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Obsessive–compulsive symptoms and attentional bias: An eye-tracking methodology

Maria C. Bradley [a], Donncha Hanna [a, **], Paul Wilson [a], Gareth Scott [b], Paul Quinn [c], Kevin F.W. Dyer [a, b, *]

[a] School of Psychology, Queen's University Belfast, Northern Ireland, UK
[b] Northern Health and Social Care Trust, Antrim, Northern Ireland, UK
[c] Belfast Health and Social Care Trust, Belfast, Northern Ireland, UK

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ABSTRACT

Background and objectives: Cognitive models suggest that attentional biases are integral in the maintenance of obsessive-compulsive symptoms (OCS). Such biases have been established experimentally in anxiety disorders; however, the evidence is unclear in Obsessive Compulsive disorder (OCD). In the present study, an eye-tracking methodology was employed to explore attentional biases in relation to OCS.
Methods: A convenience sample of 85 community volunteers was assessed on OCS using the Yale-Brown Obsessive Compulsive Scale-self report. Participants completed an eye-tracking paradigm where they were exposed to OCD, Aversive and Neutral visual stimuli. Indices of attentional bias were derived from the eye-tracking data.
Results: Simple linear regressions were performed with OCS severity as the predictor and eye-tracking measures of the different attentional biases for each of the three stimuli types were the criterion variables. Findings revealed that OCS severity moderately predicted greater frequency and duration of fixations on OCD stimuli, which reflect the *maintenance* attentional bias. No significant results were found in support of other biases.
Limitations: Interpretations based on a non-clinical sample limit the generalisability of the conclusions, although use of such samples in OCD research has been found to be comparable to clinical populations. Future research would include both clinical and sub-clinical participants.
Conclusions: Results provide some support for the theory of *maintained attention* in OCD attentional biases, as opposed to *vigilance* theory. Individuals with greater OCS do not orient to OCD stimuli any faster than individuals with lower OCS, but once a threat is identified, these individuals allocate more attention to OCS-relevant stimuli..

1. Introduction

Obsessive–Compulsive Disorder (OCD) is a pervasive mental health problem with estimated prevalence rates ranging from 1.3 to 3% (Somers, Goldner, Waraich, & Hsu, 2006; Zucker, Craske, Barrioa, & Holguin, 2002). The Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013) defines the principle descriptors of OCD as: a) recurrent thoughts, or images (obsessions) that are considered intrusive and that cause significant distress; and b) ritualistic behaviours (compulsions) typically engaged in to neutralise obsessive thoughts. However, many of the cognitive features of OCD exist on a continuum within the general population. Zucker et al., (2002) reported that 80–99% of people experience intrusive thoughts and/or impulses. Moreover, such processes are thought to be important for adaptive cognitive functions such as creativity and problem-solving (Salkovskis & McGuire, 2003).

Contemporary cognitive models of OCD claim that the disorder develops and is maintained by overestimation of both personal

* Corresponding author. School of Psychology, Doctorate in Clinical Psychology, David Keir Building, 18-30 Malone Road, Belfast, BT9 5NP, Northern Ireland, UK.
** Corresponding author. School of Psychology, David Keir Building, 18-30 Malone Road, Belfast, BT9 5NP, Northern Ireland, UK.
E-mail addresses: donncha.hanna@qub.ac.uk (D. Hanna), k.dyer@qub.ac.uk (K.F.W. Dyer).

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responsibility and the level of threat posed by situations, sensations or mental events (Rachman; 1997; Salkovskis, 1999). Most individuals will regularly experience aversive intrusions in response to environmental stimuli without developing OCD. However, in clients with OCD, it is their subsequent 'catastrophic' negative appraisal of the intrusions and the actions they undertake to neutralise the accompanying aversive feelings that causes their Obsessive Compulsive Symptoms (OCS; Frost, Steketee, & Williams, 2002; Salkovskis, 2007).

1.1. Attentional bias and OCD

In addition to the salience of appraisals and neutralising behaviours, cognitive theories of both OCD and anxiety highlight the pivotal role of attentional or information-processing biases in the maintenance of these disorders (Salkovskis & McGuire, 2003). Attentional biases are thought to develop as a result of activation of negative cognitive schemata, which, in turn, induce individuals to orientate towards environmental stimuli that are consistent with their primary fears. Both Beck's (1976) schema model and Bower's (1981) network model propose attentional biases have a substantive information-processing role in the perpetuation of anxiety and depression. Nevertheless, the exact mechanism of such biases remains unclear. Two central theories have emerged to account for attentional bias in anxiety disorders and OCD (Moritz, von Mühlenen, Randjbar, Fricke, & Jelinek, 2009). The *vigilance* hypothesis suggests that individuals with OCD may be overly sensitive/hypervigilant towards obsession-related stimuli, exhibiting a 'lowered perceptual threshold' for identifying and attending to OCD-related material (Armstrong & Olatunji, 2012). In contrast, the *delayed disengagement/maintenance* hypothesis asserts that individuals with OCD do not have an enhanced hypervigilance or initially orientate more quickly towards OCD stimuli. Rather, individuals with OCD have problems either disengaging from the stimuli or overly fixating upon them at later processing stages (Georgiou et al., 2005).

