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Aphantasia: a philosophical approach

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ABSTRACT

In the last six or seven years, aphantasia has received attention from media outlets, television shows, and social networks. This alleged condition, however, has hardly been discussed in the philosophy of mind. In this paper, I assess some of the research conducted in cognitive science and provide, for the first time in the literature, a comprehensive assessment of possible explanations for aphantasia. Specifically, the hypotheses I submit for consideration ascribe the reports of absence of visual imagery to (i) a discrepancy at the level of concepts, (ii) a failure of attentional mechanisms that modulate introspection, (iii) a lack of personal-level access to sub-personal imagistic representations, and (iv) an absence of sub-personal imagistic representations. I conclude that hypotheses (i) and (ii) can be rejected while hypotheses (iii) and (iv) can be accepted as defensible candidates for explaining aphantasia, although the latter is better suited to account for the available evidence in both comparative and absolute terms. Finally, I present some educated guesses and empirical research that could shed further light on the study of this condition.

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1. Introduction

Mental imagery seems to be a ubiquitous component of mental life. Ask someone to close their eyes and not imagine an elephant coming down the street, and it could already be too late; mental images of the heavy animal crossing a red traffic light and smashing everything in its path may spontaneously and effortlessly come to their mind. Mental imagery is also claimed to be the very fabric of literature and the arts. It is commonplace to hear that some people do not want to see the movie version of a story they have read to avoid the almost certain disappointment of seeing characters and places depicted differently than they imagined. The importance of mental imagery is no less apparent in science. From Euclid defining the sphere through the imaginary rotation of a semicircle over its diameter to Einstein's reliance on hypothetical scenarios conceived in the mind's eye, visualization permeates every

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corner of scientific practice. Finally, mental imagery also plays a central role in philosophy. Controversies about the rational role of mental imagery are found as early as Plato and Aristotle and as recently as the discussions on the epistemic status of thought experiments in contemporary analytic philosophy.[1]

Despite the apparent role of mental imagery in supporting and facilitating a substantial part of our mental lives, some otherwise healthy individuals have recently reported a complete inability to produce it. While most individuals can visualize, to use the previous example, an elephant coming down the street, others report being unable to do so—they do not have, or so they claim, a "mind's eye." They employ imagistic vocabulary just as everyone else, but, for them, having mental images is nothing but a figure of speech—a metaphor with no literal meaning.

This apparent condition, virtually neglected for more than a century since first described by Galton (1880), has recently received the name of "aphantasia."[2] The term, coined by Zeman and colleagues in their seminal work, derives from the privative "a" and "phantasía," a Greek word commonly translated as "imagination" (Zeman et al., 2015).[3] Previous terms used in the psychological and neurological literature include "visual irreminiscence" (Nielsen, 1946), "defective revisualization" (Botez et al., 1985), and "blind imagination" (Zeman et al., 2010). Individuals with this hypothetical condition are currently called "aphantasics" (D'Aloisio-Montilla, 2017; Keogh & Pearson, 2018; Watkins, 2018). Other terms used in the literature include "non-imagers" (Marks, 1986), "image-blinds" (Faw, 1997), and "non-visualizers" (Kendle, 2017).

Most self-described aphantasics, however, report having mental imagery during hypnagogic states and dreams; and even though recent surveys revealed that they have less frequent and vivid dreams compared to control groups, the absence of mental imagery during these states should not be taken to be a defining feature of aphantasia (Dawes et al., 2020; Faw, 1997; Kendle, 2017; Zeman et al., 2020). Nor is the absence of mental imagery limited to the visual sensory modality. Although the paradigm case of aphantasia is the lack of visual imagery —and this paper is limited to the research conducted in that sensory modality—there are reports of lack of mental imagery in modalities other than visual, the most salient being the inability to produce acoustic imagery in inner speech and silent reading (Dawes et al., 2020; Faw, 2009). Some scholars use the terms "visual aphantasia," "auditory aphantasia," "gustatory aphantasia," and so forth to refer to lack of mental imagery in other modalities (Monzel et al., 2022; Tween, 2019). A complete inability to form any sensory experiences in the absence of the proper stimuli is sometimes referred to as "full aphantasia" (Tween, 2019) or "multisensory aphantasia" (Monzel et al., 2022).

This alleged condition is also claimed to have different etiologies, for it would be important to distinguish between "acquired" and "congenital" aphantasia (Dawes et al., 2020; Pounder et al., 2022; Zeman et al., 2015). While some cases of acquired aphantasia were reported in the psychological and neurological literature throughout the twentieth century, usually in connection with brain injuries, cases of congenital aphantasia started being widely reported only after the term "aphantasia" gained some traction.[4] This is the case of otherwise healthy individuals who learn about their condition while having a casual conversation, watching television, or browsing on the internet and come to the astonishing conclusion that, for other individuals, having mental images is more than a figure of speech.[5] In this regard, congenital aphantasia could constitute a paradigm case of hidden differences in phenomenal experience; that is, subjective differences of which individuals remain largely unaware, concealed by the assumption that what is in one's mind is in everyone's mind (Lupyan et al., 2023; Phillips, 2014).

In the last six or seven years, aphantasia has received attention from media outlets, television shows, and social networks. For instance, articles about the topic appeared in *The New York Times* (2015) and *Scientific American* (2018); news stories were broadcast on the BBC (2015) and CBC (2016); testimonials were shared at TEDx events (2016); and references were made in Netflix's *Space Force* (2020). Aphantasia discussion groups also proliferated on Facebook, Reddit, and other social networks, not to mention the creation of the awareness website Aphantasia Network. In 2020, Altmetric placed Zeman et al.'s (2015) seminal work in the top 1% of scientific outputs, reflecting a sustained surge of interest in the phenomenon. The alleged condition, however, has hardly been discussed in the philosophy of mind. Just a couple of years ago, for example, the entry of "mental imagery" in the *Stanford Encyclopedia of Philosophy*, authored by N. J. T. Thomas, neither mentioned aphantasia nor discussed imagery deficits beyond the incidental and skeptic note that "a few people may insist that they rarely, or even never, consciously experience imagery" (Thomas, 2021, p. 3). By the time of submitting this paper, Thomas's entry had been replaced by Nanay's, which mentions aphantasia from the first section of the article, albeit without delving much into details (Nanay, 2021a). Notable exceptions that discussed cases of lack of mental imagery in the philosophical literature before the term "aphantasia" was even coined are Faw (2009) and Phillips (2014).[6]

2. The puzzle

The puzzle raised by aphantasia is how to explain the enormous range of tasks that self-described aphantasics are objectively capable of performing despite subjective reports of lack of visual imagery. As Brain wrote more than half a century ago, "perhaps the most surprising

feature is how little the loss of voluntary visualization impaired functions in which visual imagery might have been expected to play some part" (Brain, 1954, p. 290). Alleged aphantasics can carry on activities in a way that is apparently indistinguishable from other individuals; from telling a story to drawing an object, there seem to be no behavioral differences between aphantasics and visualizers aside from their reports. Self-described aphantasics have developed successful careers as graphic designers, fine artists, creative photographers, screenplay writers, film directors, and many other occupations in which visual imagery is considered to play an essential role. This serves to confirm what Galton noted more than a century ago, that "men who declare themselves entirely deficient in the power of seeing mental pictures can nevertheless give life-like descriptions of what they have seen, and can otherwise express themselves as if they were gifted with a vivid visual imagination" (Galton, 1880, p. 304).

