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The case for characterising type-2 blindsight as a genuinely visual phenomenon

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ABSTRACT

Type-2 blindsight is often characterised as involving a non-visual form of awareness that blindsight subjects experience under certain presentation conditions. This paper evaluates the claim that type-2 awareness is non-visual and the proposal that it is a cognitive form of awareness. It is argued that, contrary to the standard account, type-2 awareness is best characterised as visual both because it satisfies certain criteria for being visual and because it can accommodate facts about the phenomenon that the cognitive account cannot. The conclusion is made that type-2 blindsight is best characterised as involving a form of abnormal, degraded visual awareness.

0. Introduction

Lawrence Weiskrantz, who coined the term, defines blindsight as "...visual capacity in a field defect in the absence of acknowledged awareness" (Weiskrantz, 1986). While blindsight is often described in this way, the majority of research into it has focussed on examining the residual capacities of people who have damage to their striate cortex (V1). These subjects (henceforth, hemianopes) are clinically blind in the area of their visual field corresponding to the V1 damage, and yet often retain the capacity to perform above chance in forced choice guessing tasks and other experimental conditions (type-1 blindsight (Weiskrantz, 1998)). The claim that hemianopes are clinically blind can be misleading. In experimental conditions, they often report awareness correlated with the presentation of moving stimuli in their blind field. This residual awareness of motion in hemianopes, commonly called type-2 blindsight in the literature (Weiskrantz, 1998), was known about long before blindsight was discovered (Riddoch, 1917).

It is a common mistake to think that there are some subjects who can be categorised as having type-1 blindsight and some who have type-2 blindsight. This is not the case. Rather, the majority of hemianopes with damage that is largely restricted to V1 (i.e., does not extend to the extra-striate cortex) exhibit both type-1 and type-2 blindsight depending upon the experimental conditions. Minor changes to features of a stimulus, such as luminance contrast between stimulus and background, speed of onset and offset, and changes in luminance, can result in hemianopes who are participating in a blindsight study (henceforth, blindsight subjects) reporting awareness that is correlated with the presentation of a stimulus in their blind field (see Weiskrantz, Barbur, & Sahraie, 1995).[1] Thus the awareness that blindsight subjects have in type-2 cases (type-2 awareness) is not limited to moving stimuli.

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[1] See the introduction to this special issue for an in-depth discussion of how type-1 and type-2 blindsight are defined in the literature.

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The fact that blindsight subjects will often report some awareness associated with the stimulus presentation, unless the stimuli presented in experimental conditions are carefully controlled, has often been overlooked in discussions of blindsight. Although early experiments on GY (the most frequently studied blindsight subject) were mainly in 'type-2' conditions (in which he reported some awareness of the stimuli), it was not until the end of the last century that type-2 blindsight began to be seen as a phenomenon for investigation in and of itself (see for example: Barbur, Watson, Frackowiak, & Zeki, 1993; Weiskrantz, Cowey, & Barbur, 1999; Weiskrantz et al., 1995; Zeki & ffytche, 1998). Increased interest in the scientific study of consciousness has led to speculation that comparisons between type-1 and type-2 conditions in blindsight might serve to inform investigations into the neural correlates of consciousness (see Silvanto, 2015). Given that a blindsight subject's performance can be held constant while their awareness of the stimulus varies (Weiskrantz et al., 1995), it is sometimes thought that comparisons between type-1 and type-2 blindsight may constitute a case of 'pure contrast' between consciousness and function (for a recent critical discussion of such issues, see Overgaard (2011) and Balsdon and Azzopardi (2015)). Various imaging techniques (such as: fMRI, MEG, EEG, and PET). have been used to compare the areas of activation in blindsight subjects' ipsilateral field when they report awareness, or the lack thereof, of a stimulus (e.g., Goebel, Muckli, Zanella, Singer, & Stoerig, 2001; Sahraie et al., 1997; Schurger, Cowey, Cohen, Treisman, & Tallon-Baudry, 2008). However, as Sahraie, Hibbard, Trevethan, Ritchie, and Weiskrantz (2010) note, there are very few studies that actually meet the precondition of matching performance across aware and unaware trials.

