. Both the principle of Theory of

Event Coding and the hypothesis of the mirror neuron are known to be associated with motor cognition. According to Jeannerod's principle of mental stimulation, cortical emulation of behavior will represent a unifying force for motor cognitive functions, such as visual perception and activity interpretation. Several scholars found visualization to be a medium for the study of visual cognition.

Imagery representations have historically been interpreted as "pictures in the imagination" that reflect artifacts in the unreal universe, or as quasi-sensations that are introspectively perceived. Motor imagery provides another element to this internal simulative capability: voluntary intervention by the imager as an agent (Annett, 1995). In reality, motor imagery can be described as an internal representation of movements from a first-person viewpoint without any visible physical activity (Decety & Jeannerod 1996). Such forms of simulations refer to representations of one's body motions, despite the kinaesthetic and biomechanical limitations of our environment (Annett, 1995; Decety & Jeannerod 1996). Visual depiction using imagery, basically includes the portrayal of visual elements of the real universe with supposed pictorial characteristics. A visual picture of a movement may contain only spatial coordinates of a motion without any kinaesthetic sensation (Stevens, 2005), whereas a motor picture of a movement may involve a kinaesthetic sense of motion without any external presence being perceived.

All visual-motor visualization and mirror simulation are forms of internal simulation affecting the sensor-motor network. The key difference is how the simulation phase is created. In mental imagery, the cycle of simulation is created internally, is voluntary and involves cognitive control. Mirror simulation, on the other hand, is created by an external occurrence (dynamic action) that is automatic and does not involve conscious control. Awareness includes the ability to anticipate and distinguish between possible sensory experiences and imagery. Similarly, effective intervention includes the ability to foresee the effects of behavior. Simulation thus constitutes a method of prediction that helps to prepare and understand action (Gallese, 2009). Another variant of the simulation stresses the significance of bodily behavior in the interpretation of mental existence and, on this basis, researchers are exploring signs of mental activity.

There are some potentially open questions about the validity of visual or configurational mental scanning technique that relies on the visual or analytical examination of a person without affecting the mechanical elements of the body. They may produce a very abstract and graphical spatial picture that reflects the actual route, possibly by merging perceptual traces into a single image and rendering this image normal and condensed. Thereafter, based on the personal interests, goals, and complexity of the framework in which they are implemented, various forms of simulation can be used. As a consequence of a conscious mental operation, we will create various kinds of photos (Gibbs & Berg, 2002). Mental imaging also provides a means to learn how perception may use visualization methods in a scalable manner. This perspective reconciles the two dimensions of the simulation mentioned above, concentrating both on

the body and on the movement as well as on the sensorimotor foundation of the depictions.

Conclusion

Increasing data indicate that simulation is a fundamental cognitive framework for diverse aspects of cognition, from vision to visual imaging to social cognition (Barsalou, 2009). Mental imaging may be described as a type of intentional, aware representation of multimodal experience. This simulation process depends on the selective reactivation of the neuronal sensorimotor areas that serve previous actual practice. As Kosslyn et al. (2006) recently reported, mental imaging exists "when a depiction of the kind produced during the initial phases of perception is present, but the stimulus is not necessarily perceived; these representations retain the perceptible properties of the stimuli and eventually give rise to a subjective understanding of perception." The definition of mental imagery means that each form of experience will have an equivalent form of imagery (Moulton & Kosslyn, 2009). Visual imagery includes spatial sensory processing and entails the stimulation of sensory areas and also the primary visual cortex V1 (Kosslyn, 1994; Kosslyn et al., 2006).

Motor visualization depends on mechanical control and also stimulates the main cortex (Crammond, 1997; Grèzes & Decety, 2001; Jeannerod, 1994; Stevens, 2005). As a consequence, imagery triggers brain cortices (Kobayashi et al., 2004). This perspective broadens the original models of mental imagery, which were primarily concerned with basic graphic, static pictures. The classification of visual perceptions as multimodal objects indicates that solely depictive or pictorial structures are no longer acceptable.

Mental representations are not simply picturing of the mind; they may reflect a wider continuum of perceptions from static images to shifting events to living or sleeping bodies and selves. Depictive frameworks are not restricted to visual representations, but rather do not recognize the position of depicted artifacts or scenes. Since learning is focused on the re-enactment of sensory-motor interactions, the question emerges as to how mental representations integrate the physical context of observed occurrences. Everything we experience; how we function upon, occurs in the space-time continuum. Increasing evidence indicates that the essence of ambient interaction is expressed in the position of the images that underlie the simulation (Barsalou, 2009). The question that then naturally arises is: can conceptual images contain the physical properties of what they represent?

These questions are of central interest as much recent research in classic brain scanning work that has addressed this topic and the conclusion is "Yes" (Denis & Kosslyn, 1999). Recently, Kosslyn (2008) realized that mental visualization can better be interpreted in the form of mental stimulation, primarily as a kind of mental emulation; that is, mental processes that drive simulation imitate the processes involved in the simulation scenario. Following other modeling frameworks (Gallese, 2005), the primary role of visual visualization is to produce precise forecasts dependent on prior practice.

The analysis of visual imaging as a multimodal process often includes learning how the original sensorimotor information can be converted. Mental representations do not need to stay solely rooted in the initial tactile movement memory. They may also be created by integrating and changing retained sensorimotor knowledge in different forms, resulting in more theoretical or more explicit conceptual representation (Kosslyn et al., 2001). There is evidence, for example, that when people are challenged to examine their spatial maps mentally, they will make use of various mental scanning techniques and generate specific mental maps (Iachini & Giusberti, 2004). They will seek to adapt as much as possible to the initial sensorimotor encounter by following a kinaesthetic scanning technique and remembering the exact direction they took.

Visual perception, in which visual visualization is a significant aspect, may be seen as articulated to the degree that it stresses the role in motor and perceptual mechanisms in cognitive tasks. This is consistent with the embodied cognition idea, which stresses the fundamental role of simulation in cognition, not just of motor processes (or motor resonance) but also of other sensory modes.

Future Direction

This relationship can give rise to a field in the new area of artificial intelligence. A more systematic and theoretical analysis is required for exploring the idea of visual imagery as a primary cognitive capacity to improve the output of cognitive robots. In reality, the focus should be on the embodied processing processes used to create artificial cognitive structures of motor imagery and mental stimulation to monitor the dynamic actions of humanoid structures that reflect the artificial body.

The future directions could also include establishing relationship between neuroscientific studies and psychological history of mental imagery in order to help the reader contextualize the multidisciplinary environment in which we operate. Use of artificial neural systems and robotics to emulate the method behind our ability to construct visual representations of things and interactions, and to apply this method as a neural tool to enhance the actions of complex robots.

A new approach is therefore needed to replicate the human cognition and mental imagery onto the artificial intelligence so that one can have a better understanding of the relationship and can explore the variations.

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