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Short Communication

# Consciousness and modality: On the possible preserved visual consciousness in blindsight subjects

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ABSTRACT

In a recent paper, Brogaard (2011) presents counter-arguments to the conclusions of an experiment with blindsight subject GR. She argues that contrary to the apparent findings that GR's preserved visual abilities relate to degraded visual experiences, she is in fact fully unconscious of the stimuli she correctly identifies. In this paper, we present arguments and evidence why Brogaard's argument does not succeed in its purpose. We suggest that not only is relevant empirical evidence in opposition to Brogaard's argument, her argument misconstrues necessary criteria to decide whether a conscious experience is visual or not visual.



## 1. Introduction

In a recent paper, Brogaard (2011) discusses an experiment on the blindsight subject GR by Overgaard, Fehl, Mouridsen, and Cleeremans (2008) arguing that the conclusions reached are unwarranted.

Blindsight is, according to Brogaard, characterized by unconscious processing of colour, shape, and motion properties. To decide that a subject has blindsight, two conditions must be satisfied. First, there must be processing of such visual properties indicated by the subject's ability to make correct guesses. Second, the processing must not be conscious as indicated by the subject's report that she is not seeing those relevant properties. According to Brogaard, whenever a subject is processing colour, shape, and motion that processing is of a visual kind. If the subject reports not to be phenomenally aware of colour, shape, and motion qualities, the visual processing should be considered unconscious. Consequently, in order for a subject to be visually conscious, colour, shape, and motion must be phenomenally present to this subject.

According to Brogaard, a representation is phenomenally conscious if it is cognitively accessible in working memory; and a representation is a visual representation if it carries information about a stimulus' colour, shape, and motion qualities. Conscious visual perception of a stimulus thus requires that representations of colour, shape, and motion qualities are cognitively accessible in working memory.

Brogaard claims that there is a different sense in which information concerning a stimulus' colour, shape, and motion can be cognitively accessible in working memory. When a blindsight subject is forced to make a guess, the propositional content

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of the guess is represented in working memory and is accessible for reports. Propositional content represented in working memory is associated with a specific kind of phenomenology; but this phenomenology is not of a visual kind.

Previous to the experiment in question, Ramsøy and Overgaard (2004) asked participants to create their own categories for subjective reports during long training sessions. They were asked what images they were shown and how they experienced stimuli in terms of clarity. Participants conformed to a four-point scale (named the Perceptual Awareness Scale, or PAS) categorized as "not seen", "weak glimpse" (meaning "something was there but I had no idea what it was"), "almost clear image" and "clear image". Ramsøy and Overgaard showed that in an experimental design where one should expect to find subliminal perception, participants were completely at base chance when reporting "not seen". In a later study (Overgaard, Rote, Mouridsen, & Ramsøy, 2006), dichotomous reports were compared directly with PAS. Using the dichotomous report, participants showed subliminal perception, whereas none was present at PAS = "not seen". Generally, PAS fitted better with objective measures such as stimulus duration and correctness than did dichotomous reports as well as other methods to report subjective experience, e.g. confidence ratings (Sandberg, Timmermans, Overgaard, & Cleeremans, 2010). The strongest line of evidence for the validity of the PAS scale as a reflection of conscious perception is however the participants' own reports that it is the case. Overgaard et al. (2006) calculated for each level of PAS the percentage of cases in which participants answered 'image seen' when reporting dichotomously (but presented with identical stimulus at equal display time). The results showed that in more than 20% of the cases where participants reported "not seen" on PAS, they responded "image seen" on the dichotomous scale. If a participant reported PAS = "weak glimpse", the probability that he would report "image seen" on the dichotomous scale was 39%. This is one of the more curious aspects of the study, indicating that different processes lie behind reporting in a dichotomous and in a "gradual" way.

