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Letter

Aphantasia as imagery blindsight

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In a recent article in *TiCS* [1], Zeman provided a masterful and balanced review of aphantasia. However, in doing so, he might have been too generous to some accounts. Specifically, unlike Zeman, we consider the view that aphantasia involves nonconscious imagistic representations [2] to be clearly superior to other views. Here, we argue against these other views as they were described by Zeman. In addition, we address some additional arguments that have been raised to counter the idea that aphantasia involves nonconscious imagistic representations [3], which were not addressed by Zeman in his review.

Against the view that aphantasics lack imagistic representations, some aphantasics perform as well as other subjects in mental rotation tasks and show the typical relationship between reaction times and angular differences [4]. This is difficult to explain if they lack imagistic or iconic representations altogether.

It is also possible to decode contents from the visual cortex during mental imagery and working memory tasks in aphantasia, despite the paucity of reported imagery experience [5]. For example, during a working memory task, stimulus orientation could be decoded equally well from the visual cortex in both subjectively weak and strong imagers [6]. Performance could also be predicted from the decoded information equally well across groups. Again, this is difficult to reconcile with the idea that aphantasics lack imagistic representations altogether.

Zeman [1] also discussed introspective error as a possibility. Similar to him, we find this unlikely, as aphantasics are otherwise cogent. Although some aphantasics also lack experience in inner voices, imagined touches, and so on, in many cases the deficit is specific to vision, rendering a general account of introspective deficit unlikely. Furthermore, aphantasics do show some behavioral and physiological differences under some imagery tasks, as already reviewed by Zeman. For example, several studies of aphantasia reported a lack of effects for priming of binocular rivalry by imagery, imagery-induced pupil dilation, or skin conductance response when the expected imagery is threatening.

In another recent article, Blomkvist [3] took the lack of these effects as a challenge to the nonconscious imagery view. Why would nonconscious representations not be sufficient to drive these effects? However, in these tasks, it was unclear whether the subjects with aphantasia followed the instructions as expected. When one is not aware of one's own imagery, being asked to induce it may feel somewhat impossible. If the task was not set up to incentivize imagery, or to penalize its failure, subjects simply may not have complied. In passive imagery cases, aphantasics may likewise not engage imagery if it is not required by the task.

There is another concern raised by Blomkvist [3], which is that aphantasics have difficulties recalling episodic memory details and imagining future events [5,7,8]. A mere lack of awareness of imagery may not immediately explain these memory deficits. However, we doubt that these deficits are genuine.

An analogy with blindsight might help explain these results. Patients with blindsight report not seeing some stimuli, even when forced-choice performance shows that they process the relevant features [9,10]. Similarly, aphantasics might not report some details of memories and future imaginations in free-report interviews [5,7,8] because they do not consciously experience imagery during recall. Given that they are not subjectively aware that they have the available information, they might naturally volunteer fewer details. However, just as in blindsight, forced-choice memory tasks may be more revealing, and they show that aphantasics do encode the relevant memories [4,5,11]. Therefore, the lower level of recalled episodic memory details in aphantasia might be due to the unwillingness to spontaneously report information, as a result of a lack of conscious experience, rather than reduced capacity *per se*.

Indeed, aphantasia might be akin to blindsight for the mind's eye. Thinking about it this way may also stimulate further research. Similar to aphantasia, blindsight is a deficit of awareness in a specific sensory modality (i.e., vision). Preliminary evidence suggests reduced visual metacognition in aphantasia [12], similar to impaired visual metacognitive sensitivity in blindsight [9]. One explanation could be that explicit perceptual metacognition might rely heavily on conscious experience. Future studies could investigate metacognitive sensitivity in imagery tasks using signal detection theoretic methods and, importantly, also test for blindsight-like psychophysical signatures in aphantasia, such as dissociations between yes/no detection and two-alternative forced-choice detection performances [10], using memory tasks.

Our view is not that aphantasia is fully functioning mental imagery minus awareness. For instance, besides the differences described above, in mental rotation tasks, reaction times are longer in those with aphantasia [4]. In other words, a lack of imagery awareness might also have

functional consequences. However, the possible existence of nonconscious imagery is intriguing and may complement studies of blindsight in uncovering neural mechanisms for visual awareness. It is also theoretically significant, because it suggests that cognitive access (the availability of information for rational decision making) can occur without phenomenal consciousness. We may call this phenomenon 'blank access'.

Finally, we fully agree with Zeman and others that aphantasia is likely a heterogeneous condition. However, most neurocognitive conditions are not completely homogenous. This should not discourage us from trying to come up with parsimonious explanations that may provide useful insights for most cases. Although some aphantasics evidently engage in semantic and other cognitive strategies in lieu of imagery, it is possible that most of them do so primarily because they lack awareness of their imagistic abilities, not because they lack such abilities altogether.

Declaration of interests

The authors declare no competing interests.

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