Available online at www.sciencedirect.com

ScienceDirect

Procedia - Social and Behavioral Sciences 187 (2015) 312 – 317

Procedia
Social and Behavioral Sciences

PSIWORLD 2014

Embodied creativity: a critical analysis of an underdeveloped subject

Marius M. Stanciu*

University of Bucharest, Faculty of Psychology and Educational Sciences, 90 Şos Panduri, Bucharest, Romania

Abstract

While the idea that cognition is embodied appeared in the literature more than four decades ago, studies concerned with how and to what degree might the body and the environment influence creative thinking represent a relatively recent scientific endeavor. In this paper we wish to provide a critical examination of the core ideas of this new field, suggesting new experimental paradigms for testing the more radical and often ignored assertions of the embodied cognition program. We conclude that given the extremely small number of papers that are produced on this subject, as well as its obscurity within the scientific community, future research will have to expand its theoretical considerations greatly if the field is to survive and flourish.

Peer-review under responsibility of the Scientific Committee of PSIWORLD 2014.

Keywords: Embodied, Creativity, Cognition, Research, Review.

1. Introduction: a brief history of embodied cognition

In the last four decades, the vast and complex program of embodied cognition has often been prophesized to mark a revolution within the field of cognitive science. Intellectually rooted in the works of continental philosophers such as Martin Heidegger or Merleau-Ponty, the program's popularity really took off when Chomsky's former student, George Lakoff, joined forces with Mark Johnson in 1979 and suggested that contrary to the dominant view held at the time, mental representations are intimately connected with "direct physical experiences" (Lakoff& Johnson, 1980, p.57), a fact which makes most, if not all concepts intertwined with bodily movements and human anatomy. Drawing from a wide range of papers published in the late 70s and early 80s (e.g. Kay & McDaniel, 1978; Talmy, 1983) as well as ingenious thought experiments, Lakoff later conceived of his work as a break with what he described as first-generation cognitive science (Lakoff& Johnson, 1999; Lakoff, 2003). At the core of his new program stood the idea of the embodied mind, namely that the categories in which we think are shaped, modified and severely restricted by the manner in which we spatially explore our environment.

*Corresponding author. Tel: +40.0744.535.123; fax: +4.031.409.3254.
E-mail address: marius.ms.stanciu@gmail.com

Peer-review under responsibility of the Scientific Committee of PSIWORLD 2014.
doi:10.1016/j.sbspro.2015.03.058

Needless to say, a retrospective analysis of the literature produced in the last three decades shows that the prophesized revolution never took place. Not only that, but careful and lucid deconstructions of the program, as those conducted by Adams (2010) and Shapiro (2011), reveal that Lakoff may have simultaneously overestimated just how radical his thesis really was and underestimated its compatibility with standard computational views of the mind (Shapiro, 2011, pp. 92-93, pp. 112-113). Nonetheless, where the new thesis really succeededwas in inspiring scientists across different disciplines to promote similar conceptions regarding the relations hypothesized to exist between the workings of the mind and those of the body (e.g. Moravec, 1988; Varela, Thompson &Rosch, 1991; Clark, 1997; Damasio, 1999), further fragmenting the entire field into various subprograms that exist to this day. As such, embodied cognition in the 21st century refers not to a unitary and cohesive paradigm, but to an entire family of theses glued together by the overreaching idea that various aspects of cognition are influenced and shaped by body states and processes (Wilson, 2002). The nature of this influence as well as its magnitude, however, varies significantly from one perspective to another.

In this paper, our main purpose will be to analyze and explore how the core ideas of embodied cognition have influenced the cognitive science of creativity. This field is not only relatively new, but still undeveloped. As such, most authors prefer to write theoretical papers instead of engaging in empirical research. Furthermore, as we will argue in the next sections, scientists working in the field have adopted only some of the premises found within the embodied cognition paradigm, leaving unexplored a huge range of ideas that can lead to potentially fruitful research. Before we engage in such an analysis, however, a short description of the various subprograms is entitled.

