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Developing image sets for inducing obsessive-compulsive checking symptoms

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ABSTRACT

Visual stimuli are often used for obsessive-compulsive (OC) symptom provocation in research studies. We tested the induction of anxiety and OC checking symptoms across different types of checking provocation stimuli in three populations: individuals with obsessive compulsive disorder (OCD), individuals with checking symptoms but without a diagnosis of OCD, and control individuals with neither checking symptoms nor a clinical diagnosis. One set of provocative images depicted objects that are commonly associated with checking anxiety. Another set ('enhanced provocative images') depicted similar objects but also included contextual cues suggesting a specific harmful scenario that could occur. As expected, the enhanced provocative images were more effective at inducing anxiety and OC symptoms than the standard provocative images. Future studies requiring checking symptom provocation should therefore consider incorporating similarly suggestive images. Individuals with clinical OCD reported the greatest provocation in response to these images, followed by those with nonclinical checking, followed by control individuals. Thus, these stimuli are able to provoke OC checking symptoms and anxiety differentially across groups, with the intensity of provocation reflecting diagnostic status. All groups demonstrated a similar qualitative pattern of provocation across images. Finally, in all groups, reported anxiety closely tracked intrusive thoughts and checking urges.

1. Introduction

Symptom induction using provocative stimuli is commonly used in studies of obsessive-compulsive disorder (OCD). For example, many studies of the neurobiological basis of OCD have employed symptom provocation in a neuroimaging context (Adler et al., 2000; Agarwal et al., 2013; An et al., 2009; Cottraux et al., 1996; Gilbert et al., 2009; Mataix-Cols et al., 2003; Mataix-Cols et al., 2004; Nakao et al., 2005; Rauch et al., 1994; Scheinost et al., 2013; Schienle et al., 2005).

Symptom provocation paradigms can use either personalized or standard stimuli. As OCD symptoms can be quite idiosyncratic, personalized stimuli have the advantage of being highly relevant to a participant's particular symptomatology. They may include words/sentences chosen by the participant for their association with symptom anxiety (Cottraux et al., 1996; Nakao et al., 2005), photographs taken by the participant of anxiety-inducing scenes from their own life (Schienle et al., 2005), or other personally relevant objects/images (Adler et al., 2000; Rauch et al., 1994). However, because of their idiosyncratic nature, such personalized stimuli can vary on multiple dimensions across participants. While past research has succeeded in minimizing unwanted variation in personalized images (Morgieve et al., 2014; Simon et al., 2010; Simon et al., 2012), these image sets still require creation and validation on a participant-by-participant basis.

When stimuli need to be balanced across participants or conditions, as in comparative functional brain imaging studies, standardized stimulus sets allow for straightforward comparisons across groups and confer the added advantage of avoiding lengthy image collection and validation for each participant. One such set is the Maudsley Obsessive-Compulsive Stimuli Set (MOCSS)(Mataix-Cols et al., 2009). This image

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set has been very useful for the OCD research community (Agarwal et al., 2013; An et al., 2009; Gilbert et al., 2009; Hampson et al., 2012; Mataix-Cols et al., 2003; Mataix-Cols et al., 2004). Such an image set typically needs to be tailored and balanced for a specific application. For example, the MOCSS is often adapted (Agarwal et al., 2013; Gilbert et al., 2009) or expanded (Hampson et al., 2012) to suit the needs of particular studies.

The development and adaptation of OCD-provocative stimulus sets is facilitated by an understanding of the characteristic image features that affect the intensity of symptom provocation. Different images are used to provoke different categories of OCD symptoms, such as contamination and fear-of-harm/checking symptoms. Here, we examine the characteristics of images that provoke checking symptoms; while contamination symptoms are readily provoked by visual images, we have anecdotally found the reliable provocation of checking symptoms to be more challenging. In the MOCSS, images used to provoke checking symptoms depict objects that individuals with OCD commonly check repeatedly, such as light switches, stoves, and electrical outlets; participants are instructed to imagine that they are in the presence of these objects but are unable to check them. We tested whether such images are more provocative if they more explicitly suggest the type of harm that could arise – for example, if a flammable object is seen on a stove (Fig. 1). In this manuscript, we refer to the more explicitly suggestive images as 'enhanced provocative images' and the standard, more subtly suggestive images simply as 'provocative images'. We examined the ability of these images to produce self-reported anxiety, intrusive thoughts, and compulsive urges to check.