Such studies assume that they are investigating a contrast between conscious and unconscious visual processing. However, the standard characterisation of type-2 blindsight is that it is not a case of "genuine" visual awareness (or "seeing"). Rather, type-2 blindsight is generally characterised as being a non-visual form of awareness (Weiskrantz, 1986/2009; Cowey, 2010; Kentridge and Heywood, 1999). Alternatives to characterising type-2 awareness as visual have often been left unspecified, but a recent account suggests that it is best understood as a form of cognitive awareness of guessing performance (Brogaard, 2011a). What is at stake here can be unclear, but if type-2 blindsight is not actually a genuine case of visual awareness, then studies that compare type-1 and type-2 blindsight would not provide the right sort of contrast to inform the pursuit of the neural correlates of visual consciousness.

On the other hand, if type-2 blindsight is characterised by genuinely visual awareness, there are a few interesting potential implications. First of all, it suggests that striate cortical processing is not necessary for all forms of visual awareness (contra Lamme, 2001; Tong, 2003, see Silvanto (2015) for a discussion of this issue). Secondly, it may raise problems for certain accounts of qualia (Foley, 2011), or of the necessity of certain features of visual experience (Brogaard, 2015; Macpherson, 2015). Thirdly, if the subject's awareness is simply of a property (such as movement) independent of any object, as some recent experiments suggest (see the discussion of Azzopardi and Hock (2011) below), it could undermine the claim that binding is a necessary condition of all visual experience (contra Matthen, 2005; Treisman, 1996). Finally, if type-2 awareness is genuinely visual, it may pose a challenge to the standard interpretation of blindsight. Critical accounts of blindsight have long claimed that blindsight is the result of experimental artefacts and that blindsight subjects' above chance performance might be correlated with weak, unreported visual awareness (Campion, Latto, & Smith, 1983; Ffytche & Zeki, 2011; Kolb & Braun, 1995; Kroustallis, 2005; Natsoulas, 1997; Overgaard, Fehl, Mouridsen, Bergholt, & Cleeremans, 2008; Zeki & Ffytche, 1998).

While it is not within the scope of this article to address the complex issues related to such debates, the relevance of type-2 blindsight to them cannot be determined without first resolving the question of whether type-2 awareness is visual. Answering this question is, as it turns out, also a rather difficult conceptual and empirical issue. This paper makes the case that type-2 blindsight is, on current evidence, best characterised as a form of abnormal visual awareness. This is both because there are good reasons to believe that type-2 awareness is visual, and because the standard arguments to the contrary do not offer compelling reasons to accept the characterisation of it as non-visual. In addition, the major alternative account of type-2 blindsight as a form of cognitive awareness cannot account for important facets of the phenomenon.

1. Objective and subjective criteria for individuating the senses

That blindsight subjects are aware of something under type-2 conditions (where 'aware of' is understood as the availability of information to the subject for use in the selection and control of goal directed behaviour and report), is not in question: they report awareness associated with the presentation of the stimulus; their awareness covaries with features of the stimuli presented in their blind field (such as direction of motion), and they can describe or draw features of the stimuli (Ffytche & Zeki, 2011); they know that their awareness corresponds with a visually presented object; they can spontaneously react to the stimuli and direct their attention towards or away from the stimulus (Kentridge, Heywood, & Weiskrantz, 1999); and they can compare stimuli in their intact and blind fields and rate them for similarity (Morland et al., 1999; Stoerig & Barth, 2001).[2] Thus it seems uncontentious that they are aware. What is at issue is whether the awareness that blindsight subjects exhibit in these conditions counts as visual.

It can be unclear what warrants the claim, often made in the literature, that type-2 blindsight does not involve genuine visual awareness: Blindsight subjects have been characterised as being "aware of the occurrence of a visual event, though

[2] The results of the Stoerig and Barth study are sometimes questioned. However, even if no genuine match was found between the stimuli presented in the intact and damaged fields, this does not undermine the point here. The fact that GY was able to make a same/different comparison at all shows that he was aware of something in his blind field.