Experimental research makes this puzzle even more interesting. In the study of visual imagery, cognitive scientists often deploy a battery of standardized tests. Some of these tests are intended to capture and parametrize individuals' subjective reports of visual imagery, while others are intended to measure their objective performance in imagery-related tasks. Surprisingly, low ratings in reported visual imagery among self-described aphantasics stand in strong contrast with the normal scores they achieve in tests devised to measure objective visual imagery and visual memory capacities.

The standardized tests cognitive scientists use to capture and parametrize the subjective reports of visual imagery are the Vividness of Visual Imagery Questionnaire (VVIQ) (Marks, 1973), the Spontaneous Use of Imagery Scale (SUIS) (Reisberg et al., 2003), and the Object and Spatial Imagery Questionnaire (OSIQ) (Blajenkova et al., 2006). The VVIQ is a sixteen-question questionnaire in which participants are asked to visualize some scenes and rate the vividness of their experiences on a five-point Likert scale. Individuals may be asked, for example, to imagine "a country scene which involves trees, mountains and a lake" or "some relative or friend whom you frequently see," and then to rate the picture that comes before their mind's eye on a scale from "no image at all" to "as clear and vivid as normal vision." SUIS and OSIQ do not explicitly ask the participants to engage in visualization exercises, but instead, participants are provided with certain statements and asked to express agreement or disagreement with on a five-point Likert scale. Individuals may be asked, for example, to rate their agreement with statements such as, "When I hear a commercial on the radio, I have a clear picture of what the announcer is trying to sell," or, "If I am looking for new furniture in a store, I always visualize what the furniture would look like in particular places in my home."

The standardized tests that cognitive scientists use to measure objective performance in imagery-related tasks are the tests of mental rotation (Shepard & Metzler, 1971), recollection of details (Behrmann et al., 1994; Weber & Castleman, 1970), and identification of colors (Eddy & Glass, 1981; Heuer et al., 1986). The test of mental rotation in the version of Shepard and Metzler works with three-dimensional objects formed by ten cubes. The examiners present the participants with two objects with different degrees of rotation, and the participants must determine as quickly as possible whether the objects presented are identical in shape. The tests of recollection of details, which are more associated with visual memory capacities, may ask the participants to answer questions about parts of animals (e.g., elephant: "Does it have a long tail proportional to its body size?" "Does it have floppy or upright ears?"), determine whether letters have certain characteristics (e.g., letter "f": "Does it extend below the line?" "Does it have curved parts?"), and answer questions about salient features of famous people (e.g., Tony Blair: "Does he have large ears?" "Does he have a mustache?"). Finally, the tests of identification of colors require the participants to make comparative judgments about different hues of color (e.g., "Is the green of grass darker than the green of a pine tree?" "Which of these five reds is the color of a stop-sign?").

Success in these tests has always been considered to be a sensitive indicator of the presence of mental imagery because, first, most individuals report solving the required tasks by conjuring visual images and, second, the objects, details, and colors at issue are likely to be coded visually as opposed to verbally or otherwise (Dean & Morris, 2003; Shepard & Metzler, 1971; Thomas, 2021).[7] It was not expected that otherwise healthy individuals who sincerely report a lack of visual imagery could succeed in tests devised to measure objective performance in imagery-related tasks; and yet, this assumption was wrong. As Phillips puts it, there is a "puzzle raised by the apparent lack of correlation between objective task performance in imagery tasks and reported imagery" (Phillips, 2014, p. 279). But even if some correlations were to be found, this would not diminish the puzzle of how individuals who supposedly have no visual imagery can solve these tasks at all. The distinct possibility that self-described aphantasics are indeed aphantasics elicits important psychological and philosophical questions; chiefly, how can there be individuals who retrieve visual information about objects in their absence without mental imagery, and how they can do it without compromising the accuracy and richness of the visual information they can retrieve?

Moreover, the ability to retrieve visual information in the alleged absence of mental imagery has made some researchers compare aphantasia with blindsight; that is, cases of cortically blind patients who, nevertheless, are able to solve visual and motor tasks that would be impossible to solve

without visual information (D'Aloisio-Montilla, 2017; Fulford et al., 2018; Phillips, 2014; Zeman et al., 2010). Although aphantasia and blindsight are entirely different and unrelated conditions, aphantasics and blindseers share the ability to solve tasks without metacognition of the first-order mental states that enable their performance; while blindseers can answer questions about objects in front of them and dodge obstacles that would have otherwise involved conscious perception, aphantasics can answer questions about absent objects and perform spatial operations that would have otherwise involved conscious visual imagery.

3. Four hypotheses

In what follows, I present four hypotheses that researchers have put forward in relation to reports of lack of visual imagery and assess some of the evidence available in cognitive science. However, evaluation of the hypotheses cannot be limited to surveying the available empirical research but must engage with conceptual problems that emerge from data interpretation. Understanding aphantasia depends not just on empirical findings and cognitive models but also on what we make of concepts like that of "consciousness," "experience," and "awareness." For example, some psychologists and cognitive scientists use the term "experience" almost automatically with perceptual language, and philosophers have to disambiguate where there is a question of whether the individual is aware of the relevant mental state (Lycan, 1996). Similarly, the distinction between what is taken to be "conscious" and what is taken to be "unconscious" is usually not accompanied by an explanation of whether it hinges upon attentional processes that modulate introspection or whether it roughly overlaps, at least extensionally so, with the distinction between personal and sub-personal states (Drayson, 2012).

It is important to mention that the following list is not intended to be exhaustive of the possible explanations of aphantasia.[8] Also, even when the following hypotheses are presented as alternative explanations—and in an important sense, they are competing hypotheses about aphantasia—this exposition should not preclude the possibility that more than one hypothesis could describe the condition of a particular individual, or that different individuals could report lack of visual imagery for different reasons.

The hypotheses under consideration are the following:

DESCRIPTION: Individuals who report no visual imagery are simply describing their mental experiences in a different way, with no significant cognitive differences between self-described aphantasics and other individuals.

INTROSPECTION: Individuals who report no visual imagery fail to become aware of personal-level mental states that they nonetheless have, due to intrinsic unreliability or abnormal performance of introspection.

DISCONNECTION: Individuals who report no visual imagery have sub-personal mechanisms with imagistic representations that are not accessible at a personal level.

ABSENCE: Individuals who report no visual imagery have no sub-personal mechanisms with imagistic representations but use alternative cognitive strategies to compensate in activities that would otherwise involve visual imagery.