We examined provocative and enhanced provocative images in individuals with clinical OCD, individuals with checking obsessions and compulsions but without a diagnosis of OCD, and control individuals with neither checking symptoms nor a clinical diagnosis. Comparison of these three groups tests the ability of a standardized stimulus set to provoke OC symptoms in populations with clinical and nonclinical OCD symptoms. It also assesses the validity of piloting and testing stimuli in subclinical or nonclinical populations, which is often desirable in a research context. From a theoretical perspective, this study has bearing on whether subclinical obsessive-compulsive anxiety and clinical OCD lie along a continuum or are qualitatively different phenomena. Previous work has suggested that individuals with subclinical obsessive-compulsive symptoms share many traits with the OCD population, including distinctive cognitive and personality profiles (Gibbs, 1996) and overlapping brain activation patterns during symptom provocation (Mataix-Cols et al., 2003) – an idea that is consistent with the Research Domain Criteria (RDoC) initiative (https://www.nimh.nih.gov/research-priorities/rdoc/index.shtml). Here, we extend this work by exploring whether self-reported checking provocation induced by different stimuli is qualitatively similar across groups.

Fig. 1. Two examples of provocative images (left panel) and their matched enhanced provocative images (right panel).

We had several *a priori* expectations. First, we predicted that enhanced provocative images would induce greater anxiety than standard provocative images, which would induce greater anxiety than neutral images, confirming that explicit suggestion of harm amplifies the provocation efficacy of checking images. We expected to see this pattern in all groups (participants with OCD, participants with nonclinical checking, and control participants). In response to these provocative and enhanced provocative images, we predicted that participants with OCD would report the greatest anxiety and OC symptoms, followed by participants with nonclinical checking, followed by control participants. Second, we predicted that the anxiety induced by specific images would correlate across participants with OCD and participants with nonclinical checking. This prediction is consistent with a dimensional view of OCD, wherein participants with nonclinical checking would be expected to present qualitatively similar obsessive-compulsive experiences to clinical patients, differing only in intensity or the level of distress or impairment they produce. Finally, we predicted that stimulus-induced obsessions and compulsions would correlate well with anxiety, confirming that anxiety is a reasonable proxy for OCD symptoms in this context.

2. Methods

2.1. Participants

Fifteen individuals diagnosed with OCD (5 males, age 25.20 ± 5.17 years [S.D.]; 10 females, age 29.50 ± 11.47) were recruited through the Yale OCD Research Clinic (ocd.yale.edu). These individuals had all undergone structured psychiatric evaluation using the Mini-International Neuropsychiatric Interview (MINI; Sheehan et al., 1998), met criteria for a primary diagnosis of OCD according to DSM-5, had a minimum score of 16 on the Yale-Brown Obsessive Compulsive Scale (Goodman et al., 1989a; Goodman et al., 1989b) at screening, and endorsed checking symptoms on the YBOCS Symptom Checklist. Participants were excluded if they met criteria for active substance or alcohol use disorder within the past 6 months, a psychotic disorder, bipolar, current significant suicidal ideation, or a pervasive developmental disorder.

A 'nonclinical' group consisting of ten participants who endorsed checking symptoms but had no self-reported diagnosis of OCD was recruited from the community (5 males, age 22.8 ± 5.93; 5 females, age 23.8 ± 4.21). These individuals were administered the checking subscale (items 14–23) of the Padua Inventory (Burns et al., 1996), and a minimum score of 8 was required for participation. This group had scores on this checking subscale of the Padua inventory that were comparable to the OCD group (indeed they were numerically, though not statistically, higher); the absence of a clinical diagnosis of OCD suggests that these individuals were less impaired by their checking behaviors, as the hallmark of a clinical diagnosis of OCD is the impairment or distress caused by the symptoms.

Lastly, eleven control participants with minimal checking symptoms (less than 8 on the Padua checking subscale) were recruited from the community (3 males, age 38.67 ± 17.62; 8 females, age 27.50 ± 12.20). Control participants underwent structured psychiatric evaluation using the (MINI; Sheehan et al., 1998) and were excluded if they met criteria for any current DSM-5 diagnosis.

See Table 1 for demographic data. Due to an oversight, the Padua data from one participant with OCD was missing, so that patient was excluded in the calculation of descriptive statistics for this scale. All participants provided written consent in accordance with a protocol reviewed and approved by the Yale Human Research Protection