2. The various claims of embodied cognition

To simplify greatly, following Wilson and Golonka (2013), at one end of the spectrum of the embodied cognition program stands the not so radical idea according to which cognition can be biased by bodily states (Eerland et al., 2011) and higher order, abstract mental representations are ultimately grounded in these states (e.g. Lakoff& Johnson, 1999; Jostmannet al., 2009; Miles et al., 2010). In their first works, Lakoff and Johnson (1980, 1999; see also Lakoff, 1987) dissected an enormous amount of metaphors in order to support this perspective. In fact, our everyday language is full of “dead metaphors” that fully illustrate the point. To give just some examples, we sometimes say that we are “above a situation” because we associate ”up” with control and dominance and ”down” with submission; we ”look forward” to meeting someone as if time relations were spatial (see Boroditsky, 2001); ultimately, we might be scared of ”dark times” perhaps because our species is not adapted to a nocturnal lifestyle.

From all the various subprograms of the embodied cognition paradigm, this thesis, sometimes called “the conceptualization hypothesis” (Shapiro, 2011), is undoubtedly the less controversial one. Actually, whether they realize it or not, scientists working within this program are doing standard cognitive science with another name (Wilson &Golonka, 2013). Why this is so will become clearer in the following section in which we will discuss the various shortcomings of the embodied creativity research. For the time being it is safe to say that there is no premise within this thesis that prevents cognition from happening in a central, disembodied processing unit, as the orthodox view suggests.

In sharp contrast, at the other end of the spectrum, we find the much more radical and unorthodox perspective according to which cognition goes beyond the boundaries of the brain and becomes distributed across mind, body and environment (e.g. Beer, 1995, pp. 182-183; Clark & Chalmers, 1998; Clark, 2008; Wilson, 1994). While more of a philosophical thesis than an actual research program, this view suggests that objects found outside of the brain do not simply cause mental states and processes, but actually constitute them. Avoiding philosophical jargon, this is equivalent to saying that when you solve a simple math problem using pen and paper, the pen and paper are not simple instruments that aid the internal processing but actual “ingredients” of a coupled cognitive system that performs the processing. What are the necessary characteristics of a cognitive coupled system and what are the marks of the cognitive? – These are not simple questions (Adams &Aizawa, 2001). In fact, the counterintuitive and convoluted ideas entertained by this radical thesis make it unpopular with the vast majority of psychologists working today. Given the scope of this paper as well as the complexity of the matter we will refrain here from pursuing the subject further. Our aim until now was simply to show that the program of embodied cognition goes beyond the popular brand found in Lakoff’s writings with which most psychologists are familiar with. Sadly, however, the vast

majority of papers dedicated to the subject follow the "conceptualization hypothesis" (Shapiro, 2011) rather than the more radical and, perhaps, more fruitful ideas.

3. Embodied creativity: an underdeveloped field.

Given the interest in conceptual metaphors manifested by some of the first and most important supporters of embodied cognition (i.e. Lakoff& Johnson, 1980), one might think that embodied creativity research has become a full-fledge, mature field by now. Unfortunately, this is not the case. Within the field of cognitive science, the subject of embodied creativity represents not only a relatively new direction, but also a significantly underdeveloped one. To get a glimpse of how unfortunately unpopular the subject really is we performed a search within the Academia.edu social network, a website dedicated to promoting studies and research outside of peer reviewed journals. Our search returned only one theoretical paper. Similarly, from the eleven million users registered on the website, only five were found to be interested in embodied creativity. More refined search procedures performed across platforms (e.g. ScienceDirect, ProQuest) confirmed the fact that the subject is indeed still underdeveloped: from January 1980 to August 2014 only 216 papers were written on the subject in social sciences. Leaving aside theoretical papers and interdisciplinary studies, only four empirical papers were produced in psychology. From these, we chose to focus on two here based not only on the number of citations, but also on the amount of press they received.