It is worth noting that DESCRIPTION and INTROSPECTION deny the existence of substantial differences between self-described aphantasics and visualizers besides their reports, and thereby conclude that there is no such condition as aphantasia in a stricter sense—individuals that report lack of visual imagery are mistaken in thinking that they lack visual imagery. By contrast, DISCONNECTION and ABSENCE acknowledge the existence of substantial differences in the capacities to conjure visual imagery among individuals and provide an explanation of aphantasia in terms of a condition. In accordance with the above, DESCRIPTION and INTROSPECTION either downplay or outright disregard the authority of self-described aphantasics' reports, whereas DISCONNECTION and ABSENCE offer explanations in consonance with reported experiences. Differences between these hypotheses will become clear in the following sections.

3.1. DESCRIPTION

According to DESCRIPTION, individuals who report no visual imagery are simply describing their mental experiences in a different way, with no significant cognitive differences between self-described aphantasics and other individuals. The insight underpinning DESCRIPTION is that mental experiences are confusing, and we should not be surprised to find that discrepancies between subjective reports are at the level of concepts; while some individuals may be prone to recognize a similarity between imagery and perception, others may claim that they do not see mental images "any more than a man sees the thousand lines of Sophocles which under due pressure he is ready to repeat" (Galton, 1880, p. 302). After all, imagining something is different from seeing something, and given that it is impossible to provide an ostensive definition to calibrate the referents of the concepts used to communicate our mental states, it is uncertain whether two individuals are applying them in the same way. In short, according to DESCRIPTION, discrepancies between mental imagery reports are to be understood as a form of miscommunication.

This hypothesis has been suggested by Thomas (2001) and discussed, although not endorsed, by Schwitzgebel (2011). It is also the most parsimonious explanation about alleged cases of aphantasia and that which captures the pre-theoretical intuitions of most visualizers when presented with the case of individuals who claim to have no visual imagery whatsoever (Faw, 2009; Lupyan et al., 2023; Phillips, 2014).

Thomas's main argument is that introspective reports, in general, cannot be taken at face value since they are theory-laden—and hopelessly so. Folk and scientific theories influence the way we describe our mental states to the extent that reported discrepancies in subjective experience are more reflective of differences in our personal idiosyncrasies than actual differences in our mental states. Thomas brings up the historical case of J. B. Watson, who went from reporting that his mental imagery was as clear as perception to denying its very existence some years later, eventually rendering the concept of mental imagery to a "sheer bunk" and "medieval" superstition. These differences in subjective reports cannot be ascribed to significant changes at the cognitive level or systematic dishonesty in the reports but, rather, the argument goes, "it is much more plausible to believe that they reflect changes in how the people concerned were inclined to conceptualize their minds' workings, and, thus, to describe them verbally, to themselves as well as to others" (Thomas, 2001, p. 5).

Subjective tests of visual imagery, from Galton's breakfast table to Marks's VVIQ, import concepts in connection to the visual modality—our conceptual repertoire includes phrases such as "to have a mental picture," "to create a mental image," "to see with the mind's eye," and so forth. Now, vision gives us a grasp of the outer world, and we perceive objects as being located within our egocentric space—but where are mental images located? Does it make sense to compare mental imagery with physical images so as to justify the figure of speech of mental pictures that can be seen in the mind's eye? Mental pictures are certainly not photographs that can be handed around the table or displayed on the phone—you cannot point at a mental image to clarify what you mean and settle a discussion. In short, there are many disanalogies between what is conceptualized as mental imagery and the metaphors used to describe it, and, as Thomas argues, "because it is private, it is hard to be sure that we are applying the words we use to describe it in the same way that the next person does" (Thomas, 2001, p. 6).

Despite our charitable efforts, DESCRIPTION does not seem to be a good explanation for aphantasia. It is true that notions of mental imagery may very well differ among individuals. One may even concede that what seems to be univocal in a certain context may be equivocal in others and that subjective reports are theory-laden. Still, to claim that two individuals could be in roughly the same mental states and yet one of them fails to describe them in terms of mental imagery is nonetheless

something different. The phenomenal similarity between visual imagery and visual perception is not only informed by ordinary life, as evidenced by the conceptual repertories used to describe these mental states across many languages, but by psychological practice as well (Brogaard & Gatzia, 2017; Nanay, 2015a, 2021b; Price, 1952). To begin with, visual imagery and visual perception represent the same determinable properties, such as shape and color. Visualizing an elephant involves visualizing, at a minimum, certain color patches arranged in a certain way. Second, much like visual perception, visual imagery is perspectival. Visualizing an elephant amounts to visualizing it from a certain perspective, obscuring the other side. Although visualizers can switch from, for example, the front view to the back view, these views are not simultaneously given. Third, both visual imagery and visual perception can be sharpened through attention. When visualizing an elephant, visualizers might not be initially aware of the elephant's tail size or ear shape, but they can focus on these features by directing their attention toward them. But perhaps the most compelling evidence of the phenomenal similarity between visual imagery and visual perception comes from Perky's famous experiments in the early twentieth century, along with their successive replications (Perky, 1910; Segal, 1972; Segal & Nathan, 1964). In these experiments, participants looking at a wall were given the task of visualizing objects such as a tomato or a banana while the experimenters projected, without the participants' knowledge, faintly colored images of these objects. The "Perky effect" showed that participants took themselves to be visualizing the objects being projected. The fact that visual perception and visual imagery could be systematically confused under these settings suggests that the corresponding mental representations are similar. If the standard interpretation of these psychological experiments is correct, one might ask how plausible it is that a group of individuals could fail to describe mental imagery as having some of the characteristics they nonetheless ascribe to perception.

Some self-described aphantasics report grasping something they describe as "subvisual models" or "subliminal imaging," which certainly could give a certain credibility to DESCRIPTION. However, others adduce having no representations whatsoever supporting their performance in visual imagery and visual memory tests. For these individuals, there is no mental representation that helps them to determine, for instance, if two three-dimensional structures in the test of mental rotation are the same, nor do they report any kind of mental representation in virtue of which they can determine whether elephants have long tails in proportion to their body sizes. Most self-described aphantasics simply pause for a moment and claim they "just know" or "remember" the information at issue (Faw, 2009; Kendle, 2017; Phillips, 2014).

Now, even though this argument against DESCRIPTION may not be conclusive, additional reasons in the following sections will rule out this hypothesis as a general explanation for aphantasia.

3.2. INTROSPECTION

According to INTROSPECTION, individuals who report no visual imagery fail to become aware of personal-level mental states that they nonetheless have, due to intrinsic unreliability or abnormal performance of introspection. The core idea of this hypothesis is that there is a set of attentional mechanisms by means of which individuals typically form judgments about their mental states, and this set of mechanisms may be failing to provide information about these mental states to the individual.[9] In other words, these attentional mechanisms may systematically fail to make individuals aware of certain mental states, leading them to report a lack of mental imagery. As with DESCRIPTION, INTROSPECTION implies that aphantasia is not a true condition, for self-described aphantasics do actually have mental imagery. Against DESCRIPTION, however, INTROSPECTION entails that the initial puzzle cannot be explained by mere discrepancies at the level of concepts—it is not a problem of miscommunication but metacognition.

