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AN INVESTIGATION OF THE RELATIONSHIP BETWEEN RESPONSIBILITY AND ATTENTION DEFICITS CHARACTERISTIC OF OBSESSIVE-COMPULSIVE PHENOMENA

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Abstract. Attention deficits and inflated perceptions of responsibility have been identified as characteristics of people with obsessive-compulsive disorder (OCD). The present study examined the relative importance of responsibility and attention in predicting non-clinical levels of obsessionality. Three hundred Australian university students were screened using the Maudsley Obsessional-Compulsive Inventory (MOCI), and students who scored in the top and bottom 10% of the distribution were selected for participation. The selected participants completed the Responsibility Attitude Scale (RAS) and the Test of Everyday Attention (TEA), along with measures of trait-anxiety and depression. High MOCI scorers exhibited a greater perception of responsibility, and poorer overall attention than low MOCI scorers. These differences remained significant after controlling for trait-anxiety and depression. Logistic regression analyses revealed that responsibility was a stronger predictor of non-clinical obsessionality than was attention. Moreover, attention did not make a significant contribution to the prediction of obsessionality once responsibility had been controlled. Correlations between responsibility and TEA visual selective attention subtests remained significant after controlling for obsessionality. These findings suggest that measures of attention (particularly measures of visual selective attention) may be confounded by responsibility attitudes, thus highlighting the importance of controlling for meta-cognitive variables such as responsibility when investigating attention in OCD.

Keywords: Obsessive-compulsive disorder, responsibility, selective attention.

Introduction

The aetiology of obsessive-compulsive disorder (OCD) appears to be multi-factorial, and several aetiological theories and models exist. Amongst these, one prominent theoretical model implicates cognitive-behavioural processes, whilst another implicates attentional processes. Despite the magnitude of research on these two models, no research has yet attempted to compare the two theories with respect to their relative importance in differentiating between high and low levels of obsessive-compulsive (OC) symptoms. Nor has any research examined the possible interactions between these two models.

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A great deal of recent research on cognitive-behavioural processes in OCD has focused on the role of inflated responsibility appraisals. Salkovskis (1985, 1989) proposes that the difference between ''normal'' intrusive thoughts and clinical obsessions lies not in the occurrence or content of these thoughts, but in the way that the intrusive thoughts are interpreted. Normal intrusive thoughts become obsessions when an individual interprets the occurrence or content of the intrusion(s) as indicating personal responsibility for causing or preventing harm to oneself or others. Misinterpretations of personal responsibility can result in conscious attempts to suppress or neutralize the intrusion. As a consequence of these attempts, intrusive thoughts become more salient and the likelihood of further attempts to neutralize or suppress the thought increases, which further increases the likelihood of recurrence. The occurrence of obsessional thoughts, when combined with perceptions of inflated responsibility, lead to the perception of threat and an overwhelming feeling that one must do something to minimize this threat. This sense of inflated responsibility is suggested to be the impetus for various types of obsessional problems and compulsive behaviour.

The hypothesized association between inflated responsibility and OC symptoms has been supported by several studies using self-report questionnaires (e.g., Freeston, Ladouceur, Gagnon, & Thibodeau, 1993; Rachman, Thordarson, Shafran, & Woody, 1995; Rhéaume, Ladouceur, Freeston, & Letarte, 1994, 1995; Salkovskis et al., 2000), and also by experiments that have demonstrated a change in OC symptoms as a result of deliberate manipulations of responsibility (e.g., Bouchard, Rhéaume, & Ladouceur, 1999; Ladouceur et al., 1995; Lopatka & Rachman, 1995; Shafran, 1997).

A second theoretical model proposes that people with OCD are characterized by a selective attention deficit. Research employing a variety of paradigms and procedures, including dichotic listening (Foa & McNally, 1986) and threat-related Stroop tasks (Foa, Ilai, McCarthy, Shoyer, & Murdock, 1993; Lavy, van Oppen, & van den Hout, 1994), have consistently demonstrated that people with OCD have an attentional bias for threat-related stimuli. This selective attention bias, however, is characteristic of all anxiety disorders, not just OCD (Williams, Mathews, & McLeod, 1996). However, in addition to a selective attention bias for threat-related information, people with OCD appear also to be characterized by a more general attention deficit. Research suggests that people with OCD have difficulty inhibiting processing of irrelevant environmental (external) and mental (internal) stimuli. Unlike the content-dependent attention bias for threat-related stimuli, results from negative priming studies suggest that the content-*independent* attention deficit is unique to OCD, and not merely a product of having an anxiety disorder (Enright & Beech, 1990, 1993a).

