

Mental Imagery and Its Limitations

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Mental Imagery: Representations of the World

Scientific attention to mental imagery dates to the 19th century when Francis Galton (1880) prompted subjects to form mental pictures as visual representations of absent objects. Galton noted that some people can provide detailed images, whereas others cannot conjure mental pictures at all. The advent of visualization techniques starting as early as the 60s still begs the question as to whether mental imagery harnesses the power to improve human overall well-being (Pearson, Naselaris, Holmes, & Kosslyn, 2015; Rosario & Leite, 2015) and mastery level performance (Slimani, Chamari, Boudhiba, & Chéour, 2016; Weller, 2016). Today, mental imagery of heightened interest in psychology, especially in cognitive science and neuroscience. Highlighting both the contemporary relevance and limitations of mental imagery will help researchers and practitioners develop a better understanding of its pivotal role in the human experience.

This paper will discuss theoretical, empirical and clinical developments related to mental imagery with a cognitive science perspective. An exploration on the implications of mental imagery practices within the broader realm of psychology will be offered as well. Mounting evidence demonstrates that mental imagery plays a mediating role in cognition (Slimani, *et al.* 2016). The power mental imagery generates with human perception enables one to exert human potential, as it is the mind's eye that offers a window into the world of the human psyche.

Imagery: Constructions of the Past and Future

Mental imagery or the mind's eye (Lang, 2016), relates to perceptual experience. Reflective of perceptual experience, mental imagery occurs in the absence of physical stimuli (Rosario & Leite, 2015). Mental images are prompted by working memory cues (Nęcka, Żak, & Gruszka, 2016) insofar as they function as mental representations that bear intentionality (Bourget, 2017). Although the longstanding view of visual imagery was that it emerged from the presence of actual mental images residing within the mind, body or spirit, the contemporary view has largely dismissed this attitude.

Today, mental imagery is characterized as reconstructions of prior perceptual experience, yet it also creates anticipated future possibilities (Rosario & Leite, 2015; Weller, 2016). As such, mental imagery plays a large, if not pivotal role particularly in memory (Nęcka, *et al.* 2016, Rosario & Leite, 2015) and motivation (Ahn, *et al.* 2016; Wells, 2016). It is also believed to be responsible for innovative and creative developments (Pearson & Logie, 2015). As such, it plays a crucial role in cognitive processes and manifestations.

Mental Imagery in Cognitive Science

Recalling the behaviorist mindset of John Watson (1913), the earlier part of psychological science included skeptical attitudes towards mental representations (Digdon, Powell, & Harris, 2014). A resurgence of interest in imagery emerged with the development of cognitive perspectives around the 60s, whereby the school behaviorism was replaced with mental paradigms and cognitive frameworks.

At this juncture, the study of the mind became widely legitimized as a scientific practice (Griffiths, 2015). Notable points of departure reflect on current lines of research concerning practical applications for targeted psychological and behavioral outcomes. In the same vein, research on imagery based techniques continue to proliferate. Despite that evidence consistently suggests that mental imagery is subjective in nature (Parra, 2015; Rosario & Leite, 2015), the practical implications of findings draw scientific attention to imagery.

More recently, mental imagery based techniques have been extended to serve goals in education, sports and medicine (Weller, 2016). Such procedures have become widely accepted as effective methods for procedural performance (Catenacci, Harris, Langdon, Scott, & Czech, 2016). Although mental imagery as a phenomenon has been likened to mysticism and other non-scientific based rarities (Parra, 2015; Watson, 1913), research on mental imagery has generated ample evidence to support the claim that it enhances measures for favorable human psychological and behavioral outcomes.

Nevertheless, mental imagery is a reconstruction of, yet not synonymous with, perceptual experience. Empirical accounts of any given experience, such as those from retrospective self-reports, are subject to subjectivity (Lang, 2016), thereby introducing vast individual differences in reporting vividness (Bourget, 2017; Murray, *et al.* 2016). Despite individual differences, mental imagery is a common aspect of mental life.

Sunday, McGugin and Gauthier (2016) investigated whether perceptual expertise on cars relates to visual imagery vividness as reflected in brain areas. Findings suggest that developed perceptual experience allows one to create distinct and highly developed mental images. Such considerations warrant the question as to whether there is any validity to approaches that employ mental imagery within psychological contexts.

Neural Representations of Mental Imagery

More recently, neuroscience has demonstrated that mental imagery corresponds with cognitive processes at the neural level. Studies that use brain imaging techniques indicate that humans can recall from imagery without directly referring to substantiating elements. Remembering is a key capacity that allows one to think about events and experiences outside of the present environmental context (Nęcka, *et al.* 2016; Squire & Dede, 2015). As such, mental life is not necessarily drawn from the immediate, external world.

Research on neurocognitive mechanisms suggests that practicing mental task rehearsal activates brain areas corresponding to those of physical tasks. Visualization, also referred to as mental rehearsal (Ignacio, *et al.* 2016), allows one to form a mental image through intentionality to reach a desired outcome. For example, a surgeon consistently practices mental imagery techniques to enhance precision skills in preparation for a complex surgical procedure (Weller, 2016). The conjured scenario, endowed with mental images of a previous favorable performance or a desired future outcome enables immersion in the perceptual experience. Such scenarios can include a suite of sensory modalities (Murray, *et al.* 2016; McNorgan, 2012). By rehearsing such visualization techniques, the skill is enhanced in lieu of physical practice.

Improving Mental Imagery Techniques: Recommendations

Emerging literature in cognitive science and neuroscience sheds light on neural status and its relevance to mental imagery. Given that emotions have a profound impact on cognitive states (Buttigieg, Duffy, & Altmann, 2016) and individual differences underlie mental imagery due to its subjective nature (Parra, 2015; Rosario & Leite, 2015), developing a better understanding of the link between emotional imagery, personal experience and neural mechanisms will spur more effective mental imagery techniques.

The most common reference to the phenomena of mental imagery concerns visual mental images. Nevertheless, the human brain tends to formulate and maintain holistic mental images (McNorgan, 2012). Naturally, multisensory integration in relation to mental imagery is key to adaptive behavior, as it gives rise to perceptions and coherent representations of the world (Murray, et al. 2016; McNorgan, 2012). By focusing on full, integrated depictions of imagery, new and innovative imagery techniques can be developed. The strategic application of distinct and comprehensive imagery tasks promptly after a traumatic experience, for example, can reduce the frequency of intrusive images (Pearson, et al. 2015; Rosario & Leite, 2015). It is the coherency among representations that allows humans to formulate meaning out of perceptual experience.

Conclusion

As illustrated, underscoring the strengths as well as limitations of mental imagery informs researchers and practitioners of the important role it plays in human psychology. The power that mental images bears on mental processes demonstrates its link to representations drawn from the external world. The overlap between mental imagery and perception not only profoundly impacts one's world schema, it exerts human potential.

Moreover, mental imagery is so closely intertwined with perception that navigates our sense of reality. As an unrivaled tool, it produces enough mental inertia to profoundly impact mental processes and subsequent behavior. Key insights concerning the potential possibilities of mental imagery can be useful for future research and clinical developments moving forward.

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