A version of this hypothesis was originally suggested by Hebb (1968), for whom individuals who report a lack of visual imagery are able to form mental images that they are unable to retrieve.[10] This view also seems to have been proposed by Marks, for whom "non-(visual)-imagers may be suffering from some sort of sub-clinical neurological disconnection syndrome, whereby they do have visual imagery, but are unable to report it" (Thomas, 2001, p. 3).[11] Schwitzgebel (2011) and, more recently, Nanay (2021a, 2021b) have also defended some versions of INTROSPECTION.

Nanay claims, for example, that "at least some aphantasics seem to have mental imagery that they are not aware of" (Nanay, 2021a, p. 7). He considers aphantasia to be a behavioral category that may have different underlying conditions, one of which must be explained by analogy with cases of unconscious perception and unpacked in terms of failures of attentional processes. In other words, some cases of aphantasia are best explained as cases of "unconscious visual imagery."[12] In any event, this should not be a reason for concern because, according to Nanay, "recent research highlights that there are very few behavioral or neural differences between conscious and unconscious mental imagery" (Nanay, 2021b, p. 1).

Schwitzgebel is possibly the philosopher of mind who has most resolutely defended the idea that introspection is unreliable, even in normal conditions. The fact that certain individuals may fail to become aware of their mental imagery need not be something pathological but an extreme of the distribution of individuals who are in

themselves lousy at understanding their mental lives. Moreover, extensive variation in mental imagery, according to Schwitzgebel, is a myth based on the excessive weight given to our ability to understand our mental lives. If differences in visual imagery were as vast as self-described aphantasics report, we should expect substantial behavioral differences, "differences comparable to that between a prodigy and a normal person or between a normal person and one with severe disabilities" (Schwitzgebel, 2011, p. 44). However, as our initial puzzle suggests, there seems to be no correlation between subjective reports and objective performance in visual imagery and visual memory tests, and, therefore, we should not honor the reports of self-described aphantasics.

The most immediate criticism of INTROSPECTION draws attention to the fact that while descriptions of our mental lives can be messy and liable to error, the thesis that some individuals systematically fail to introspect their mental imagery is a very demanding one. Most self-described aphantasics are able to introspect visual imagery during hypnagogic states and dreams, and others are able to introspect mental imagery in other sensory modalities (Dawes et al., 2020; Faw, 2009; Zeman et al., 2020). Thus, INTROSPECTION would fall short in explaining why otherwise healthy individuals can introspect some forms of mental imagery but not others. One may acknowledge that individuals sometimes make mistakes about their mental lives, but to insist that self-described aphantasics consistently misunderstand their mental lives, even in favorable circumstances and regardless of their attentiveness, is a thesis that should provide further reasons to be taken seriously.

Perhaps more important, INTROSPECTION—but also DESCRIPTION—predicts little to no behavioral differences between self-described aphantasics and other individuals besides their reports. However, recent evidence supports the existence of these differences. For example, differences between self-described aphantasics and visualizers have been observed in the information that each group is able to retrieve from visualization exercises. One of these exercises, which is used as a shibboleth for aphantasia in some "awareness" circles, runs as follows[13]:

Visualize the following scene: There is a ball on a table. Someone walks up to the table and gives the ball a push. The ball rolls and finally falls to the floor.

Now, answer the following questions:

(a) What size and color was the ball?
(b) What gender was the person that pushed the ball?
(c) How exactly did the ball move after being pushed?

This exercise is interesting because, should visual imagery be conjured, visualizers should have a somewhat clear idea of what the ball, person, and resulting motion looked like (the reader may have experienced some of this when reading the prompt). It is not surprising to find that most visualizers often provide additional information that is not explicitly asked for in the questions. Visualizers may reply, for example, that they visualized a rubber ball about the size of a handball, or that they are not entirely certain about the gender as they only saw the person's feet, but they are confident that it was a child (among my colleagues, one even reported visualizing not a person but a monkey). These answers are similar to those that would be obtained if the participants were asked about a scene they witnessed a few moments ago. After all, as Berkeley observed in his critique of Locke's theory of abstract ideas more than three centuries ago, "whatever ... I imagine, it must have some particular shape and color. Likewise, the idea of man that I frame to myself must be either of a white, or a black, or a tawny, a straight, or a crooked, a tall, or a low, or a middle-sized man. I cannot by any effort of thought conceive the abstract idea above described. And it is equally impossible for me to form the abstract idea of motion distinct from the body moving, and which is neither swift nor slow, curvilinear nor rectilinear" (Berkeley, 1910, p. 11). While Berkeley's observation seems true for visualizers, it should not, the argument goes, hold true for self-described aphantasics; given that these individuals allegedly lack visual imagery, they should not be able to provide positive answers to the questions in the prompt. In fact, that is what happens; self-described aphantasics simply shrug their shoulders as if they were asked about the ball's serial number or the person's ice cream preferences.

The results obtained in visualization exercises like the one introduced above are part of a broader phenomenon that is also manifest in the way different individuals experience the practice of reading. Most readers cannot avoid creating visual images of the characters and places involved in a story, and as Berkeley notes, having a mental image of something is having a mental image along with many of its determinable properties. Self-described aphantasics, however, report creating no visual images as the narrative of a story unfolds (Alireza, 2016; Kendle, 2017). Consequently, characters in fictional stories are ex hypothesi not assigned the determinable properties that most individuals promptly and involuntarily assign to them. Aragorn in *The Lord of the Rings*, to mention a well-known example, has no physiognomy outside of that specified by the narrator. Likewise, Gondor has no topography beyond what is mentioned in the story. For movies based on books, it is interesting to note that visualizers often complain about characters and places being represented differently than they had pictured when reading the book. It is commonplace to hear that some people do not want to see the Hollywood version of a story they have read—anyone who has

read J. R. R. Tolkien has already formed a vivid mental image of the fictional universe in the story. By contrast, the information that self-described aphantasics are able to gather from the reading is, according to them, not detailed enough to produce such disappointment-by-mismatch when they see, for example, Viggo Mortensen carrying the shards of Narsil or New Zealand's mountain ranges portrayed as Gondor. The point is not, of course, that self-described aphantasics cannot be disappointed by the way certain characters or places are portrayed in movies but that the nature and extent of their disappointment differ from that of visualizers.

The proponent of INTROSPECTION could attempt to disregard these observations by reminding the contender that self-described aphantasics' reports —or any subjective reports, for that matter—need not be honored. However, notice that the above are not reports about the intimacy of visual imagery, or lack thereof—they are reports about the information one can retrieve from a visualization exercise or fictional story.

Moreover, these differences seem to extend to the emotions that visualization exercises and fictional stories are capable of evoking. Indeed, some researchers have found a positive correlation between the reported vividness of visual imagery and the extent to which individuals are affected by frightening scenarios. Wicken et al. (2021), for example, showed that self-described aphantasics exhibit no physiological response to fear, as measured by skin conductance, when reading frightening stories, even though they show no difference compared to control groups when viewing frightening images.[14]

Relatedly, surveys revealed that about two-thirds of self-described aphantasics report difficulties with autobiographical memory; that is, the ability to recreate past episodic memories from a personal point of view (Zeman et al., 2015). Watkins even suggested incidences of aphantasia in disorders such as the recently described syndrome of "severely deficient autobiographical memory" (SDAM), in which individuals are prevented from traveling in time to reenact experiences and emotions (Watkins, 2018). These reports were recently confirmed by other systematic and wide-ranging psychological studies with self-described aphantasics (Dawes et al., 2020; Milton et al., 2021).