Enright and Beech (1990, 1993a) combined a negative priming procedure (Tipper, 1985) with the Stroop paradigm (Stroop, 1935), where participants were presented with colour words printed in incongruous colours and asked to name the colour of the ink. On the succeeding trial, the target stimulus (i.e., the colour of the ink) was the colour that was ignored in the preceding trial (e.g., the printed colour word). OCD patients exhibited markedly reduced negative priming effects (i.e., no significant increase in response latency to previously ignored stimuli) compared to control participants, while patients with other anxiety disorders (agoraphobia, simple phobia, panic disorder, generalized anxiety disorder, social anxiety, and post-traumatic stress disorder) displayed the same negative priming effects as controls. The negative priming procedure is an indirect measure of selective attention, as reduced negative priming effects are believed to represent a deficit in preconscious mechanisms for inhibiting irrelevant cues. Furthermore, Enright and Beech (1993b) found

that on semantic priming tasks, pre-presentation actually *facilitated* performance for OCD participants (i.e., response latency *decreased* when the stimulus had previously been ignored). It was concluded that a general inability to selectively attend to relevant stimuli whilst screening out irrelevant competing external and internal stimuli (particularly intrusive thoughts) may be central to the aetiology of OCD. However, for reasons that remain unclear, MacDonald, Antony, MacLeod and Swinson (1999) failed to replicate the findings of Enright and Beech, and McNally, Wilhelm, Buhlmann and Shin (2001) found only a marginally significant negative priming deficit in OCD patients, relative to control participants.

Further research suggests that reliable negative priming effects are apparent in low trait-anxious people but not in high trait-anxious people (Fox, 1994), suggesting a possible relationship between trait-anxiety and impaired selective attention. It is therefore important to control for trait-anxiety when examining selective attention.

Veale, Sahakian, Owen and Marks (1996), who compared a group of OCD patients with matched healthy controls on neuropsychological tests sensitive to frontal lobe dysfunction, provide further support for the attention deficit theory. OCD patients exhibited impaired performance on an attentional set-shifting task, suggesting that they had difficulty in selectively attending to relevant stimuli when distracting stimuli were introduced. Veale et al. (1996) concluded that people with OCD may be easily distracted by irrelevant competing stimuli (both internal and external) that would be easily ignored by healthy controls.

The most direct evidence of a selective attention deficit in OCD comes from a study by Clayton, Richards and Edwards (1999), who compared a group of OCD patients to a group of patients with panic disorder and a group of non-clinical controls on their performance on the Test of Everyday Attention (TEA; Robertson, Ward, Ridgeway, & Nimmo-Smith, 1994). A selective attention deficit was found to be associated with OCD but not with panic disorder. Clayton et al. (1999) interpreted these results as suggesting ''that people with OCD have a reduced ability to selectively ignore unimportant external (sensory) and internal (cognitive) stimuli'' (p. 174) such as intrusive thoughts. Furthermore, people with OCD also exhibited poorer performance than panic and controls on tests sensitive to attention switching and sustained attention, suggesting that people with OCD may have a wider range of attention deficits than those proposed by Enright and Beech (1990, 1993a, 1993b).

Further support for the proposed attention deficit comes from a recent study by Okasha et al. (2000), who compared neuropsychological test performance and event-related potentials (ERPs) between a group of OCD patients and a group of non-clinical controls. People with OCD displayed overfocused attention to irrelevant stimuli and delayed selective attention to relevant tasks. Moreover, selective attention appeared to worsen with OCD symptom severity. It appeared that people with OCD were unable to disregard irrelevant cues and suffered excessive interference with information processing. These results were consistent with previous ERP studies, whose authors had speculated that abnormal ERPs in OCD patients may reflect a deficit in selective attention (Shagass, Roemer, Straumanis, & Josiassen, 1984), hyperarousal and over-focused attention to irrelevant cues (Rapaport et al., 1981; Towey et al., 1990).

However, it remains uncertain whether slowed performance by OCD sufferers on tests measuring selective attention can be attributed to the effects of antidepressant mediation or ''a meticulous concern for the correct execution of the test, or intrusion of obsessive thoughts disturbing the subject during the task'' (Okasha et al., 2000, p. 281), rather than an attention deficit per se. Moreover, slowness in OCD has been proposed to arise from

obsessional traits such as indecisiveness, perfectionism and meticulousness (Veale, 1993). Given that Clayton et al. (1999) observed differences on only one of the untimed TEA subtests (and all timed tests), the differences they observed on the timed tests may have been due to slow responding associated with the medication the OCD participants were taking (all of the OCD participants were currently taking antidepressants, compared to 38% of the panic participants and 7% of controls) or intrusive thoughts. In order to examine whether these differences exist in the absence of medication, replication is necessary with either a non-clinical population or a non-medicated clinical population. In this context it is also important to control for depressive symptomatology, as depression is commonly associated with a decreased ability to maintain concentration (Watts, 1993; Willner, 1984).

