Lives without imagery

Lives without imagery – congenital aphantasia

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1. Introduction

Visual imagery is, for most of us, a conspicuous ingredient of everyday experience, playing a prominent role in memory, daydreaming and creativity. Galton, who pioneered the quantitative study of visual imagery with his famous 'breakfast-table survey', reported a wide variation in its subjective vividness(Galton, 1880). Indeed, some participants described 'no power of visualising'. This phenomenon has received little attention since, though Faw reported that 2.1-2.7% of 2,500 participants 'claim no visual imagination'(Faw Bill, 2009).

The experience of imagery depends on activity in fronto-parietal 'executive' systems and in posterior brain regions which together enable us to generate images on the basis of our stored knowledge of appearances(Ishai, 2010; Bartolomeo, 2008; Ishai, Ungerleider, & Haxby, 2000). The relative contributions of lower and higher order visual regions to the experience of visual imagery are debated (Bartolomeo, 2002). Clinical reports suggest the existence of two major types of neurogenic visual imagery impairment: i) visual memory disorders, causing both visual agnosia and imagery loss, and ii) 'imagery generation' deficits selectively disabling imagery(Farah MJ, 1984).

In 2010 we reported a particularly 'pure' case of imagery generation disorder, in a 65 year old man who became unable to summon images to the mind's eye after coronary angioplasty(Zeman et al., 2010). Following a popular description of our paper(Zimmer, 2010), we were contacted by over twenty individuals who recognised themselves in the article's account of 'blind imagination', with the important difference that their imagery impairment had been lifelong. Here we describe the features of their condition, elicited by a questionnaire, and suggest a name – *aphantasia* - for this poorly recognised phenomenon.

2. Results

21 individuals contacted us because of their lifelong reduction of visual imagery. We explored the features of their condition with a questionnaire devised for the purpose and the Vividness of Visual Imagery Questionnaire (Marks DF, 1973) (*see supplementary data for further details of methods and results*). Participants typically became aware of their condition in their teens or twenties when through conversation or reading they realised that most people who 'saw things in the mind's eye', unlike our participants, enjoyed a quasi-visual experience. Our participants rating of imagery vividness was significantly lower than that of 121 controls (Mann Whitney $p<.001$ – see Figure 1). 19/21 were male. 5/21 reported affected relatives. 10/21 reported that all modalities of imagery were affected. Despite their substantial (9/12) or complete (12/21) deficit in voluntary visual imagery, the majority of participants described involuntary imagery during wakefulness (usually in the form of 'flashes' (10/21)) and/or during dreams (17/21). Within the group of participants who reported no imagery while completing the Vividness of Visual Imagery Questionnaire, 10/11 reported involuntary imagery during wakefulness and/or dreams, confirming a significant dissociation between voluntary and involuntary imagery (McNemar Test $p<.01$). Most participants reported difficulties with autobiographical memory. They described a varied but modest effect on mood and relationships. 14 identified compensatory strengths in verbal, mathematical and logical domains. Their successful performance in a task that would normally elicit imagery – 'count how many windows there are in your house or apartment' - was achieved by drawing on what participants described as 'knowledge', 'memory' and 'subvisual' models.

3. Discussion

φαντασία, phantasia, is the classical Greek term for imagination, defined by Aristotle as the 'faculty/power by which a *phantasma* [image or mental representation] is presented to us' (Aristotle, 1968, 428a, 1-4). We propose the use of the term 'aphantasia' to refer to a condition of reduced or absent voluntary imagery. Terms used previously include loss of 'visual' or 'mental imagery' (Riddoch MJ, 1990), loss of the 'mind's eye' (Wilson BA, Baddeley AD, & Young AW, 1999), 'loss of visualisation'(Brain R, 1954), 'defective revisualisation' (Botez, Olivier, Vezina, Botez, & Kaufman, 1985) and 'visual irreminiscence'(Nielsen, 1946).

Sceptics could claim that aphantasia is itself a mere fantasy: describing our inner lives is difficult and undoubtedly liable to error(Hurlburt & Schwitzgebel, 2007). We suspect, however, that aphantasia will prove to be a variant of neuropsychological functioning akin to synaesthesia (Barnett & Newell, 2008) and to congenital prosopagnosia(Gruter, Gruter, Bell, & Carbon, 2009). Indeed, aphantasia may have some specific relationship to these disorders, as congenital prosopagnosia is associated with unusually low(Gruter et al., 2009), and synaesthesia with unusually high(Barnett & Newell, 2008), VVIQ scores.

The participants described here were self-selected and some of our findings, such as the male predominance, may reflect the readership of a science magazine like *Discover*. There is a need, therefore, for further study in a more representative sample. The existence of lifelong 'aphantasia' raises numerous additional questions. How commonly does aphantasia occur? Existing data suggest a frequency of around 2% but there is no fully reported large scale study. The evidence of familial occurrence should be investigated further. Does aphantasia have objective neuropsychological associations? Correlations between imagery vividness and cognitive functioning have been elusive in the past(McKelvie, 1995), but recently developed measures of autobiographical memory(Levine, Svoboda, Hay, Winocur, & Moscovitch, 2002), imaginative thinking (Hassabis, Kumaran, Vann, & Maguire, 2007)and 'visual-object intelligence' (Blazhenkova & Kozhevnikov, 2010) open up new avenues for exploration.

Personality and mood may also be relevant variables. Does it have subtypes? The descriptions given by our participants suggest that in some visual memory is preserved even if visual imagery is absent, while others may rely entirely on non-visual representations in memory tasks; the relationship between aphantasia and congenital prosopagnosia also deserves further study. If, as we hypothesise, the absence or reduction of visual imagery has neural correlates, can we discover these? We are optimistic that modern structural and functional brain imaging may help to answer questions about the nature of visual imagery that were first posed in ancient Greece and first quantified at Sir Francis Galton's breakfast table over a hundred years ago.

Figure legends

Figure 1: Distribution of VVIQ scores in participants with aphantasia and control participants

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