Now, it is unlikely that these behavioral differences can be attributed to failures of the attentional mechanisms that modulate introspection.[15] Skin conductance tracks changes in autonomic nervous system arousal, which, in turn, are triggered by low-level processes of which the individual may or may not be aware. Introspection, or the lack thereof, is thus unlikely to produce the effects described above. Indeed, Wicken et al. (2021) dismiss the hypothesis that self-described aphantasics lack good metacognition of their mental images and provide an explanation that delves deeper into our cognitive architecture.

If the interpretation of these empirical results is correct, there are good reasons to believe that INTROSPECTION not only fails to predict but also would be unable to explain the behavioral differences between self-described aphantasics and visualizers. But even if one were to maintain this hypothesis as a viable contender, the following sections will present additional experimental results that virtually rule out INTROSPECTION—and DESCRIPTION—as a plausible explanation for aphantasia.

3.3. DISCONNECTION

According to DISCONNECTION, individuals who report no visual imagery have sub-personal mechanisms with imagistic representations that are not accessible at a personal level. The personal and sub-personal distinction, introduced by Dennett (1969), is between states and capacities attributed to the individual (for example, the capacity to perceive objects or understand language) and states and capacities attributed to a particular component of the individual's cognitive system (for example, the capacity to convert differences in luminosity into edges or combine words into grammatical sentences). According to this hypothesis, subsystems within the self-described aphantasics would be endowed with the same cognitive mechanisms as visualizers but without the relevant information being accessible to the individual as such.

Although DISCONNECTION resembles INTROSPECTION, these hypotheses differ in two important ways. First, while the hypothesis of a failure of attentional mechanisms that modulate introspection denies the existence of considerable differences between self-described aphantasics and visualizers, the hypothesis of a disconnection between personal-level mental states and sub-personal mechanisms predicts significant differences from the beginning, for it is true that the whole individual does not have visual imagery. Consequently, while INTROSPECTION does not honor the reports of those who claim to have no mental imagery, DISCONNECTION grants prima facie credibility to these reports and explains the nature of the deficit. Second, while INTROSPECTION blames attentional mechanisms that modulate introspection for what it regards as false reports, DISCONNECTION claims that there is nothing to blame these mechanisms for—no more than we would blame them for failing to reveal the algorithms of edge detection or the rules of transformational grammar.

This hypothesis seems to have been first proposed, at least for patients with acquired aphantasia, by Brain (1954) after studying cases of loss of visual imagery due to brain injuries.[16] For the cases of congenital aphantasia, the first conceptual and empirical articulation probably belongs to Botez and colleagues, who conclude that "visual imagery does exist in our patient at a subliminal level, but he is incapable of conscious retrieval and

reporting" (Botez et al., 1985, p. 387). In that particular case, Botez and colleagues attribute the lack of visual imagery to neurological causes that affected the visual interhemispheric transfer.[17] More recently, two similar versions of DISCONNECTION have been proposed by Faw (1997, 2009) and Phillips (2014). Although neither of them denies the existence of specific neural correlates of visual imagery and the lack thereof, their explanations do not entail neurological damage, as in Brain's patients, or abnormal neurological development, as in Botez's patient.

Faw (2009) introduces the concepts of "MI-1" to refer to the objective capacity for mental imagery and "MI-2" to refer to the subjective capacity for mental imagery. The MI-1/MI-2 distinction is not intended to provide a specific hypothesis but a somewhat higher-level description of the phenomenon that, in turn, could be instantiated by several lower-level hypotheses. The lower-level hypothesis favored by him, however, seems to fall into DISCONNECTION. In Faw's own words, individuals who report a lack of visual imagery "might have some sort of subliminal imaging ability that allows normal perception but not conscious supraliminal imaging" (Faw, 2009, p. 46). Individuals with only MI-1 (lacking MI-2) would have cognitive mechanisms endowed with imagistic representations, but these would not constitute mental states of the whole person.

In a similar vein, Phillips (2014) distinguishes two senses of "mental imagery," namely, the "representational" and "experiential" senses.[18] Imagery in the representational sense refers to those "underlying sub-personal representations" that are constitutively structured as images. By contrast, imagery in the experiential sense refers to "conscious personal-level episodes." While visual imagery and visual memory tests measure imagery in the representational sense, individual reports describe imagery in the experiential sense. There is a theoretical possibility, therefore, that self-described aphantasics have underlying sub-personal representations that allow them to solve visual imagery and visual memory tests but lack personal-level episodes that allow them to produce the corresponding reports.

This view grants that some individuals could be correct in reporting no visual imagery—inasmuch as they have no personal-level episodes of visual imagery—and, at the same time, explains why they can score well in visual imagery and visual memory tests—insofar as they have underlying sub-personal representations just like visualizers.

What about the observed differences in information retrieval and emotional response in the context of visualization exercises and fictional stories? DISCONNECTION does not provide an explanation for these differences, but unlike previous hypotheses, it contains theoretical elements that extend beyond mere discrepancies at the level of concepts or failures of attentional processes. Proponents of this view count with the resources for creating

models in which the lack of personal-level access to sub-personal imagistic representations affects differentially other personal or sub-personal agencies that typically benefit from this informational access. Even so, as we will see, DISCONNECTION may encounter some difficulties in explaining other empirical findings related to aphantasia.

3.4. ABSENCE

According to ABSENCE, individuals who report no visual imagery have no sub-personal mechanisms with imagistic representations but use alternative cognitive strategies to compensate in activities that would otherwise involve visual imagery.

This hypothesis has been defended by Zeman et al. (2010, 2015), and pointed as one among other possible explanations of aphantasia by Keogh and Pearson (2018), Kay et al. (2022), Wicken et al. (2021), and Pounder et al. (2022).[19] Acquired aphantasia was studied by the former in a patient who reported a loss of mental imagery after a minor surgery. Zeman and colleagues found that despite subjective reports of lack of visual imagery, he was not impaired in solving visual imagery and visual memory tasks. However, since the cognitive strategy used by most participants in Shepard and Metzler's tests is rotating the three-dimensional objects in the mind's eye, data typically show a linear correlation between the angle of rotation and the time required to determine whether the objects presented in the task are the same—larger angles correlate with longer response time, and smaller angles correlate with shorter response time. The pattern obtained from Zeman's patient showed a less clear relationship between angular rotation and response time, suggesting that he adopted a different cognitive strategy for solving mental rotation tasks.