Despite the magnitude of the research that has been conducted on responsibility appraisals and attention deficits in OCD, there have been no attempts to integrate the two theories. Both attention deficits and inflated perceptions of responsibility have been identified in people with OCD, and both variables have been proposed to contribute to the multi-factorial aetiology of OCD. Tallis (1995) describes OCD as ''the common end with respect to several different pathways and factors'' (p. 164). The relative importance of these factors may vary from one person to the next, but it is quite unlikely that these two theories are mutually exclusive. Nevertheless, there is no existing research that has attempted to integrate them or to demonstrate their relative importance. One of the consequences of failing to integrate different theoretical models into OCD research is the likelihood of overlooking potential confounding variables. Given that attention deficits and dysfunctional responsibility beliefs coexist in many OCD patients, cross-theoretical confounds are not impossible. Salkovskis (1985, 1989, 1996, 1999) has speculated that an inflated appraisal of responsibility would impair selective attention in OCD sufferers, but this prediction has never been empirically tested.

It can be hypothesized that due to inflated perceptions of responsibility, people with OCD have an increased vigilance for a broad range of potentially threatening stimuli that require attention (Rachman, 1998). The decision as to whether a particular stimulus is relevant in a particular situation is usually made at a preconscious level. However, since people with OCD appear to have a deficit in the preconscious mechanisms for inhibiting irrelevant cues (Enright & Beech, 1993a), it is possible that their increased vigilance for potentially harmful stimuli might lead them to have a diminished ability to inhibit irrelevant environmental (external) and mental (internal) stimuli. Reduced ability to inhibit irrelevant stimuli may lead to difficulty screening out (irrelevant) intrusive thoughts. Failure to inhibit unwanted intrusive thoughts preconsciously is likely to lead to conscious attempts at thought suppression, which can increase the negative mood state associated with unwanted intrusions (Purdon & Clark, 2001). This leads to increased anxiety, which is likely to provoke even greater vigilance for (relevant) potentially harmful stimuli, thus creating a vicious cycle.

If inflated responsibility contributes to an attention deficit in people with OCD, then it is plausible that dysfunctional responsibility beliefs and attitudes may confound neuropsychological measures, such as those designed to measure attention deficits. If measures of attention (such as the TEA) are confounded by responsibility, then studies aiming to assess attention deficits in OCD (e.g., Clayton et al., 1999) may have been measuring a construct apart from attention. If inflated responsibility impairs attention, given that people with OCD report a greater sense of personal responsibility than members of the general population (Salkovskis et al., 2000), it is not surprising that people with OCD would exhibit poorer

attention than controls. Hence one of the advantages of integrating theoretical models is the ability to examine possible confounds between variables from different theoretical models.

The aims of the present study are therefore threefold. The first is to examine the ability of a recently developed measure of responsibility (The Responsibility Attitude Scale, RAS; Salkovskis et al., 2000) to differentiate between non-clinical individuals with high and low levels of OC symptoms. The second is to replicate the findings of Clayton et al. (1999) in a non-clinical population, whilst additionally examining the effect of controlling for trait-anxiety and depression. The third aim is to investigate whether inflated perceptions of responsibility are related to attention deficits in a non-clinical population. The relative importance of responsibility and attention in predicting OC symptoms will be assessed, together with an examination of the relationship (if any) between these two variables. Although there is no evidence to suggest that one variable may be a more powerful predictor of OC symptoms than the other, Salkovskis, Richards and Forrester (1995) have suggested that ''responsibility-driven attempts to control cognitive activity explain obsessional and compulsive phenomena better than generalized deficit models'' (p. 281). Therefore, one of the specific predictions in the current study is that responsibility appraisals will contribute more to the prediction of OC symptoms than general attention deficits. Furthermore, it is predicted that the variance in OC symptoms accounted for by attention will diminish after controlling for responsibility appraisals.

Method

Participants

Three hundred Australian university students were screened using the Maudsley Obsessional-Compulsive Inventory (MOCI; Hodgson & Rachman, 1977). The top 10% of scorers were selected as the high-obsessive-compulsive (HOC) group, and the bottom 10% of scorers were selected as the low-obsessive-compulsive (LOC) group. The HOC group consisted of 11 males and 19 females, and the LOC group consisted of 12 males and 18 females. There was no significant difference in age between the HOC group ($M = 22.40$, $SD = 5.53$) and the LOC group ($M = 23.07$, $SD = 6.77$); $t(58) = 0.31$, $p = .76$, two-tailed. The mean MOCI score for the HOC and LOC group was 15.43 ($SD = 2.25$) and 1.13 ($SD = .57$) respectively. This difference was significant; $t(32.71)^{1} = -33.68$, $p < .001$, two-tailed. None of the participants were currently taking any antidepressant medication.

Materials

The Maudsley Obsessional-Compulsive Inventory (MOCI; Hodgson & Rachman, 1977) is a self-report questionnaire consisting of 30 true/false items. It can be used to obtain a total OC symptom score ranging from 0 to 30 (with higher scores representing greater levels of OC symptoms), as well as four sub-scale scores (checking, washing, slowness, and doubting). The internal consistency (Chronbach's α) of the MOCI in the current study was 0.79, which is comparable to previous non-clinical studies (e.g., Sanavio & Vidotto, 1985; Sternberger & Burns, 1990).