1.2. Measuring attentional bias

Discerning the exact mechanism of OCD attentional biases (e.g., *vigilance* vs. *delayed disengagement/maintenance*) has proved challenging due to the limited technology available for testing theoretical models. Dot-probe response and modified Stroop tasks have been the predominant paradigms used to measure attentional bias in OCD; however, research has produced inconsistent evidence.

The Emotional Stroop paradigm measures the ability to process one dimension of a multidimensional stimulus (i.e., naming the colour of text) when another dimension (i.e., emotional word meaning) interferes with this task. A response delay in colour naming is interpreted as interference as a result of automatic activation of fear-responses or mood-congruent semantic networks (Kyrios & lob, 1998). McNally, Riemann, Luro, Lukach, and Kim (1992) found that both participants with OCD and panic disorder exhibited attentional biases towards general threat words in an Emotional Stroop task. Lavy, van Oppen, and van den Hout (1994) also examined response times to OCD stimuli. Individuals with OCD took significantly longer to colour name OCD-related words compared to healthy controls, suggesting greater attentional bias toward OCD stimuli. In terms of OCD subtypes, participants with washing compulsions have been found to display slower response times to washing-specific words than those without such compulsions (Foa, Ilai, McCarthy, Shoyer, & Murdock, 1993). The literature is clouded, unfortunately, by the fact that many of these findings have not been replicated in more recent Stroop investigations (e.g., Kampman, Keijsers, Verbraak, Naring, & Hoogduin, 2002; Moritz et al., 2004; Moritz et al., 2008).

Dot-probe experimental paradigms usually present two images simultaneously on a screen. When the images disappear, one is replaced with a probe (e.g. an 'x') and the participant is required to indicate the position of the probe. A delay in responding is expected if the individual's attention was captured by the image that was on the mirror side of the probe, as the eye must travel further. Dot-probe investigations have also yielded equivocal results with regard to OCD biases. Tata, Leibowitz, Prunty, Cameron, and Pickering (1996) and Amir, Najmi, and Morrison (2009) found evidence of attentional bias for OCD-salient information in participants with OCD. Moritz et al. (2009) used visual stimuli rather than words and lengthened stimuli presentation times (relative to previous studies) resulting in evidence supporting the presence of attentional bias. Conversely, similar probe detection tasks found no evidence of an attentional bias (e.g., Harkness, Harris, Jones, & Vaccaro, 2009).

There are several possible methodological explanations for the previous inconsistent findings. Firstly, OCD Stroop words (e.g., 'responsibility', 'dirt') have often been considered not sensitive enough to evoke OCD attentional biases, especially compared to stimulus words for other disorders such as alcohol abuse (e.g., 'beer'; Summerfeldt & Endler, 1998). In contrast, Moritz et al. (2009) found pictorial stimuli were more emotionally evocative than word stimuli and potentially more likely to elicit biases. Secondly, generic OCD stimuli may not be suitably idiosyncratic to access the attentional biases of the majority of individuals with OCD. The Obsessive-Compulsive Cognition Working Group (1997) stated that the heterogeneity of this population was the main impediment to attentional bias research. The personal nature of many OCD appraisals makes it difficult to develop a single set of stimuli that are relevant for the wider OCD population, even for members of the same subtype.

Another consideration within the literature is the overreliance on behavioural response paradigms to investigate the existence of bias (e.g., Stroop tasks, reaction times). The validity of the dot-probe task as a measure of attention has been criticised, since the human eye can shift and fixate many times within the period it takes for the probe to appear in trials (Mogg, Millar, & Bradley, 2000). A more effective and ecologically valid method of measuring attentional bias is to track eye-movements in relation to set stimuli (Jonides, 1981). Eye-tracking studies have begun to operationalise distinct attentional processes using types of eye-movement pattern (Armstrong & Olatunji, 2012) and this paradigm has already has been used frequently within other fields of research such as autism (Riby & Hancock, 2009) and schizophrenia (Hutton & Ettinger, 2006). Anxiety research has also employed this paradigm with some success. Mogg et al. (2000) used both eye-tracking and a reaction-time design to explore attention to face-pairs (threatening, sad, happy, neutral) in individuals with generalised anxiety disorder (GAD) and depression. The GAD group exhibited a *vigilance* bias by orienting their gaze more quickly to threatening faces than the depression and control groups. Reaction-time tasks were unable to detect any biases in this study.

1.3. Eye-tracking paradigm in OCD research

Research examining attentional bias in OCD using eye-tracking methodologies is at an early stage with only a handful of studies using this approach on non-clinical populations (e.g., Armstrong Olatunji, Sarawgi & Simmons, 2010; Armstrong, Sarawgi, & Olatunji, 2012; Toffolo, van den Hout, Hooge, Engelhard, & Cath, 2013). Results support the presence of attentional bias in OCD; however, there is still a lack of consistency regarding the precise type of attentional processing involved in this process (i.e., *vigilance* vs. *delayed disengagement/*