This anomaly led Zeman and colleagues to perform further research using functional magnetic resonance imaging (fMRI). Studies showed striking differences between their patient and the control group in tasks that required visualizing the faces of famous people, but not in those that required viewing them in pictures. Specifically, both Zeman's patient and the individuals in the control group activated posterior cortical areas associated with vision when asked to look at famous faces, but only the control group showed considerable activation of these areas when asked to visualize these faces. Instead, Zeman's patient showed higher activation in anterior cortical areas that are typically associated with executive functions.[20]

The contrast observed in the respective patterns of cortical activation can be interpreted as evidence against DESCRIPTION and INTROSPECTION since neither of these hypotheses predicts considerable differences at a neurological level. In addition, the apparent use of a different cognitive strategy in the test of mental rotation may be understood as evidence against

DISCONNECTION. If Zeman's patient had sub-personal mechanisms associated with visual imagery operating normally; that is, differing from control groups only on the information that is consciously accessible at a personal level, then it would have been correct to predict similar performance to the control group. In other words, there is prima facie no reason to think that the patient's failure to consciously access representations that are imagistic in nature would have affected his response time in a way that does not correlate with the angular rotation. Indeed, the lack of correlation led Zeman and colleagues to reject an explanation in terms of processing of imagistic representations which do not enter consciousness.

Does this mean that DISCONNECTION is not a plausible hypothesis for aphantasia? Drawing that conclusion about all cases of aphantasia, including both congenital and acquired, would be a hasty generalization. What the research conducted by Zeman and colleagues shows is that DISCONNECTION does not provide a good explanation for their patient. Whether this conclusion can be extrapolated to otherwise healthy individuals who report a lifelong lack of visual imagery is something that requires further evidence. It is important to note that proponents of DISCONNECTION, such as Phillips (2014), acknowledge from the beginning that some cognitive processes at work in standard tests of visual imagery are not imagistic and, thus, make room for the possibility that patients such as Zeman's may have developed strategies that exploit other cognitive mechanisms. In fact, Phillips agrees with Zeman in relation to the above patient's condition but predicts that this anomaly concerning response time will not be replicated in patients with congenital aphantasia.[21]

More recently, Pounder et al. (2022) found differences in response time in the mental rotation task, but only between visualizers and self-described aphantasics who reported severe deficits in visual imagery. Other self-described aphantasics who did not score at floor on the VVIQ scale showed no differences compared to control groups. These differences within the group of self-described aphantasics could be interpreted as portraying different underlying characteristics for different individuals. It is possible that some individuals report a lack of visual imagery in line with DISCONNECTION and others with ABSENCE. This need not be the case, however. It should be noted that even when some self-described aphantasics showed a linear correlation between angular rotation and response time in accordance with Phillips's predictions, it does not imply the existence of sub-personal imagistic representations as suggested by DISCONNECTION. It may well be the case that aphantasics have no imagistic representations working at a sub-personal level but use haptic or motor mechanisms whose representations are nonetheless spatially organized. Spatial organization will predict, just like imagistic coding, a linear correlation between angular rotation and response time.

However, there are independent reasons to think that cases of congenital aphantasia are similar to cases of acquired aphantasia. Two neurological studies revealed commonalities between Zeman's patient and individuals who reported lifelong deficits in visual imagery. Fulford et al.'s (2018) fMRI studies showed that individuals with deficits in visual imagery had a more widespread cortical activation than their respective control groups when asked to visualize famous faces and places. Moreover, the participants in the study showed, just like Zeman's patient, lower activation in posterior cortical areas associated with vision and higher activation in anterior cortical areas associated with executive functions when asked to visualize famous faces and places. In the same vein, Milton et al.'s (2021) fMRI studies showed that self-described aphantasics had lower activation in posterior cortical areas compared to high-visualizers and lower activation in anterior parietal areas compared to both high-visualizers and control groups. Milton and colleagues interpret their results in terms of a reduction in connectivity between cognitive control systems and visual cortices.[22] Taken together, these neurological results can be understood as evidence in favor of ABSENCE, suggesting that aphantasics have no visual imagery whatsoever, not even sub-personal imagistic representations, but they exploit other cognitive mechanisms somewhat comparable in richness.

Another line of research intended to shed light on the nature of aphantasia has been conducted by Keogh and Pearson (2018) by exploiting the effects of binocular rivalry. In standard tests of binocular rivalry, the participants are presented with two different images, one to each eye. Instead of seeing two superimposed images, participants perceive one image while the other is suppressed. Using the same binocular rivalry setup, Pearson et al. (2008) have further demonstrated that presenting a very faint projection of one of the images prior results in a higher probability of that image being dominant in the test. In other words, the dominance of one image over the other can be induced by faintly showing one of them to the participant before the instance of binocular rivalry. This effect in which one image is induced over the other is called the "priming effect." Now, similar results can be obtained when, instead of presenting the participants with one of the images before the instance of binocular rivalry, they are asked to visualize one of them (Pearson, 2014; Pearson et al., 2008). This means that visual imagery can prime dominance of one image over the other in a similar way that visual perception does. Interestingly, the binocular rivalry tests conducted with self-described aphantasics revealed no significant dominance-inducing effect of one image over the other (Keogh & Pearson, 2018). In other words, the experimental results showed that the priming effect among aphantasics does not differ substantially from chance. Along the same line, Keogh and Pearson, led by Kay et al. (2022), have recently

gathered evidence that indicates that self-described aphantasics, unlike visualizers, do not adjust the size of their pupils when asked to visualize high-luminance objects.

How should these experimental results be understood in relation to the hypotheses we are considering? The visual rivalry and pupillometry experimental paradigms provide strong evidence against DESCRIPTION and INTROSPECTION insofar as they clearly show significant behavioral differences between self-described aphantasics and visualizers beyond subjective reports. In turn, they also provide evidence against our initial puzzle, for differences at the behavioral level could be more important than supposed at first. Notice that the absence of priming effect and pupillary response to illusory brightness among self-described aphantasics cannot be attributed to the inherent difficulty to describe our mental lives or the failure to form adequate judgments about our mental states. Given that these experimental paradigms allow experimenters to dispense with any interpretation of individuals' own mental lives and bypass subjective reports of visual imagery, researchers do not need to honor or dishonor self-described aphantasics' construals—they can simply point out the behavioral differences between the groups.

Moreover, evidence stemming from the visual rivalry and pupillometry experimental paradigms incidentally supports the thesis that individuals have good metacognition of their mental states and strengthens the program of finding hidden differences in phenomenal experience through self-reports (Lupyan et al., 2023; Phillips, 2014). The fact that individuals' construals of their own mental lives are a reliable predictor of either the presence or absence of priming effect and pupillary response suggests that introspection may not be as unreliable as Schwitzgebel and others claim.

How these results should be evaluated in relation to DISCONNECTION, on the other hand, is less clear. It could be tempting to conclude that if aphantasia was to involve a lack of visual imagery in the sense of differences at the personal level with no significant differences at the sub-personal level, we should be able to observe priming effect and pupillary response among aphantasics. Since this prediction is not verified, the argument goes, aphantasics must lack sub-personal imagistic representations. However, the proponent of DISCONNECTION may claim that this conclusion presupposes that the priming effect and pupillary response are driven by sub-personal imagistic representations. An alternative explanation would be that the priming effect and pupillary response are not bound to these sub-personal representations but to higher-order states such as beliefs and expectations. In other words, the visual rivalry and pupillometry experimental paradigms favor ABSENCE over DISCONNECTION on the plausible but unproven assumption that the priming effect and pupillary response are causally connected to the activation of the visual cortices and other areas related to visual imagery.

