

Probing the unimaginable: New data help to understand the nature of aphantasia

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Artistic depiction of the capacity to produce mental images. Credit: Paris Brain Institute.

"Think of a white sandy beach on a paradise island. Can you see it?" The ability to visualize a place, object, or place on request varies significantly between individuals. But some people cannot conjure up mental images at all: This trait is known as aphantasia, literally "a defect of imagination."

Aphantasia is not a disorder of the mind but an astonishing cognitive peculiarity that could help us understand how visual mental imagery works. At Paris Brain Institute, Jianghao Liu and Paolo Bartolomeo (Inserm) have shown that people with aphantasia have characteristics that can be described objectively: they are slower than average at processing visual information and have difficulty absorbing it. These observations are described in a [recent study](#) published in the journal *Cortex*.

The ability to visualize faces, objects, landscapes, or even scenes from the past exists on a spectrum. While some can picture the layout of a city in minute detail and mentally walk through it, street by street, others have a perfectly blank internal cinema. In this case, we speak of aphantasia—the inability to voluntarily produce the visual mental image corresponding to an idea.

People whose aphantasia is congenital—i.e., not due to a stroke, [brain injury](#), or [psychiatric illness](#)—become aware of their peculiarity reasonably late in life. Indeed, this small deficit in visualization does not cause any handicap, and they have no reason to suspect they are atypical. Nor do they realize that at the other end of the spectrum are hyperphantasic individuals who can produce mental images as precise as illustrations in a book.

"Talking to these people is fascinating. We tend to think that access to [visual perception](#), conceptualization, and memory is the same for everyone. Nothing could be further from the truth," Paolo Bartolomeo, neurologist and researcher at Paris Brain Institute, says. "Aphantasics cannot mentally picture what their parents, friends, or partner look like when they are away. But they can still describe the [physical characteristics](#) of their loved ones: this visual information has been stored, in one way or another."

Visual mental imagery in question

There is currently a lively debate about the origin of aphantasia. Is it linked to a perceptual deficit? Emotional and psychological factors? A slight difficulty in accessing one's sensations?

To answer this question, Paolo Bartolomeo and Jianghao Liu, a doctoral student in the "Neurophysiology and Functional Neuroimaging" team at Paris Brain Institute, recruited 117 volunteers—including 44 aphantasics, 31 hyperphantasics and 42 people with typical mental imagery—and gave them a mental imagery and visual perception test.

"Our test, called the Imagination Perception Battery (BIP), is designed to assess the link between perception and mental imagery through the different visual qualities that enable a scene to be described—such as shape, color, position in space, presence of words or faces," Jianghao Liu explains.

Participants were asked to look at a blank screen. At the same time, an off-screen voice announced a [visual quality](#) (such as "shape"), followed by two words corresponding to concepts they had to materialize in their minds as accurately as possible ("beaver" and "fox" for example). The voice also gave them a qualifier (such as "long"); then, the participants were asked to decide which of the beaver or fox best matched the epithet "long."

The speed and relevance of responses were recorded, and the respondents were asked to assess the quality of the mental image they had—or had not—managed to produce from the description. Finally, they had to take a perception test in which the stimuli were presented in a visual format: the long fox appeared in the form of an image accompanied by its audio description without the participants having to picture it.

When imagination takes its time

"Our results indicate that the performance of people with aphantasia is equivalent to other groups in terms of perception and the ability to associate a concept with its representation," Liu comments. "With one exception. Aphantasics are, on average, slower than hyperphantasics and typical imagers when it comes to processing visual information, particularly shapes and colors. They also have little confidence in the accuracy of their answers."

Previous studies have shown that aphantasics are just as quick as other people to answer questions that require manipulating abstract concepts. Therefore, only the processing of visual information is delayed for them. How can this phenomenon be explained?

"Participants in the aphantasic group perceive elements of reality accurately and show no deficits in memory and language processing. We believe that they present a slight defect of what we call phenomenal consciousness. This means that they have access to information about shapes, colors, and spatial relationships—but that this [visual information](#) does not translate into a visual mental image in conscious experience," Bartolomeo says.

"This peculiarity is probably compensated by other cognitive strategies, such as mental lists of visual characteristics, which allow aphantasics to remember everything they have seen."

The future of perception

These preliminary results are limited by the data collection method, which consisted of an online questionnaire. However, they put us on a promising track to understand how visual mental imagery works. Future

studies could reveal the neural mechanisms underlying these observations and, ultimately, help us to understand the visualization deficits specific to stroke patients.

"We also hope to develop interventional tools for certain psychiatric illnesses, such as [post-traumatic stress disorder](#) (PTSD), which is characterized by the eruption of images from traumatic memories. If we could rid patients of these intrusive mental images, it would greatly promote their recovery," Liu concludes.

More information: Liu, J., Bartolomeo, P., Probing the unimaginable: The impact of aphantasia on distinct domains of visual mental imagery and visual perception. *Cortex* (2023). [DOI: 10.1016/j.cortex.2023.06.003](https://doi.org/10.1016/j.cortex.2023.06.003)

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