[1] Equal variances not assumed.

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The Responsibility Attitude Scale (RAS; Salkovskis et al., 2000) is a self-report questionnaire consisting of 26 statements designed to assess general beliefs about responsibility (e.g., ''I often feel responsible for things which go wrong''). Respondents are required to indicate the degree to which they agree with each statement, based on a 7-point scale ranging from 1 (totally disagree) to 7 (totally agree). A total responsibility score is obtained by summing all the items and dividing by 26, resulting in a final score between 1 and 7. The internal consistency of the RAS in the current study was 0.95.

The Test of Everyday Attention (TEA; Robertson et al., 1994) is a psychometric test battery that assesses four components of attention: selective attention, attention switching, sustained attention, and auditory-verbal working memory (AVWM). It consists of eight subtests and provides 10 scaled attention scores, adjusted for age. The TEA comes in three parallel versions (A, B and C), and consists of four factors. Subtests loading on the selective attention factor (*Map Search* [MS1 and MS2] and *Telephone Search* [TS]) are sensitive to *visual* selective attention deficits, as they require participants to search for targets amidst complex visual arrays whilst ignoring irrelevant information. Subtests loading on the sustained attention factor (*Elevator Counting* [EC], *Telephone Search while Counting* [TSC] and *Lottery*) reflect the participant's ability to maintain attention/concentration on a repetitive and relatively unchanging task. The AVWM factor consists of subtests (*Elevator Counting with Distraction* [ECD] and *Elevator Counting with Reversal* [ECR]) that involve ''the manipulation and sequencing of auditory-verbal information in working memory, as well as *auditory* [italics added] selective attention'' (Robertson et al., 1994, p. 10). The attention switching subtest (*Visual Elevator* [VE]) assesses the participant's ability to switch attention rapidly from one direction of counting to another. Subtest 8 (Lottery) was not administered in the current study as the differences between groups on this subtest in the Clayton et al. (1999) study were very small, $F(2, 42) = 0.4$, $p = .67$, due to a ceiling effect. Given the large effect sizes and power of the Clayton et al. (1999) study, this subtest does not warrant replication.

Raw scores from each TEA subtest (with the exception of EC) are transformed into age-adjusted standard scores that lie on a scale from 1 to 19, with the mean performance in the standardization sample corresponding to a scale score of 10, and a standard deviation of 3. Higher scores indicate greater attentional capabilities. Scores from the Elevator Counting subtest are not transformed into scaled scores due to the low ceiling effect of this subtest. In the present study, an overall attention score (total attention) was obtained by summing the eight scaled (and one unscaled) subtest scores. In addition, four factor scores (i.e., selective attention, attention switching, sustained attention, and AVWM) were obtained by averaging the sub-tests loading on each respective factor.

Form Y-2 of the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) was used to measure trait-anxiety. The STAI (Form Y-2) contains 20 items; each rated on a four-point scale (almost never, sometimes, often, or almost always) aimed at assessing how the respondent generally feels. Scores can range from a minimum of 20 to a maximum of 80, with higher scores indicative of greater levels of trait-anxiety. The internal consistency of the STAI in the current study was 0.93.

The Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) is a 20-item self-report questionnaire that assesses depressive symptoms experienced during the past week. For each item, the respondent indicates how often during the past week they felt or behaved a certain way, where 0 = rarely or none of the time (less than 1 day); 1 = some

or a little of the time (1–2 days); 2 = occasionally or a moderate amount of time (3–4 days); and 3 = most or all of the time (5–7 days). After reverse-coding negatively worded (i.e., non-depressive) items (such as ''I was happy''), the scores from the 20 items are summed, resulting in a range of possible total scores from 0 to 60. Higher scores represent greater levels of depressive symptomatology. Satisfactory internal consistency of the CES-D was demonstrated in the current study ($\alpha = 0.88$), which is consistent with previous results (e.g., Knight, Williams, McGee, & Olaman, 1997; Orme, Reis, & Herz, 1986).

Procedure

This study was approved by the Social and Behavioural Research Ethics Committee of Flinders University. Students completed the MOCI voluntarily in return for participation in a cash prize raffle. Based on MOCI-total scores, 60 students were selected to participate in the final component of the study (i.e., the top 10% and bottom 10% of the distribution). These student were contacted via telephone and/or e-mail and asked whether they were currently taking any antidepressant medication. Those who were not on antidepressants were then invited to attend individual testing sessions of approximately 50 minutes duration. During these sessions, the TEA (Version A) was administered (excluding Subtest 8: Lottery), followed by the RAS, STAI, and CES-D (in randomized order).