Overgaard et al. (2008) performed a study on a 31-year old hemianopic with left-sided injury to primary visual cortex. In the first experiment, letters were briefly flashed at different locations on a computer screen and GR's only task was to respond to every stimulus, revealing that she was blind to everything presented in the upper right quadrant. In a second experiment, GR was presented with different visual figures and asked (1) which figures were shown, and (2) if she actually saw the figure – yes or no. GR reported close to never that she saw stimuli in the upper right quadrant, yet she was able to report correctly about these stimuli more often than chance. In the healthy part, her reports were significant predictors of correctness, based on which the authors concluded that she had blindsight. The third experiment was identical to the second, except she now should respond with PAS rather than in a binary fashion. As a consequence, her blindsight seemingly "disappeared" in the sense that, even though she reported much more vague experiences in the upper right compared to the upper left quadrant, the relationship between correctness and reported experience was identical. All correctness above chance seemed related to vague yet conscious vision when using PAS.

## 2. Brogaard's argument

Brogaard raises the argument that in spite of what seems as empirical evidence of the opposite, GR, if not also the healthy participants of the previous experiments, are in fact not conscious of visual stimuli. She points out that even though the study on GR shows that reported visual clarity and correctness are significantly correlated, we are left without knowledge about what GR is conscious of. In other words, she argues, GR (presumably along with healthy participants reporting vague perceptions with PAS) may not be able to distinguish visual experiences from other kinds of experiences, e.g. thoughts. Brogaard concludes that blindsight patients are visually unconscious.

Brogaard argues that when GR and other blindsight subjects are forced to guess about colour, shape, and motion properties of a stimulus, the activity of guessing generates a propositional representation that is cognitively accessible is working memory. It is this propositional content which is reported in the blindsight subject's verbal response. A propositional representation in working memory is associated with cognitive phenomenology but not with visual phenomenology. Blindsight subjects are not presented with phenomenal colour, shape, and motion qualities since these are not represented in working memory.

The argument is not an easy one to make, and we shall here argue that it is most likely wrong. First of all, aspects of the experiment in question (Overgaard et al., 2008) go against this interpretation, alongside with evidence from some previous experiments. Furthermore, as it will be argued, it is not straightforward what counts as visually unconscious perception.

## 3. PAS and visual consciousness

Brogaard grants that the PAS scale mentions clarity of visual images, but she is not convinced, based on this phrasing alone, that the reports truly refer to visual experiences. The PAS scale is however linked very closely to visual experience. Participants are instructed to report the visual clarity of a stimulus, and each scale step is checked with the participant to make sure she finds it meaningful. It is clearly described to the participant that the experiment is about visual experience, and that PAS is about nothing else than how clear the stimulus appears to her. Before starting the experiment, several pilot rounds are run where the participant discusses her understanding of the scale steps with the experimenter, and during this entire process, several descriptions of distinctly visual experiences are shared between the two (see also Overgaard, Nielsen, & Fuglsang-Frederiksen, 2004). During the experiment, in the case of GR, stimuli were presented to the upper right quadrant of her visual field (the "injured" one) and to the upper left quadrant (which was uninjured and "normal"). Thus, GR was con-

tinuously presented with comparable stimuli to both visual fields, reporting about them with the same scale. Were the experiences related to the visual stimulation on either side fundamentally incongruent and of basically different kinds, it would seem strange and surprising if this would not have been revealed during the procedure.

Since the one criterion to decide whether a subject has blindsight, as agreed by Brogaard and most others in this field of research, rests on the subjective report, it seems very difficult to argue against GR's own descriptions of visual experiences. It seems obviously false to conclude that GR is unconscious of visual stimuli based on the finding that she satisfies the criteria for blindsight when instructed to report in one way but that she does not when instructed in a different way.

Reasonably, one might question whether GR is a special case and whether this finding may generalize to other blindsight patients. However, the literature is full of rarely discussed indications of experiences linked to visual stimuli in blindsight (Overgaard, 2011). In one experiment, Stoerig and Barth (2001) investigated reported "feelings" in GY in order to see if they were somehow low-level perceptual in nature. To do so, GY was asked to match a visual stimulus presented to the blind field with one of different image transformation of the same stimulus in the healthy field. When using high-contrast stimuli, GY deemed the stimuli as "visual" and accordingly as "no match at all" compared to the "feeling" in the blind field. However, with moving stimuli, GY accepted the match as long as they were sufficiently blurred and appeared as "motion only". The results match with GY's verbal descriptions of his "feelings" as "similar to that of a normally sighted man who, with his eyes shut against sunlight, can perceive the direction of motion of a hand waved in front of him" (Beckers & Zeki, 1995, p. 56). Stoerig and Barth conclude that even though GY's vision is clearly degraded and different from normal vision, his experiences are still basically visual in nature.

