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Differential performance on the go/no-go task as a function of the autogenous-reactive taxonomy of obsessions: Findings from a non-treatment seeking sample

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ABSTRACT

It has been suggested that obsessive-compulsive disorder is characterized by impaired inhibitory control. Response inhibition is a cognitive process required for one to cancel or suppress dominant but inappropriate responses. The present study examined response inhibition among non-treatment seeking individuals diagnosed with OCD and individuals with low levels of OCD symptoms using a computerized visual go/no-go task. Specifically, we sought to examine a prediction from the autogenous-reactive subtype model of obsessions (Lee, H.-J., & Kwon, S.-M. (2003). Two different types of obsession: autogenous obsessions and reactive obsessions. *Behaviour Research and Therapy, 41,* 11–29; Lee, H.-J., & Telch, M. J. (2008). Autogenous obsessions and reactive obsessions. In J. Abramowitz, S. Taylor, & D. McKay (Eds.), Obsessive-compulsive disorder: subtypes and spectrum conditions. New York: Elsevier., asserting that OCD individuals presenting with the autogenous subtype of obsessions will display greater difficulty in inhibitory control relative to individuals presenting with obsessions of the reactive subtype. Results showed that individuals with OCD of the autogenous subtype displayed more deficient inhibitory control on the visual go/no-go task as indexed by a longer response delay between the original stimuli set and the reversed stimuli set compared to individuals with OCD of the reactive subtype or individuals with low levels of OCD symptoms.

Introduction

Lee and Kwon (2003) put forward a taxonomic model of obsessions that proposes two different subtypes of unwanted mental intrusions that occur in obsessive-compulsive disorder (OCD). *Autogenous obsessions* are highly aversive and unrealistic thoughts, images, or impulses that tend to be perceived as threatening in their own right. They usually take the form of thoughts, images, urges, or impulses with repulsive themes concerning unacceptable sexual behavior, violence and aggression, sacrilege and blasphemy, horrific scenes, and the like. These highly irrational and unacceptable (i.e., ego-dystonic) intrusions are likely to result in threat perception focused on the thoughts themselves. Autogenous obsessions can occur without clear antecedents, or be triggered by stimuli that are symbolically, unrealistically, or remotely associated with the thoughts. *Reactive obsessions*, in contrast, are somewhat realistic aversive thoughts, doubts, or concerns, in which the perceived threat is not the obsession itself, but rather the *trigger* of the obsession or some associated negative *consequence* that is possible (but improbable). Reactive obsessions include thoughts, concerns, or doubts about contamination, mistakes, accidents, asymmetry, or disarray. They tend to be perceived as relatively realistic and likely to come true, thereby eliciting some corrective (usually overt) actions aimed at putting the associated uncomfortable situation back to a safe or desired state. Relative to autogenous obsessions, reactive obsessions are more likely to occur in reaction to explicit cues, which also correspond to specific core threats (e.g., potential contaminants, disarrayed/unsymmetrical objects). Reactive obsessions also evidence a more realistic link with their triggers. For instance, believing that one has been exposed to germs may serve as an invariable trigger for obsessions concerning contamination, and lead the person to strive to correct the triggering situation through cleaning or washing. To date, numerous studies have demonstrated some meaningful differences between the two subtypes of obsessions in several important domains related to OCD: (a) cognitive appraisals and neutralizing strategies (Belloch, Morillo, & Garcia-Soriano, 2007; Lee, Lee, Kim, Kwon, & Telch, 2005; Lee, Kwon, Kwon, & Telch, 2005); (b) associated OCD symptoms (Lee & Telch, 2005; Moulding, Kyrios, Doron, & Nedeljkovic, 2007); (c) associated dysfunctional beliefs (Lee, Kwon et al., 2005); and (d) associated personality features (Lee, Kim, & Kwon, 2005; Lee & Telch, 2005).

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The autogenous-reactive subtype model predicts that OCD patients presenting with autogenous obsessions will display greater difficulty in inhibitory cognitive control relative to OCD patients presenting with reactive obsessions. Preliminary support for this hypothesis comes from studies comparing the two patient subtypes on cognitive control-relevant features. Compared to those who primarily display reactive obsessions, those who primarily display autogenous obsessions were found to: (a) perceive their obsessions as more threatening and were more likely to use counterproductive thought control strategies such as thought stopping or distraction (Lee & Kwon, 2003; Lee, Kwon et al., 2005); (b) experience stronger urges and worries that they will lose control over impulsive actions (Lee, Kwon et al., 2005), (c) display more cognitive features of OCD symptoms (e.g., obsessing, impulses of harm) as opposed to behavioral symptoms such as overt compulsive behavior (Lee & Telch, 2005; Moulding et al., 2007); and (d) show greater perceptual distortions and illogical/magical thinking (Lee, Kim, & Kwon, 2005; Lee & Telch, 2005). Although these studies provide some support for a possible linkage between autogenous obsessions and cognitive control difficulty, a significant limitation exist in that most of the data were derived from self-report measures.