In one of the studies, published in the *Journal of Experimental Psychology* (Slepain&Ambady, 2012), the authors showed that embodying a metaphor really does help internal cognitive processing, increasing performance in both divergent and convergent thinking tasks. More explicitly, the researchers asked two groups of undergraduate students to follow, using a pen, two shapes drawn on a paper: a round, continuous snake-like drawing and an angular, choppy one. As expected, the subjects that had to trace the more fluid drawing showed also better results in both divergent thinking tasks (an alternative usage test inspired by Guilford, 1967) and solving a small number of RAT problems. From these findings the authors concluded that the body really does influence the mind, as the mood of the subjects as well as the difficulty of the tracing tasks was controlled for. In other words, according to the authors, at least, fluid motions of the body lead to fluid and original ideas. Similar conclusions have also been drawn by Leung *et al.*(2012). In a series of ingenious experiments performed with undergraduate students, the authors showed that walking freely in an open space may encourage one to think freely. Furthermore, embodying an expression such as "thinking outside of the box" may improve performance in tests such as the RAT. This was concluded by comparing the results of the subjects that were asked to solve the test literally inside of a box as opposed to those asked to complete the task siting on it.

Leaving aside shortcomings such as the small and homogenous samples that were used, as well as the relatively moderate effect sizes, such studies are undoubtedly a step into the right direction. The issue here has less to do with the methodological soundness of the research and more to do with how the authors chose to treat the idea of embodied cognition. Following Shapiro's taxonomy (2011), both studies we mentioned follow the "conceptualization hypothesis". This, of course, is not necessarily a bad thing in itself. The problem, however, is that research performed in this vain cannot discriminate between the "soft" general hypothesis of the embodied cognition thesis according to which bodily states bias abstract cognitive processes and the "hard", more unorthodox view, according to which solving tasks may not require internal representations at all (van Gelder, 1995) or theymay imply cognitive systems that expand beyond the boundaries of the brain. To make the matter more clear perhaps an example is entitled.

Cognitive science, as it was conceived and developed in the 1960s, did indeed perceive cognition as a disembodied process. Consequently, a clear delimitation was drawn between "software" – the set of algorithms that transform sensory inputs into outputs - and "hardware", namely, the physical substance on which the algorithms were implemented on. Now, if someone is asked to build a robot which has to navigate an environment and perform a series of tasks, a purely disembodied program would not get too far. What even the "soft" form of the embodied cognition thesis teaches us is that an internal representation of the outside world must be supplemented with an internal representation of the body in which the processor is encased if artificial intelligence is to successfully mimic the cognitive processes of even the simplest natural organisms. *Ipso facto,* different algorithms would have to be

adapted to different robots, taking into account a wide range of hardware details: from the distribution and characteristics of the sensors to the moving speed and the position of the robot in the environment. This perspective, however, does not suggest in any way that different results will be obtained if the central processing unit receives real information as opposed to being artificially given inputs in a virtual reality. Coming to real life, this means that studies such as those we have mentioned before cannot answer the question if body states affect cognition because their representations interfere with other internal representations or if doing something is just as important as having a mental representation that one is doing something. In other words, they cannot tell us if gestures and body movements are causal contributors to cognition or real constituents. Luckily, there might be a way to actually test this in a satisfactory empirical manner.

One of the most exciting and interesting findings in neuroscience from the past decade was the realization that brains can be fooled to generate illusory conscious perceptions that one's body does not occupy its actual physical location. As HenrikEhrsson showed in a now famous study (Ehrsson, 2007), receiving visual inputs from head-mounted displays connected to cameras that mimic natural eye positioning along with kinesthetic stimulation is enough to create the illusion that a person does not inhabit its own body, but an entirely different location . While true out-of-body experiences could not be generated this way, the experiment did prove that representations of one's own body can be successfully manipulated in a laboratory setting.