At this juncture, another line of psychological research proves to be particularly relevant. Keogh and Pearson (2014) also showed that background luminance substantially decreases performance in visual working memory tasks among high-visualizers but not low-visualizers. In other words, they found that, while high-visualizers have—on average—better performance in visual working memory tasks compared to low-visualizers, their performance drops drastically when background luminance is increased. In stark contrast, low-visualizers' performance remains constant across illumination conditions. Importantly, the effect of background luminance among high-visualizers is restricted to visual working memory tasks, for neither group decreased performance in verbal work memory tasks. Although this study predates the identification of aphantasia as such and, therefore, participants were recruited as low-visualizers as determined by low priming effect and not self-reports of lack of visual imagery, some participants in the study may have nonetheless been aphantasics (Keogh & Pearson, 2018). But even if this were not the case, evidence suggests that individuals employ multiple cognitive strategies to solve visual working memory tasks, albeit with varying degrees of success.

A plausible yet by no means uncontroversial interpretation of these experimental results is that, while high-visualizers use cognitive mechanisms supported by cortical areas associated with vision—mechanisms that can be selectively disrupted by illumination conditions—low-visualizers employ cognitive mechanisms that share little to no neural correlates with the visual modality. Given that incoming visual information has obligatory access to the visual areas, it is not surprising, then, that changes in luminance can interfere with the performance of individuals using mechanisms that employ these areas, while the performance of individuals using other cognitive mechanisms remains unaffected.

4. Future directions

Although DISCONNECTION cannot be discarded as a general explanation for aphantasia, it nonetheless seems less suited than ABSENCE to explain the available evidence. Further research in this direction could help us to either decide between these hypotheses, accept them both as two possible underlying explanations of what is generically referred to as "aphantasia," or suggest an alternative account not considered here.

Specific experimental paradigms could shed further light on this issue: First, the imagery value test (Paivio, 1971; Sadoski, 2005). Assessing whether nouns with high imagery value (such as "elephant") and nouns with low imagery value (such as "truth") are remembered and retrieved at different rates in self-described aphantasics, as has been observed among visualizers,

could provide crucial evidence concerning how these concepts are codified and thus help us understand the relationship between mental imagery and different forms of memory.

Second, the pupillometry paradigm could also provide differential evidence for one of the hypotheses above. Binda et al. (2013), for example, found that grayscale pictures of high-luminance objects (such as the sun) elicit greater pupil constriction than those of low-luminance objects (such as the moon). Although it remains unclear whether pupil responses were produced in response to higher-level semantic representations or lower-level imagistic representations, the absence of pupillary response to illusory brightness among self-described aphantasics points in the direction of the latter possibility (Kay et al., 2022). Similarly, Mathôt et al. (2017) found that words conveying brightness (such as "day") also elicit greater pupil constriction than words conveying darkness (such as "night"). Further research using this experimental paradigm with self-described aphantasics could show whether reading or hearing words associated with degrees of illumination produce distinctive effects among self-described aphantasics. Similar effects would favor DISCONNECTION over ABSENCE, while differential effects would favor ABSENCE over DISCONNECTION.

Third, the eye-tracking paradigm could determine whether self-described aphantasics show similar eye-movement patterns when asked to visualize and perceive a certain scene. It has been documented among visualizers that eyes move "around" visualized objects in a similar way that they would move around actually perceived objects (Altmann, 2004; Nanay, 2015b). A commonality in eye-movement patterns between self-described aphantasics and visualizers would indicate the existence of imagistic representations that are nevertheless not accessible at a personal level, favoring DISCONNECTION, while a dissimilarity in eye-movement patterns would suggest the presence of alternative mechanisms, favoring ABSENCE.

Finally, further research using fMRI with a battery of imagery-related tasks (instead of tasks requiring participants to visualize only faces and places) with self-described aphantasics is expected to provide conclusive evidence not only for the study of aphantasia but also mental imagery in general, as there is still no consensus on which cortical areas are strictly associated with visual imagery.[23]

5. Concluding summary

In this paper, I have considered four hypotheses aimed at explaining aphantasia. After assessing the available evidence, various reasons have emerged to doubt that it could be explained either as a discrepancy at the level of concepts or a failure of attentional mechanisms; neither DESCRIPTION nor INTROSPECTION predicts the behavioral and neurological differences

observed between self-described aphantasics and visualizers. In turn, the hypothesis of a lack of personal-level access to sub-personal imagistic representations cannot be discarded as an explanation for aphantasia but may encounter some difficulties in explaining the empirical findings surveyed above. Despite its strengths in accommodating aphantasics' self-reports and providing a framework for models that explain certain behavioral differences, DISCONNECTION faces problems in accounting for the behavioral effects induced by the visual rivalry, pupillary, and luminance experimental paradigms and may also face challenges in accounting for the widespread cortical activation in aphantasics. Finally, the hypothesis of an absence of sub-personal imagistic representations is both in comparative and absolute terms better suited to explain the previous psychological and neurological studies; ABSENCE can accommodate virtually all the evidence gathered thus far.

From an interdisciplinary perspective, it is hoped that the philosophical concepts presented here have proven helpful in addressing some of the problems emerging from cognitive science. Three elements I take to be particularly relevant to the discussion are: First, to provide a conceptual articulation of what is as yet only a diverse array of empirical studies and offer, for the first time in the literature, a comprehensive evaluation of possible explanations for aphantasia. Second, to call attention to the distinction between what I termed "INTROSPECTION" and "DISCONNECTION," something that is too often blurred by vague use of the concepts of "consciousness," "experience," and "awareness." Third, and related to the previous point, to call for greater precision in what we mean by "mental imagery" in relation to aphantasia—and thus avoid the ambiguity of whether it refers to personal-level events (of which the individual may or may not be aware) or sub-personal imagistic representations (of which the subject is necessarily unaware). In this regard, aphantasia is a case in which conceptual clarification is of particular importance, not only for empirical research but also for philosophical inquiry itself, inasmuch as this condition challenges many of our pre-theoretical and philosophical intuitions alike.

Notes

1. Euclid's definition of the sphere can be found in the Book IX, Definition 14, of his *Elements*. Einstein's famous *Gedankenexperimente* can be found in his *Autobiographical Notes*. For the controversy between Plato and Aristotle about the rational role of mental imagery, see, for example, Ananth (2014). For discussion about the rational role of imagination in contemporary analytic philosophy, see Berto and Schoonen (2018).
2. I will refer to aphantasia as a "condition" or "alleged condition" with the caveat that many self-described aphantasics do not think their perceived lack of visual imagery in terms of an impairment, disability, or handicap. The same applies to other

expressions such as "otherwise healthy individuals" I will be employing in this paper. In this regard, Zeman et al. (2020) write that they "do not at present consider lifelong aphantasia to be a medical disorder, but rather an intriguing variation in human experience, analogous to synesthesia" (p. 438).