The principal aim of the current study was to provide a more stringent test of the attenuated inhibitory control associated with autogenous obsessions by utilizing a visual go/no-go task. The go/no-go paradigm has been widely used to index response inhibition (Dimitrov et al., 2003; Eigsti et al., 2006). Response inhibition is a cognitive process that is required to cancel an intended movement or suppress previously learned stimulus-response associations (Aron, Robbins, & Poldrack, 2004). To date, several go/no-go studies have provided data that suggest impaired response inhibition among individuals with OCD (e.g., Aycicegi, Dinn, Harris, & Erkmen, 2003; Bannon, Gonsalvez, Croft, & Boyce, 2002; Penadés et al., 2007; Watkins et al., 2005). For example, Bannon et al. (2002) found a greater deficit in go/no-go performance (i.e., greater commission errors – response to non-target items) among individuals with OCD, relative to individuals with panic disorder. Particularly, some authors have examined whether go/no-go performance would differ as a function of OCD subtypes. Omori et al. (2007) reported that checkers showed greater commission errors than washers on a visual go/no-go task. In contrast, Penadés et al. (2007) examined four OCD subtypes (i.e., checking, washing, slowness, and doubting), but failed to find evidence for differential go/no-go performance among these groups. Similarly, Khanna and Vijaykumar (2000) reported no differences in go/no-go performance across different OCD subtypes: checkers, washers, individuals with both checking and washing, and individuals with only obsessions. Taken together, OCD seems to be associated with impaired inhibitory control. However, no consistent findings have emerged with respect to certain OCD subtypes showing more or less inhibitory control on the go/no-go task. Moreover, different subtyping schemes and the limited range of symptom presentations make it difficult to integrate the findings in the larger context of OCD.

To date, no study that has compared go/no-go performance among individuals with OCD as a function of their *obsessional* presentations. This study sought to examine this issue based on the autogenous-reactive subtype model. More specifically, to test the hypothesis of deficient inhibitory control among individuals who primarily present with autogenous obsessions, we used a computerized visual go/no-go task that included a response set shift block, in which previously learned target and distracter were presented in reversed roles. We expected that individuals primarily presenting with autogenous obsessions as opposed to reactive obsessions, would display greater response latencies and/or commission errors in the response set shift block as compared with the original response set block.

Methods

Participants

Undergraduates ($N = 2570$) enrolled in introductory psychology courses at the University of Texas at Austin underwent online-based initial screening using the Obsessive-Compulsive Inventory-Revised (OCI-R; Foa et al., 2002). They received partial course credit for their participation. Those scoring in the top 3% ($N = 80$) and a random sample ($N = 40$) of those scoring in the bottom 3% were invited to participate.[1] From these two groups, 56 high OCI-R and 26 low OCI-R scorers responded to the study. These 82 students were then administered the OCD module of the Composite International Diagnostic Interview (CIDI; World Health Organization, 1997) by master-level clinical psychology graduate students who had received extensive training in its administration. This additional screening procedure identified 41 individuals who met current DSM-IV diagnostic criteria for OCD. None of the low OCI-R group met for OCD based on the CIDI interview. Due to unexpected computer problems, data on the go/no-go task were lost for three participants. Thus, the final sample consisted of 64 participants (24 males, 40 females, mean age = 18.55, SD = 1.02) who either met current DSM-IV criteria for OCD ($N = 40$) or displayed low levels of OCD symptoms ($N = 24$; CON). Our sample presented a diverse racial composition: Caucasian (62.5%), Hispanic (16.4%), Asian/Pacific Islander (14.1%), African American (4.7%), and other (2.3%).

Measures

OCD symptoms

OCD symptoms were measured using the Obsessive-Compulsive Inventory-Revised (OCI-R; Foa et al., 2002). The OCI-R is a widely used 18-item self-report measure with a total score ranging from 0 to 72. It has demonstrated a solid factor structure, good internal and test–retest reliability, and convergent validity (Abramowitz & Deacon, 2006; Foa et al., 2002). A recent study also found that the OCI-R was more strongly correlated with other OCD measures than with the measures of depression or pathological worry, using student samples (Hajcak, Huppert, Simons, & Foa, 2004). A cutoff score of 15 on the OCI-R was found to have good sensitivity (84%) and specificity (78%) in discriminating between individuals with OCD and non-clinical participants (Foa et al., 2002). Similarly, a more recent study (with 51.9% of its sample being diagnosed as OCD) found that the probability of having OCD was 74.0% with the total score of 14 or higher on this measure (Abramowitz & Deacon, 2006).