Combining this experimental paradigm with that employed by Slepain and Ambady (2012) could potentially settle the question if gestures and movements are constituents or rather mere causal inputs to cognition. To give a more articulate description, a second experimental group could be formed, consisting of subjects that receive direct visual inputs from cameras mounted on the participants' heads that perform the tracing task suggested by Slepain and Amabady. Subjects from the former group could then be induced to believe not only that they occupy another location but also that they trace the round, continuous shapes just as subjects from the second group do. Similarly, a third experimental group could be paired with the control group that traces the rigid, angular shaped drawings. If no significant differences in creative performance can be found between these paired groups, then, we believe, embodied cognition partisans should refrain from promoting some of their more radical ideas. If relevant statistical differences are to be found, however, then there are good reasons to reevaluate the basic tenets of standard computational cognitive science. In fact, such findings would certainly support a central suggestion advanced by some adepts of embodied cognition, namely that body movements and gestures can function similarly to internal cognitive processes, providing cognitive off-loading when internal resources are taxed (Tvesky, 2009, p. 210). This fact, of course, opens the door to even more problematic conclusions because if we allow gestures to be constituents of cognition then, via a parity argument (see for example Clark, 2008, p. 222), any tool that aids us in our tasks becomes a constituent of cognition as long as it forms a coupled cognitive system with our mind. Consider for example the case of a painter that draws sketches in order to arrive closer and closer to the desired image that he holds in his mind. According to the perspective we discussed previously, the drawing board is not just a simple tool, but a temporary "working memory" that helps the painter use his own internal resources for other tasks. Metaphorically speaking, the drawing board thus becomes a mental "lever" that contributes almost equally to the entire creation process. One way of testing this, of course, would be to compare the creative output of subjects that are allowed to use tools and gestures with those that are not allowed to do so. If no differences are to be found between the first two groups in terms of originality, fluency or complexity, then there is evidence that gestures and body movements can sometimes act just as tools, facilitating cognition by providing easily accessible off-loading. This line of research would consequently address one of the more radical and problematic premises of the embodied cognition program, pointing out if and to what degree might gestures function similarly to the tools we developed in order to improve the efficiency of our mind. But even leaving aside this direction, the conceptualization hypothesis can still provide unexplored perspectives that might one day become fertile grounds for future research.

Psychologists studying creativity have long emphasized the need to differentiate between everyday creativity (usually called little-c) and the more complex forms which result in culturally relevant, highly regarded products and artifacts (e.g. Kaufman &Beghetto, 2009). Embodied creativity studies have ignored higher forms of creativity until now, focusing instead on nomothetic research performed on largely normal samples. This, we think, represents another shortcoming of the field because it leaves unanswered questions regarding how bodily experiences can lead to novel metaphors by grounding abstract representations. If Lakoff and Johnson (1980) are right in that higher cognition ultimately comes down to spatial and body analogies we form early during our ontogenesis, then we might

expect that highly productive artists, poets or novelists differ significantly from the normal population in terms of these early embodied metaphors that they form. To prove or disprove this hypothesis, of course, would require scientists to go beyond standard nomothetic studies performed with the pen and paper and focus on the somatic, neuropsychological and even psychopathological peculiarities of highly creative people. To be more precise, data related to the early life experiences and positive schizotypy symptoms of artists and scientists could complement DTI brain scans in order to investigate the degree to which higher forms of creativity require special white matter architectures found within the thalamus and/or the sensory and association areas of the cortex.

4. Conclusions

Embodied creativity research represents a new and promising direction that can change the manner in which we perceive not only the creative process, but also the influence that the body and the environment can have on shaping creativity itself. Despite the age of some of its core concepts, the field, however, is still underdeveloped. To overcome this situation future studies will have to expand their theoretical considerations greatly and go beyond standard research paradigms, adopting an interdisciplinary framework that successfully fuses ideas from clinical and developmental psychology with those of neuroscience. Ultimately, the pragmatic prospects of the field should not be underestimated, as embodied creativity research can help us better understand the impact physical activities can have on creative thinking, facilitating the development of new techniques dedicated to fostering creative output in return.

References

Adams, F. (2010). Embodied Cognition. *Phenomenology and the Cognitive Sciences, 9*, 619-628.

Adams, F., & Aizawa, K. (2001). The bounds of cognition. *Philosophical Psychology,* 14, 43-64.

Beer, R. D. (1995). A dynamical systems perspective on agent-environment interaction. *Artificial Intellgence,* 72, 173-215.

