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Mental Imagery

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Mental imagery occurs when you represent objects sensorily without a direct stimulation of the senses, for instance, when you think of a lemon and, although you do not see one, the brightness of its yellow somehow appears to you; when you have the impression that a certain pattern of shapes and colors is still there, after moving your gaze away from a strong light spot to a darker one; when you see a horse in a cloud. These are visual cases but mental imagery can come in other perceptual modalities (e.g., auditory, olfactory, tactile), and, indeed, it has been described as *quasi*-perceptual or *perception-like* in nature. The prefix and the suffix are meant to stress that although mental imagery resembles perception in relevant ways, it also shows important differences, which seem to relate mental imagery to imagination. Mental imagery connects to both perception and imagination, so it is important to delineate its specific nature and functions.

History

The idea that the mind is able to evoke objects and situations when they are not actually present can be traced back in Western thought at least to Aristotle, who famously claimed that we cannot think without mental images, *phantasmata* (i.e., traces of the original sensory manifestations provided by the senses). However, it was not until the late 19th century that the technical term *mental imagery* was introduced by the early experimental psychologists (e.g., Fechner, Galton, Wundt, and Titchener), who were mainly interested in the phenomenological aspects (e.g., vividness, stability) of *mental vision* or *visual imagination* (other terms used to refer to mental imagery; [Galton, 1880](#)) and how they could help to distinguish it from perception. During this first phase of mental imagery experimentation, [Perky \(1910\)](#) conducted her renowned experiments, in which subjects were asked to imagine objects (e.g., a banana, a leaf) while, unbeknownst to them, faint images of the same objects were projected onto a screen. Participants were unable to detect the projected images, thus suggesting that perceptual states can be confused with mental images.

The importance of mental imagery in explaining cognition began to decline around the 1920s. Two factors mainly contributed to this fall. First, evidence had accumulated for the existence of imageless thought (Galton had already found subjects, including leading scientists, unable to entertain mental images). Second, there was a shift from what is inside individuals' heads and introspection to what can be externally observed with objective measures (instantiated in the behaviorist approach).

New developments in experimental psychology (e.g., the discovery of rapid eye movement sleep, research on hallucinogenic drugs), together with a general cognitive turn, led to a revival of interest in mental imagery from the 1960 onward ([Richardson, 1969](#)). Despite its fluctuating fortunes, mental imagery is still a prolific research topic engaging the concurrent efforts of philosophy, psychology, and neuroscience.

Core concepts

Mental imagery is a notion somehow caught between two others: perception and imagination. To the former, mental imagery owes its sensory nature, yet it is unclear to what extent it is like perception. It is an open question whether they differ merely quantitatively or qualitatively, and along which dimensions. What makes mental imagery different from perception seems to be explained by it being a form of imagination, if not imagination tout court, but consensus is lacking and the debate is dominated by either perceptualist or imaginativist accounts.

Mental Imagery and Perception

Mental imagery is often defined as simulating perception. This idea can be cashed out in at least three ways: procedurally (i.e., mental imagery exploits much of the same cognitive mechanisms and processes underlying perception), phenomenologically (i.e., mental imagery simulates the “what it is like” to have a perceptual experience), and functionally (i.e., mental imagery can play most of the functions that perception has in our mental economy). Evidence supports all these dimensions but also shows that perception and mental imagery differ to some extent. For instance, comparative data show that perception and mental imagery share brain regions and networks, but the exact contours of the overlap are still debated ([Spagna et al., 2024](#)) and might be more limited than what has been initially assumed ([Brogaard & Gatzia, 2017](#)) [see [Visual Cognitive Neuroscience](#)].

Mental Imagery and Imagination

Mental imagery is rarely detached from the imagination, and when a distinction is made, it is to contrast mental imagery with other types of imagination or with creativity. The simulative nature of mental imagery has led to characterizing it as a variety of imagination (i.e., perception-like imagination), on the basis of the definition of imagination as a simulative capacity ([Currie & Ravenscroft, 2002](#); [Goldman, 2006](#)). However, it can be claimed that the type of mental simulation involved in mental imagery and perception-like imagination is not the same ([Arcangeli, 2020](#)). Distinguishing between mental imagery and imagination is helpful in recognizing that mental imagery can be recruited by a variety of capacities (e.g., belief, desire, memory) without necessarily invoking imagination, not even in its perception-like form ([Nanay, 2023](#)), and independently of whether imagination can come without mental imagery ([White, 1990](#); [Kind, 2001](#)).