Results

Anxiety and depression

The mean level of trait-anxiety for the HOC group ($M = 47.17$, $SD = 9.48$) was significantly greater than the mean level of trait-anxiety for the LOC group ($M = 34.27$, $SD = 7.60$); $t(58) = -5.82$, $p < .001$, two-tailed. The mean level of depression was also significantly higher for the HOC group ($M = 15.77$, $SD = 8.93$) than for the LOC group ($M = 7.13$, $SD = 4.17$); $t(41.06)$[2] $= -4.80$, $p < .001$, two-tailed. These measures were therefore included as covariates in the remaining analyses.

Responsibility

The mean RAS score for the LOC group ($M = 3.01$, $SD = 0.66$) was significantly lower than the mean RAS score for the HOC group ($M = 4.55$, $SD = 0.83$), $F(1, 58) = 62.85$, $p < .001$. These scores are comparable with those of Salkovskis et al. (2000), where the mean RAS score for OCD patients was 4.69 ($SD = 1.01$), compared to 4.00 ($SD = 0.92$) for participants with other anxiety disorders, and 3.48 ($SD = 1.01$) for non-clinical controls. The difference between the HOC and LOC group in the current study remained significant after controlling for trait-anxiety, $F(2, 57) = 48.62$, $p < .001$, depression, $F(2, 57) = 47.62$, $p < .001$, and after controlling for both trait-anxiety and depression, $F(3, 56) = 34.76$, $p < .001$.

[2] Equal variances not assumed.

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Attention

As shown in Figure 1, the HOC group performed more poorly than the LOC group on all of the TEA subtests. MANOVA analyses revealed that there was a significant difference between groups on a linear combination of the TEA subtests, Pillai's Trace = 0.43, $F(9, 50) = 4.19$, $p < .001$; however univariate ANOVAs and ANCOVAs (see Table 1) revealed that not all of the individual subtests contributed to the significant multivariate effect. Significant differences between groups were only found on the Elevator Counting with Distraction (ECD; untimed), Visual Elevator (timing score; VE2), Telephone Search (TS; timed), and Telephone Search while Counting (TSC; timed) subtests. After controlling for trait-anxiety and depression, differences in ECD, VE2 and TS scores remained significant at the 0.05 alpha level. After performing the Bonferroni correction, ECD and VE2 remained significant at the adjusted 0.006 alpha level.

The mean total attention score for the HOC group ($M = 92.30$, $SD = 15.07$) was significantly less than the mean total attention score for the LOC group ($M = 104.60$, $SD = 11.51$); $F(1, 58) = 12.64$, $p < .001$. This difference remained significant after controlling for trait-anxiety, $F(2, 57) = 6.21$, $p < .01$, depression, $F(2, 57) = 6.28$, $p < .01$, and after controlling for both trait-anxiety and depression, $F(3, 56) = 4.20$, $p < .01$.

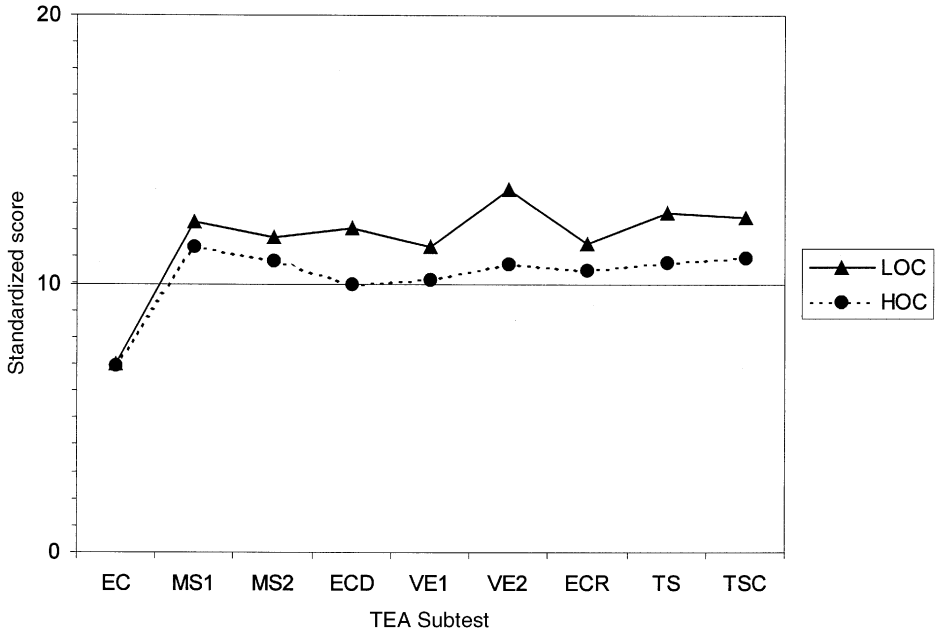

Figure 1. Mean TEA subtest scores for the high-obsessive-compulsive (HOC) and low-obsessive-compulsive (LOC) group. A scaled score of 10 represents the ''norm'' for each subtest (based on a normative sample of 154 healthy volunteers), with the exception of Elevator Counting (EC). EC scores are not transformed into scaled scores due to the low ceiling effect of this subtest. The maximum possible EC score is 7