General emotional distress

We administered the State-Trait Anxiety Inventory – trait version (STAI; Spielberger et al., 1983) and the Beck Depression

[1] The initial screening cut-off on the OCI-R (i.e., top 3% in total scores) was determined to maximize the likelihood of recruiting individuals who would meet current DSM-IV criteria for OCD. For the current data, this cut-off provided a more stringent criterion compared to established cut-off scores (e.g., Foa et al., 2002), thus enhancing the sensitivity of the screening procedure. Most epidemiological studies have demonstrated the lifetime prevalence rates of OCD to range around 3%, for example, 2.5% – the Epidemiologic Catchment Area study (ECA; Regier et al., 1988; Robins et al., 1984), 2.9% – Bland and colleagues (Bland, Orn, & Newman, 1988; Kolada, Bland, & Newman, 1994), and 2.8% – Henderson and Pollard (1988). Nevertheless, our sample of individuals meeting current DSM-VI diagnostic criteria for OCD may not be fully comparable to a clinical sample. Thus, we constructed the reference condition as individuals displaying low levels of OCD symptoms by confining their overall symptom level within the bottom 3% on the OCI-R, in order to increase the chance to clearly demonstrate the impact of OCD diagnosis upon the go/no-go performance.

Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) in order to compare levels of general emotional distress across groups. The STAI – trait is a 20-item self-report measure of assessing trait anxiety or how the respondent feels generally. The BDI is a widely used self-report measure of depressive symptoms. Both instruments have demonstrated good psychometric properties.

Autogenous vs. reactive obsessions

The Revised Obsessional Intrusion Inventory (ROII) – Part I is a 52-item self-report measure assessing a variety of unwanted intrusive thoughts (Purdon & Clark, 1993). Respondents are asked to rate how frequently they experience each of the 52 obsessions on a 7-point scale (0 = never ~6 = frequently during the day). A two-factor structure, which corresponds to the autogenous-reactive distinction, has been demonstrated in previous studies (Lee & Kwon, 2003; Moulding et al., 2007). The autogenous-obsession factor includes 41 thoughts, images, and impulses concerning sex, violence, aggression, and blasphemies, while the reactive-obsession factor includes 11 thoughts, concerns, and doubts about mistakes, accidents, dirt, or contamination. Previous studies demonstrated that the ROII could be used to classify respondents into the autogenous vs. reactive subtype that differ systematically on several OCD-related domains (Lee & Kwon, 2003; Lee, Lee et al., 2005).

Composite international diagnostic interview (World Health Organization, 1997; CIDI)

All participants were administered the OCD module of the CIDI to determine their OCD status. The CIDI is fully structured and can be administered by trained non-clinician or clinician interviewers. Overall, it has demonstrated excellent reliability and validity (overall Kappa = .90; Andrews & Peters, 1998; Wittchen, 1994). The OCD module of the CIDI has shown adequate inter-rater reliability and sensitivity (Andrews & Peters, 1998; Peters & Andrews, 1995). All our CIDI interviewers underwent six 2-h training sessions for reliable OCD assessment under the supervision of the senior author (MJT), which covered general interview techniques, the psychopathology of OCD, case examples of OCD, and interview observations and practice trials.

Assessment of cognitive control: visual go/no-go task

We used a computerized visual go/no-go task that was used in previous studies (Aycicegi et al., 2003; Lapierre et al., 1995). This task consisted of three blocks, each of which had 50 trials. In the first (learning) block, subjects were asked to press the space bar on the computer keyboard as rapidly as possible when a 2 × 2 cm blue square appeared against a 20 × 20 cm white background on the computer monitor (see Fig. 1). This learning block aimed to form a strong stimulus-response pattern that would prompt the subject to rapidly respond to the target stimulus (i.e., the blue square). Another 50 trials in the second block proceeded with an additional (non-target) stimulus (i.e., a blue cross of similar size). Subjects were asked to respond only to the blue square but refrain from pressing the space bar in response to a blue cross. This block was designed to lead subjects to learn to respond selectively to the blue square (i.e., target) as opposed to the blue cross (i.e., non-target). The second block included 25 target trials and 25 non-target trials. In the last block, another 50 trials were presented with the target and non-target stimuli reversed. Subjects were asked to respond only to the blue cross while refraining from responding to the blue square. Again, the last block consisted of 25 target and 25 non-target trials. Throughout the study, the location of the target/non-target stimulus was pseudorandom on the white background. Within each block, the inter-stimulus intervals also varied randomly between 100, 250, 400, 500, 750, 1000, and 2000 ms. If