Questions, controversies, and new developments

Regardless of the specific framework within which they are articulated (e.g., traditional representationalism, embodied views, predictive coding), both perceptualist and imaginativist accounts of mental imagery have their shortcomings, especially in explaining all the functions attributed to mental imagery ([Jones & Wilkinson, 2020](#); [Cavedon-Taylor, 2023](#)). The tendency in the literature is to pay more attention to the nature than the function of mental imagery, and mainly to its visual form (for other modalities, see, e.g., [Lacey & Lawson, 2013](#); [Deroy, 2020](#); [Regev et al., 2021](#)). This is exemplified by the

mental imagery debate on how to characterize the format of mental imagery (pictorial, for Kosslyn, and descriptive, for Pylyshyn), which dominated the second phase of mental imagery experimental studies and directed the focus on the underpinnings of visual mental imagery (e.g., whether mental imagery activates the early visual cortex).

The lively debate on congenital *aphantasia*—the lifelong condition of reduced or absent mental imagery ([Zeman, 2024](#))—is putting pressure on many of the unresolved issues. Although *aphantasics* are unable to form mental images and have difficulty mentally projecting themselves into the past and into the future, they are otherwise healthy individuals and in fact exhibit quite typical behavior in several contexts that are taken to require the use of mental imagery (e.g., mental rotation tasks [see [Figure 1](#)], counting windows in one's house, dreaming). This raises the question of whether mental imagery is genuinely important for human cognition. Do aphantasics lack mental imagery, or do they access it via alternative routes? Are imagination and perception somehow impaired in aphantasics? What about aphantasia with respect to nonvisual perceptual modalities? These are among the most pressing questions that require further investigation.

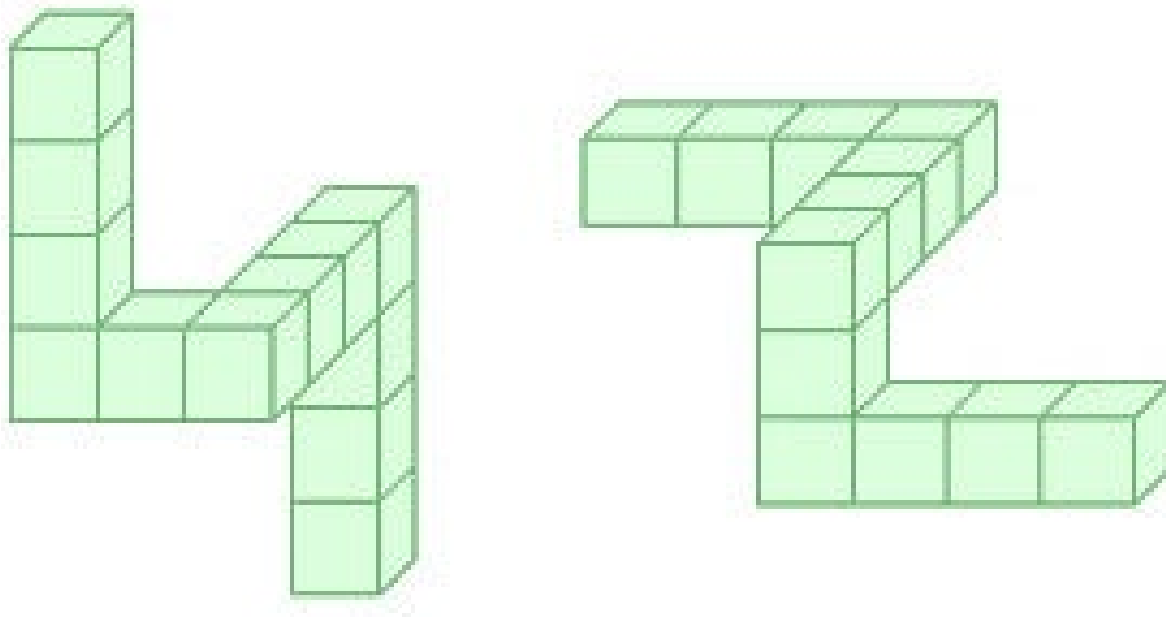


Figure 1

Example problem from a mental rotation task. When rotated, are these two three-dimensional figures identical?

Broader connections

Mental imagery connects with almost all major topics in cognitive science (perception, action, imagination, memory, desire, emotions, knowledge), as it is claimed to play an important role in a wide variety of phenomena, e.g., perceptual illusions, dreams, psychological disorders, implicit biases, and

synesthesia. Moving away from perceptualist and imaginalist accounts of mental imagery may shed new light on all these research fields.

Further reading

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