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Table 1. Summary of univariate ANOVA and ANCOVA results comparing performance on TEA subtests for the low-obsessive-compulsive (LOC) and high-obsessive-compulsive (HOC) group

	LOC		HOC		*F*(1,58)	*F*(2,57)	*F*(2,57)	*F*(3,56)
Subtest	*M*	(*SD*)	*M*	(*SD*)	No covariates	Controlling for trait-anxiety	Controlling for depression	Controlling for trait-anxiety and depression
MS1†	12.33	(2.40)	11.37	(2.47)	2.37	3.75*	2.63	2.50
MS2†	11.70	(3.45)	10.87	(3.51)	0.86	0.43	0.86	0.74
EC	7.00	(0.00)	6.93	(0.25)	2.07	1.84	2.43	1.61
ECD	12.07	(1.84)	9.97	(2.85)	11.53***	10.25***	6.28**	7.15***
VE1	11.37	(2.30)	10.17	(2.83)	3.25	2.13	1.64	1.93
VE2†	13.52	(1.90)	10.73	(2.36)	25.38***	12.55***	13.52***	9.04***
ECR	11.50	(1.93)	10.50	(2.42)	3.14	1.60	1.69	1.38
TS†	12.63	(2.37)	10.80	(2.53)	8.38**	4.98**	5.18**	3.47*
TSC†	12.48	(2.09)	10.97	(3.09)	4.96*	2.55	2.66	1.74

Note.† Indicates timed test. MS1 = Map Search (one minute score); MS2 = Map Search (two minute score); EC = Elevator Counting; ECD = Elevator Counting with Distraction; VE1 = Visual Elevator (accuracy score); VE2 = Visual Elevator (timing score); ECR = Elevator Counting with Reversal; TS = Telephone Search; TSC = Telephone Search while Counting.

* $p < .05$; ** $p < .01$; *** $p < .001$

Comparison of responsibility and attention

A hierarchical logistic regression analysis was performed in order to determine the relative importance of responsibility and total attention in predicting group membership (i.e., HOC or LOC group). A summary of the logistic regression models is provided in Table 2. Trait-anxiety and depression were entered into the regression equation first, accounting for approximately 37.7% of the variance in group membership. This model correctly classified 75% of cases and was able to significantly distinguish between individuals with low and high levels of OC symptoms, χ^2 (2, $N = 60$) = 28.44, $p < .0001$.

After entering responsibility, the model correctly classified 83.33% of cases. Approximately a further 14% of the variance in group membership was explained by responsibility after controlling for trait-anxiety and depression. The odds ratios associated with trait-anxiety, depression and responsibility in this model were 2.13 (95% CI: 0.56 – 8.14), 1.04 (95% CI: 0.21 – 5.02) and 12.44 (95% CI: 2.18 – 71.18) respectively.

When both responsibility and total attention were entered into the regression equation (in addition to trait-anxiety, depression and the constant), the odds ratios associated with trait-anxiety, depression, responsibility and total attention were 2.31 (95% CI: 0.59 – 9.09), 0.84 (95% CI: 0.17 – 4.09), 9.97 (95% CI: 1.82 – 54.69) and 0.38 (95% CI: 0.11 – 1.37) respectively. Responsibility was the only significant predictor of group membership, with the unstandardized regression coefficients (*B*s) associated with responsibility and total attention being 2.30 ($p < .01$) and –0.96 ($p > .05$) respectively. The model containing all of the variables continued to correctly classify 83.33% of cases. Thus it appeared that total attention did not improve the prediction beyond that already predicted by trait-anxiety, depression and responsibility.

Before taking responsibility into account, total attention appeared to account for an additional 7.9% of the variance in group membership (step χ^2 (1, $N = 60$) = 8.13, $p < .01$) beyond that accounted for by trait-anxiety and depression. However, after controlling for responsibility, the additional variance explained by total attention was not significant (Cox & Snell R^2 change = 0.02, step χ^2 (1, $N = 60$) = 2.50, $p > .10$).

Table 2. Summary of logistic regression models predicting group membership

Variables in model	Cox & Snell R^2	Model χ^2	Model *df*	Step χ^2	Step *df*	% of cases correctly classifed[a]
Anx + Dep	.377	28.44****	2	28.44****	2	75.00
Anx + Dep + Resp	.517	43.68****	3	15.25***	1	83.33
Anx + Dep + Resp + Attn	.537	46.19****	4	2.50	1	83.33
Anx + Dep	.377	28.44****	2	28.44****	2	75.00
Anx + Dep + Attn	.456	36.57****	3	8.13**	1	80.00
Anx + Dep + Attn + Resp	.537	46.19****	4	9.62**	1	83.33

Note. All models include the constant. Anx = trait-anxiety; Dep = depression; Attn = total attention; Resp = responsibility.