Several other studies of blindsight describe reports of vague or unusual visual experiences (e.g. Barbur, Ruddock, & Waterfield, 1980; Weiskrantz, Cowey, & Hodinott-Hill, 2002), and even some of the earliest experiments mention DB's verbal reports of colour experiences (Weiskrantz, Warrington, Sanders, & Marshall, 1974). For these reasons, we find it a reasonable hypothesis that the preserved visual abilities of blindsight patients are associated with some kind of visual experiences.

We find that Brogaard reads the conclusions of our experiment on GR too strongly when she claims that we interpret GR's experiences as degraded yet basically identical versions of normal vision. We argue that GR's experiences are essentially visual, yet we do not argue that they are directly comparable to "normal vision".[1]

## 4. Consciousness and modality

This debate rests on a specific attitude to a question about what we may accept as cases of conscious and unconscious perception. Obvious cases of unconscious perception would be those where participants fully and consistently deny any conscious experience despite evidence of correctly identifying or reacting to physically existing visual stimuli. On the contrary, obvious cases of conscious perception would be those where participants with the same conviction insist on conscious experiences correctly matching physically existing visual stimuli. More difficult cases, however, could be cases where subjects would report conscious experiences totally unrelated to the physically existing stimulus – or without any stimulus at all (as in hallucinations). Also difficult are cases of the here relevant kind, where patients report conscious experiences related to a physically existing stimulus that however are not clearly comparable to how healthy people would report them. In this latter case, as in the obvious case of conscious perception, we have a correct identification of a stimulus and a related conscious experience.

As suggested elsewhere (Overgaard, 2011), the reports of blindsight patients may be interpreted as reports of experiences similar to those related to tactile perception. However, if GR in fact experienced something tactile related to visual stimuli (even though this may seem unlikely based on the actual experimental procedure as discussed above) would this, then, be a case of normal tactile perception based on an unusual kind of stimulus, or, rather, a case of unusual visual perception?

One way to enter this debate is to investigate which criteria to use in order to decide whether something is (a) conscious and (b) visual. It seems in that most researchers studying consciousness, also counting Brogaard, endorse the view that decisions whether one is conscious or not is based on subjective criteria. That is, only by way of introspection do we know whether we are conscious of a given, say, visual stimulus. There are rather good arguments for this position. Were we to believe that some objectively measured phenomenon, say, recurrent processing in the brain (Lamme, 2010), is so strongly associated with consciousness that this would never appear without the conscious experience and vice versa, we would still not have found such an introspection-free method. To arrive at this association, one would have to conduct several experiments, correlating recurrent processes with consciousness – using introspecting experimental participants. Consequently, this method would not be independent of introspection but carry along the strengths, weaknesses and limitations held by introspection (Overgaard, 2010). So, in order to decide whether something is conscious or unconscious, one needs introspection. It is important to note that in order to decide whether a representation is conscious or unconscious we need only one criterion. We would not be able to make sense of one criterion to be used in order to decide whether something is conscious and another, totally different, criterion to decide whether something is unconscious.

In order to decide whether something is visual or not, we arguably need a different criterion. Brogaard, along with several other researchers not least in the blindsight literature (Cowey, 2010), believes that visual perception can occur unconsciously – obviously, as this is a central aspect of her argument. So, whether something is visual or not, cannot be decided introspec-

[1] This debate can be found in a more detailed version in Overgaard (2011).

tively. Were we to argue that such decision was a purely introspective matter, we would not be able to decide whether an unconscious perception were visual or something else. Consequently, again we need only one criterion (or set of criteria) to decide whether or not a representation is visual. That is, the same criterion (or set of criteria) is used across cases of conscious and unconscious perception.

Unconscious visual perception is established whenever a subject is able to react to a visual stimulus. Consequently, one would say, a visual process is one in which a subject at some level reacts to something visual. From this argument it should follow that if there is any kind of preserved conscious experience in blindsight subjects caused by visual stimuli, as Brogaard admits there might be, those experiences should be conceived of as visual. Even in the case that a subject has experiences usually associated with tactile (or some other kind of) perception: If the experience is the result of a visual processing, it is a case of visual perception with a distorted, gradual or transformed kind of conscious experience.