3. Plato uses the term "phantasía" to refer to appearances and regards this notion as a combination of perception and belief (*Soph.* 263b–264b, *Tht.* 152a–186e). Aristotle inherits this use but sometimes employs the term in ways that seem to refer to imagination and mental imagery (*DA* III, 3, 427b 17–25, 428a 1–16, *Mem.* I, 450a 20–25).
4. According to some estimates, extreme cases of this alleged condition may affect up to 1% of the population (Zeman et al., 2020).
5. For testimonials, see Price (1952), Faw (2009), Ross (2016), Alireza (2016), Kendle (2017), and Watkins (2018). Perhaps I should add that I describe myself as an aphantasic.
6. More recently, D'Aloisio-Montilla (2017) has argued that aphantasia provides a new line of argument in favor of the "overflow account;" that is, the view that phenomenal consciousness is far richer than access consciousness (Block, 2011).
7. For an extensive review of the literature about the apparent lack of correlation between subjective reports of visual imagery and objective performance in imagery-related tasks, see Dean and Morris (2003), Nanay (2021b), Schwitzgebel (2011), and Phillips (2014).
8. Another possible explanation of aphantasia that I have not included here is that individuals who report no visual imagery have the capacity to produce it but are prevented from doing so by other personal or sub-personal agencies. In other words, self-described aphantasics would be able to conjure visual imagery but are systematically prevented from reaching the instance in which visual imagery is produced. "Neurosis," "anxiety," "repression," "depression," "biases," and simply "refusal to imagine" are some of the interfering factors considered in the literature. Different versions of this hypothesis, which I have termed "INTERFERENCE," have been suggested by Charcot and Bernard (1883), Zangwill (according to Brain, 1954), Kunzendorf (1995), and de Vito and Bartolomeo (2016) and constitute one of the possibilities that researchers either explicitly or implicitly attempt to rule out in contemporary work on aphantasia (see, for example, Kay et al., 2022; Wicken et al., 2021).
9. For theories of introspection and discussion, see Armstrong (1968), Dennett (1969), Lycan (1987), and Hill (1988).
10. Hebb (1968) claims that "the difference between those who have little imagery and those who have much may be not a difference of the mechanism of thinking, but a difference in the retrievability of the image" (p. 476).
11. The ideas that Thomas (2001) ascribes to Marks on the basis of their personal communication seem to be akin to what I have called "INTROSPECTION" (all this provided that by "visual imagery" Marks signifies personal-level states and not sub-personal representations, for otherwise his view would be best described as what I have termed "DISCONNECTION").
12. Nanay's stance on this matter requires further clarification. For a mental state to be "unconscious" in Nanay's sense, the individual must lack "conscious awareness" and, therefore, his take on the issue is similar to what we have described as INTROSPECTION. However, since he defines "mental imagery" in terms of "cortical activation of the early visual cortices," he makes no room for the distinction between INTROSPECTION and DISCONNECTION; if having mental imagery is simply being in such a neurological state, whether the lack of access to information pertaining to that state occurs due to a failure in introspection or lack of personal access makes no difference, the only case

in which an underlying condition would count as a genuine case of lack of mental imagery would be that of absence of cortical activation of the early visual cortices, something analogous to ABSENCE, of which Nanay is skeptical (Nanay, 2021b).

13. This is a modified version of a visualization exercise found on Reddit: https://www.reddit.com/r/Aphantasia/comments/c6k023/this_is_why_the_new_users_here_are_confused_two/
14. Dadds et al. (2004) have also suggested a positive correlation between the reported vividness of visual imagery and the extent to which individuals are affected by aversions (but see Dawes et al., 2020, for a nuanced hypothesis). Also, see Milton et al. (2021) for other psychological characteristics that could potentially be associated with aphantasia, such as elevated IQ scores, traits on the autistic spectrum, and introversion.
15. Thanks to an anonymous reviewer for bringing to my attention the need to include this point in the argument.
16. Brain (1954) claims that "it follows that visual imagery is not essential to these processes, which therefore must depend upon neurophysiological schemas which do not themselves enter consciousness" (p. 290).
17. Specifically, Botez et al. (1985) found hypoplasia of the right hemisphere and abnormal development of the posterior and superior parts of a stretched corpus callosum. Although the passage itself does not allow us to distinguish between INTROSPECTION and DISCONNECTION, the existence of these neural correlates suggests the latter.
18. It is important to mention that the famous "mental imagery debate" from the seventies and eighties pertains only to imagery in the sense of underlying sub-personal representations. Thus, there is no need to get involved in such debate in this paper besides pointing out that DISCONNECTION would require sub-personal representations to be imagistic in nature.
19. For example, Zeman et al. (2010) conclude that their patient "preserved performance on tests of visual imagery ... [due to] the use of alternative nonvisual strategies" (p. 154). Keogh and Pearson (2018) claim that their experimental results "support the theory that congenital aphantasia is characterized by a lack of low-level sensory visual imagery, and is not due to a lack of metacognition or an inability to introspect" (p. 58). Wicken et al. (2021) argue that the data "provide further support for aphantasia being a condition that is characterized by a true lack of visual imagery, rather than a condition of poor metacognition" (p. 4). Kay et al. (2022) claim that their research "provide strong evidence linking the pupillary light response to mental imagery, as well as supporting the behavioral work showing that aphantasic individuals indeed lack visual sensory imagery" (p. 8). Finally, Pounder et al. (2022) suggest that "it is the possible that aphantasic individuals are completing these tasks without access to visual imagery, but rather by using spatial imagery (similar to congenitally blind individuals)" (p. 189).
20. Specifically, Zeman's patient and the control group showed no differential activation in the inferior occipital and fusiform gyri when viewing pictures of famous faces. However, when prompted to visualize these faces, the patient showed a comparatively reduced activation in the bilateral fusiform gyri, superior temporal gyri/sulci, inferior occipital gyri, and calcarine sulci, and a comparatively increased activation in the right anterior cingulate, bilateral inferior frontal gyri, and the precuneus (Zeman et al., 2010).
21. In Phillips's own words, "what Zeman et al. call 'blind imagination' apparently involves the 'successful use of an alternative strategy to perform imagery tasks in the absence of the experience of imagery' (Zeman et al., 2010, [p.] 145). One piece of

evidence for this is that their subject does not exhibit the standard reaction time effect in the mental rotation task. Acknowledging the size of this empirical assumption, I assumed above that this is not true of professed non-imagers" (2014, p. 296).

22. Surprisingly, neither Fulford et al. (2018) nor Milton et al. (2021) found a positive correlation between visual imagery and activation in the early visual cortices.
23. For discussion about the cortical areas that underlie visual imagery, see Albers et al. (2013), Brogaard and Gatzia (2017); Fulford et al. (2018), Nanay (2021b), and Spagna et al. (2021).

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