Boroditsky, L. (2001). Does Language Shape Thought?: Mandarin and English Speakers' Conceptions of Time. *Cognitive Psychology,* 43, 1-22.

Clark, A. (1997). *Being There: Putting Brain, Body and World Together Again.* Cambridge MA: The MIT Press.

Clark, A. (2008). Supersizing the Mind: Embodiment, Action, and Cognitive Extension. Oxford: Oxford University Press.

Clark, A., & Chalmers, D. (1998). The Extended Mind. *Analysis, 58,* 7-19.

Damasio, A. (1999). *The Feeling of What Happens: Body, Emotion and the Making of Consciousness*. Harourt Brace.

Eerland, A., Guadalupe, T., & Zwaan, R. (2011). Leaning to the left makes the Eiffel Tower seem smaller: posture-modulated estimation. *Psychological Science,* 22, 1511-1514.

Guilford, J. P. (1967). *The nature of human intelligence.* New York, NY: McGraw-Hill.

Ehrsson, H.H. (2007). The Experimental Induction of Out-of-Body Experiences.*Science,*317, 1048.

Kaufman, J. C., & Beghetto, R. A. (2009). Beyond big and little: the four C model of creativity. *Review of General Psychology,* 13, 1-12.

Kay, P., & McDaniel, C. K. (1978). The linguistic significance of the meanings of basic color terms. *Language,* 54, 610-646.

Lakoff, G. (1987). *Women, Fire, and Dangerous Things: What Categories Reveal About the Mind,* University of Chicago Press.

Lakoff, G. (2003). How the Body Shapes Thought: Thinking with an All Too Human Brain. In A. Sanford & P. Johnson-Laird (Eds.), *The Nature and Limits of Human Understanding: The 2001 Gifford Lectures at the University of Glasgow* (pp. 49-74). Edinburgh: T & T lark Publishers, Ltd.

Lakoff, G., & Johnson, M. (1980). *Metaphors We Live By.* Chicago: University of Chicago Press.

Lakoff, G., & Johnson, M. (1999). *Philosophy in the Flesh: The Embodied Mind and its Challenges to Western Thought*. New York: Basic Books.

Leung, A.K.Y., Kim, S., Polman, E., Ong, L., &Qiu, L. (2012). Embodied metaphors and creative "acts".*Psychological Science,* 23, 502-509.

Jostmann, N. B., Lakens, D., & Schubert, T. W. (2009). Weight as an embodiment of importance.*Psychological Science,* 20(9), 1169-1174.

Miles, L., Nind, L., &Macrae, C. (2010).Moving through time.*Psychological Science,* 21, 222-223.

Moravec, H. (1988). *Mind Children.* Harvard University Press.

Shapiro, L. (2011). *Embodied Cognition.*New York: Routledge Press.

Slepian, M. L., &Ambady, N. (2012).Fluid Movement and creativity.*Journal of Experimental Psychology: Genera,* 141, 625-629.

Talmy, L. (1983). How language structures space. In H.L. Pick, Jr. & L.P. Acredolo (Eds.), *Spatial orientation: Theory, research, and application* (pp. 225-282). New York: Plenum Press.

Tversky, B. (2009). Spatial Cognition: Embodied and Situated. In P. Robbins & M. Aydede (Eds.), *Cambridge Handbook of Situated Cognition* (pp. 201-216). Cambridge: Cambridge University Press.

Van Gelder, T. (1995). What Might Cognition Be, If Not Computation.*Journal of Philosophy, 92,* 345-381.

Varela, Thompson, E., &Rosch, E. (1991).*The Embodied Mind: Cognitive Science and Human Experience.* Cambridge MIT Press.

Wilson, A.D., &Golonka, S. (2013). Embodied cognition is not what you think it is. *Frontiers in Psychology,* 4, 58.
Wilson, M. (2002). Six views of embodied cognition. *Psychonomic Bulletin & Review,* 9(4), 626-636.
Wilson, R. (1994). Wide Computationalism.*Mind, 103,* 351-374.