[a] $N = 60$

** $p < .01$; *** $p < .001$; **** $p < .0001$

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There was a significant negative correlation between responsibility and total attention scores ($r = -0.44$, $N = 60$, $p < .001$, two-tailed). Correlations of responsibility with the four components of attention are presented in Table 3. In order to control for the prospect of a spurious association between attention and responsibility (due to both variables being related to OC symptoms), partial correlations were performed in which group membership was controlled. The negative correlation between responsibility and selective attention was the only one to remain significant ($pr = -0.26$, $df = 57$, $p < .05$, two-tailed). After controlling for group membership, responsibility was not significantly correlated with any of the other attentional components.

Discussion

The main goal of the present study was to integrate two previously independent areas of research on OCD, in an attempt to understand how attention deficits fit into the context of recent research on dysfunctional beliefs and attitudes. As anticipated, non-clinical individuals with high self-reported levels of OC symptoms reported significantly greater levels of trait-anxiety, depression, and responsibility than individuals with low self-reported levels of OC symptoms. Despite non-significant differences between groups on some of the individual TEA subtests, overall attentional capability (as measured by the total attention score) was significantly greater in the LOC group than in the HOC group, with all of the group differences on individual subtests being in the predicted direction.

The TEA subtest that produced the greatest difference between groups, both before and after controlling for depression and trait-anxiety, was Visual Elevator. However, a significant difference was only found on the timing score (VE2), not the accuracy score (VE1). This is consistent with the findings of Galderisi, Mucci, Catapano, D'Amato and Maj (1995), who found that OCD patients responded with the same degree of accuracy as controls on tasks involving the fronto-subcortical systems, but took significantly longer to do so. Galderisi et al. (1995) speculated that, ''just like obsessions, slowness in these patients is the result of a difficulty in suppressing intrusive and perseverative responses: before acting, patients have to choose from many competing responses, that in other subjects are automatically rejected'' (p. 397). This is also a plausible explanation for the current VE findings.

Table 3. Correlations of responsibility with total attention and TEA factors before and after controlling for group membership

	Pearson correlation[a]	Partial correlation[b]
Total attention	–0.44***	–0.21
Selective attention	–0.36**	–0.26*
Attention switching	–0.23	–0.09
Sustained attention	–0.26*	–0.07
AVWM	–0.31*	–0.05

Note. AVWM = Auditory-Verbal Working Memory
[a] $N = 60$. [b] $df = 57$
* $p < .05$; ** $p < .01$; *** $p < .001$ (all correlation are two-tailed)

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As predicted, responsibility was a stronger predictor of OC symptoms (group membership) than was overall attention, which supported speculation by Salkovskis et al. (1995). In fact, when the logistic regression model contained all of the variables of interest (i.e., responsibility, attention, trait-anxiety and depression), responsibility was the only significant predictor of group membership. The odds ratio from this model associated with responsibility indicated an almost 10-fold increase in the risk for being in the high-obsessive-compulsive group for every standard deviation increase in responsibility. In contrast, the odds ratio associated with attention was not significant, which suggests that having poorer overall attention may not significantly increase ones risk of developing OC symptoms, once responsibility has been taken into account. Although total attention was a significant predictor of group membership after controlling for depression and trait-anxiety, it was no longer a significant predictor of group membership after responsibility had been controlled for. This suggests that the relationship between attention and OC symptoms observed in previous studies may have been confounded by responsibility. Thus inferior attentional performance by OCD patients observed in previous studies (e.g., Clayton et al., 1999) may have been a result of inflated responsibility rather than an attention deficit per se. In other words, inflated perceptions of personal responsibility for harm may have led OCD patients to be hypervigilant for a broad range of potentially harmful stimuli (Rachman, 1998), leading to a diminished ability to inhibit irrelevant information.

Inflated levels of responsibility were associated with poorer overall attention, but this is likely to have been a spurious association, seeing that the correlation between total attention and responsibility was not significant after controlling for group membership. However, even after controlling for group membership, the correlation between responsibility and selective attention remained significant. Bearing in mind that TEA subtests that load on the selective attention factor are sensitive to *visual* selective attention deficits, it appears that there may be an association between visual selective attention and responsibility beyond that attributable to OC symptoms. As a result, it may be that specific measures of visual selective attention, rather than measures of attention in general, are confounded by responsibility. At this stage it remains unclear as to why this may be the case and future researchers may wish to further explore this possibility. Of course, this result needs to be replicated before solid conclusions can be drawn.