Brogaard endorses a cognitive theory of consciousness (de Gardelle & Kouider, 2009; McGovern & Baars, 2007) according to which a representation is conscious only if it is made accessible for further cognitive processing by being "placed" in working memory. According to Brogaard's view, the question of whether a representation is a visual representation is a question of its causal origin. If the representation is caused by a visual stimulus and is produced and subserved by activation in the visual system, then it is a visual representation. If the representation is made cognitively accessible in working memory, then the visual representation is conscious and the subject has a visual experience of the stimulus. The only available criterion for deciding if a representation is made accessible in working memory, i.e. if it is conscious, is the subject's introspective report.

How can Brogaard determine whether the blindsight subject has a visual representation in her working memory? We have shown that some blindsight subjects do report visual phenomenology when a stimulus is presented in the affected field. Brogaard must therefore argue that the representation accessible in the blindsight subject's working memory, and reported by her in the PAS experiments, is in fact not a visual representation. Brogaard argues that the experience reported by the blindsight subject is not visual since the representations are not visual representations but propositional representations generated by the guessing activity. Brogaard must therefore argue that we can distinguish visual representations from propositional representations in terms of their causal origin. This is however not easily done.

It is common to think that a representation is a representation of whatever object or event that normally causes its occurrence and is now causing its occurrence. Both the propositional representation that Brogaard claims is produced by the blindsight subject's forced guess and the normally sighted subject's representation of visual qualities are caused by the stimulus' properties of colour, shape, and motion. Both the propositional representation of the blindsight subject and the visual representation of the normally sighted subject are subserved by activity in the visual system, and both types of representation can be made cognitively accessible in working memory.

Brogaard might claim that the representations have different causal origin since the propositional representation is caused by the guessing activity, whereas the visual representation is spontaneously produced and placed in working memory. This could be taken to indicate that different mechanisms are in play. This would however not suffice to reach the conclusion that blindsight subjects have no visual experiences. First of all, we cannot infer from different mechanisms to different representations. Different types of mechanisms can operate on the same type of representation, and visual representations might function as input to both mechanisms. Second, even though it is puzzling that blindsight subjects have to be forced to guess (and the visual representation is not spontaneously "placed" in working memory), this is not sufficient reason to argue that there is a special mechanism for guessing that generates a special type of propositional representation which when "placed" in working memory is associated with a special type of cognitive phenomenology. A much more parsimonious proposal is to say that blindsight subjects have to be forced to guess simply because their visual experience is seriously degraded and transformed (compared to normal visual experience).

In other words, Brogaard cannot conclude that the representation giving rise to the blindsight subject's phenomenology is not visual because of what the subject reports; and she cannot conclude that the representation is not visual because of its causal origin. The subject reports some kind of visual phenomenology, the representation is caused by a visual stimulus, and it is subserved by the visual system. Therefore, there are good reasons to believe that blindsight subjects visual processing do in fact involve some kind of visual consciousness.

As should be clear in the above, we disagree with Brogaard that GR has fully unconscious perception, and we disagree with her that blindsight as such relies on something else than vision. However, we have not argued that perception in the absence of conscious experience cannot as a matter of principle take place. It remains as an empirical question whether other blindsight patients and to which degree subliminal perception in healthy subjects rely on vague perceptual experiences.

## 5. Conclusion

To sum up, Brogaard's argument commits her to the view that the subject's report about what she experiences is our only means of determining whether or not she is consciously perceiving a stimulus, and if she is conscious of the stimulus, in what sensory modality she is experiencing it. Brogaard cannot use the external relation to the stimulus, since both the propositional representation of the blindsight subject and the visual representation of the normally sighted subject are externally related to the stimulus. We have, however, presented arguments to support the claim that blindsight subjects have a form

(degraded and transformed) of visual experience that respects this constraint. The PAS scale is exactly a means for probing the subjects' experience by asking them to report it. Furthermore, other researchers have provided similar evidence for some kind of visual experience in blindsight subjects. Finally, we argued that Brogaard does not have the resources for arguing that blindsight subjects' visual representations are unconscious when their subjective reports of visual phenomenology correlates with correct responses (as in Overgaard et al. (2008)).

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