If replicable, the above finding has important implications, both in terms of interpreting previous research findings, and in designing future research. With respect to previous research, most studies of selective attention in OCD have employed *visual* measures. Findings from these studies therefore need to be interpreted with caution because the present non-clinical findings suggest that previous findings of visual selective attention deficits in OCD may have been an indication of inflated responsibility rather than an attention deficit. This is particularly likely as most previous studies have employed clinical OCD participants, who have consistently been shown to have an inflated sense of responsibility compared to both clinical and non-clinical controls (e.g., Freeston et al., 1993; Salkovskis et al., 2000). Furthermore, the only study that has employed both visual and auditory measures of attention (Clayton et al., 1999) found the most significant differences on the TEA visual selective attention subtests. These were the same subtests that were found to be associated with responsibility, after controlling for group membership, in the present study. Thus it is possible that the differences observed by Clayton et al. (1999) were, at least in part, due to the inflated responsibility attitudes held by the OCD patients. In other words, visual selective

attention and OC symptoms may be spuriously related due to the common factor of responsibility. Hence an important implication of these findings is the need for future researchers aiming to explore attention deficits in OCD to control for participants' responsibility levels.

Despite non-significant differences on some of the TEA subtests, the fact that some significant group differences (particularly with regard to total attention) were found in a non-clinical, non-medicated, sample suggests that the differences observed by Clayton et al. (1999) may not have been the result of interference from antidepressant medication. OC symptoms do appear to be related to an attention deficit, and the present data suggest that this relationship can not be accounted for by trait-anxiety, depression, or interference from antidepressants. Moreover, the highly significant difference found on one of the untimed subtests (i.e., ECD) suggests that differential performance on the TEA was not merely due to obsessional slowness (as proposed by Veale, 1993), but rather the result of a reduced ability to screen out irrelevant information. However, the apparent relationship between OC symptoms and the inability to screen out irrelevant stimuli (particularly visual stimuli) appears to be largely attributable to responsibility.

The lack of statistically significant differences on some TEA subtests in the present study may have been attributable to the nature of the sample, which consisted entirely of university students. It is possible that university students have above-average attentional capabilities, which may account for the fact that participants in both groups (HOC and LOC) tended to perform, on average, above the norms of the TEA (see Figure 1), and a ceiling effect was observed on many of the subtests. Utilization of a population with above-average attention might have led to a restricted range of attention scores, which could have masked differences on individual subtests. Future researchers aiming to replicate the present findings using a non-clinical population are therefore encouraged to employ a sample that is not university-based. This is likely to lead to a greater range of attention scores and thus potentially create greater differences between groups. Differences between groups could be further increased by selecting a narrower range of high scorers (e.g., the top 2% of the distribution rather than the top 10%), so that the high-OC group would be more representative of clinical OCD patients (seeing as the prevalence of OCD is approximately 2%). This should increase the effect size and result in greater statistical power. Alternatively, researchers could extend the present findings to a clinical population, bearing in mind the importance of controlling for factors such as trait-anxiety, depression, and medication use.

Although previous research suggests that content-independent attention deficits are specific to OCD and not merely a product of having an anxiety disorder (e.g., Clayton et al., 1999; Enright & Beech, 1990, 1993a), the present findings can not be attributed specifically to OC symptoms due to the lack of an anxiety disorder comparison group. Whilst it appears that the current findings can not be accounted for by trait-anxiety or depression, participants' performance on the TEA may have been influenced by state-anxiety (which was not assessed in the current study). Future researchers are therefore encouraged to employ either a comparison group of anxiety disorder patients (e.g., panic disorder, generalized anxiety disorder, specific phobia) or an anxiety disorder analogue sample (if a non-clinical population is used). Furthermore, attempts should be made to control for state- as well as trait-anxiety.

Conclusions about whether the relationship between responsibility and attention (particularly visual selective attention) is causal cannot be drawn from this study due to the cross-sectional, correlational, nature of this study. Experimental studies examining the effect of manipulating responsibility levels (as in Bouchard et al., 1999; Lopatka & Rachman,

1995; Shafran, 1997) on attentional performance are required in order to conclude causality. If future experimental investigations reveal that inflated responsibility does lead to poorer attention, then it is plausible that CBT interventions designed to challenge dysfunctional beliefs about responsibility may, indirectly, improve the attentional capabilities of OCD clients. This would not be surprising given that some forms of CBT have been shown to alter caudate glucose metabolism (Baxter et al., 1992), and that caudate functioning is proposed to underlie attentional deficits (Pitman, 1989; Schneider, 1984).

In summary, the findings from the present study, taken with the findings of Clayton et al. (1999), imply that attention deficits in OCD may not be limited to selective attention, and may include deficits in attention switching (possibly as a result of a cognitive set-shifting deficit; see Veale et al., 1996) and sustained attention. Future research should therefore focus on general attention rather than the current trend toward looking at visual selective attention, particularly since it is visual selective attention that appears to be confounded by responsibility. Due to this potential confound, future investigations of attention deficits in OCD, especially in the visual modality, should attempt to control for responsibility.

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