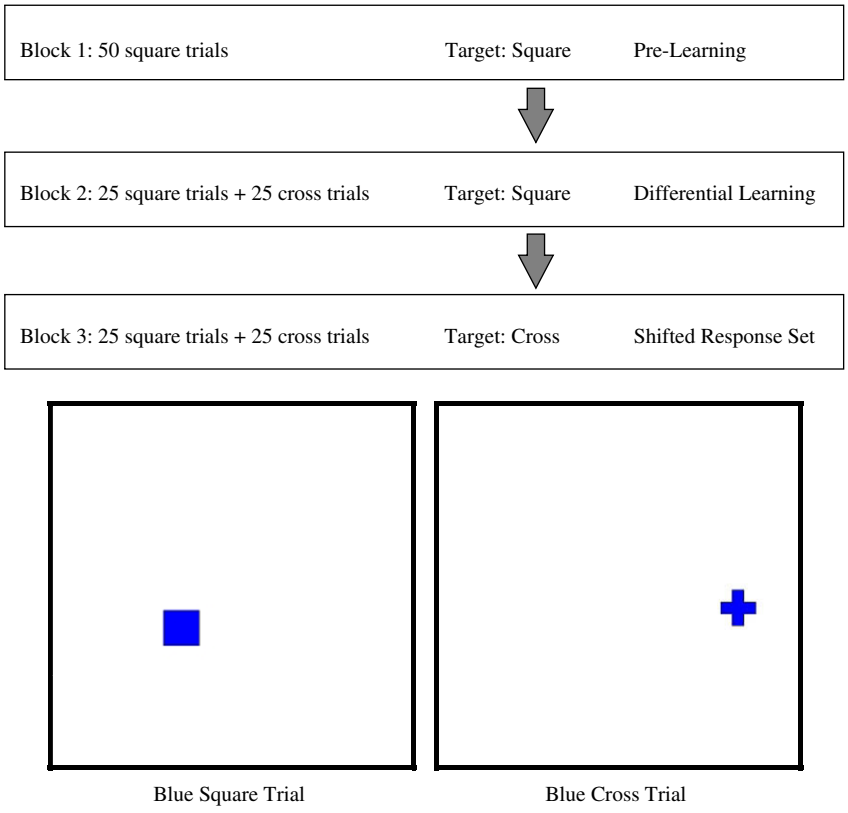

Fig. 1. The structure and stimuli of the go/no-go task.

no keyboard input was provided within 1500 ms from the stimulus onset, this trial was recorded as an omission and the program proceeded to the next trial.

Autogenous-reactive subgrouping of individuals with OCD

Forty-one individuals diagnosed with OCD were divided into the autogenous vs. reactive subgroup based on their primary obsession reported on the ROII. Classification of the autogenous vs. reactive subgroups followed procedures outlined in our previous studies (Lee, Kwon et al., 2005; Lee, Kim, & Kwon, 2005). Participants were asked to indicate their primary obsession out of the 52 items listed on the ROII. In the event that participants could not identify their primary obsession from the ROII, they were instructed to record it on the bottom of the form. However, all our participants were able to identify their primary obsession from the items listed on the ROII. Next, participants meeting for OCD were classified into either the Autogenous or Reactive group based on whether their primary obsession loaded on the autogenous vs. reactive subscale of the ROII. Using this procedure, 21 participants were classified as presenting with the autogenous subtype (AOs) while the remaining 20 participants were classified as presenting with the reactive subtype (ROs). Because AOs vs. ROs classification was based on participants' selection of their primary obsession as opposed to their factor scores on the ROII, it was possible for participants to be classified as AOs but show an overall pattern of mental intrusions that was more consistent with the reactive subtype or vice versa. Consequently, we compared AOs and ROs on their *overall* pattern of mental intrusions as measured by the ROII factor scores. Consistent with their primary obsession classification, AOs scored significantly higher than ROs on the autogenous factor score of the ROII ($p < .01$) and significantly lower than ROs on the reactive subscale ($p < .05$).

Analyses

Three outcome scores were generated from the go/no-go task: (a) commission errors; (b) omission errors; and (c) attenuated response inhibition (ARI). Commission errors were defined as the number of trials in which the subject mistakenly pressed the space bar in response to the non-target stimulus (i.e., responses to the blue cross in Block 2 or the blue square in Block 3). Omission errors were defined as the number of trials in which subjects failed to press the space bar in response to the correct target stimulus (i.e., failure to respond to the blue square in Block 2 or the blue cross in Block 3). ARI scores were computed by subtracting the average correct RT in Block 2 (i.e., original response set) from the average correct RT in Block 3 (i.e., reversed response set). Thus, the scores derived from this formula are proportionate to the extent of response delay that would occur as a result of difficulty in inhibiting response to presently dominant but inappropriate information. ARI scores were analyzed using one-way between-group ANOVAs, and commission and omission errors were analyzed using non-parametric Kruskal–Wallis tests.

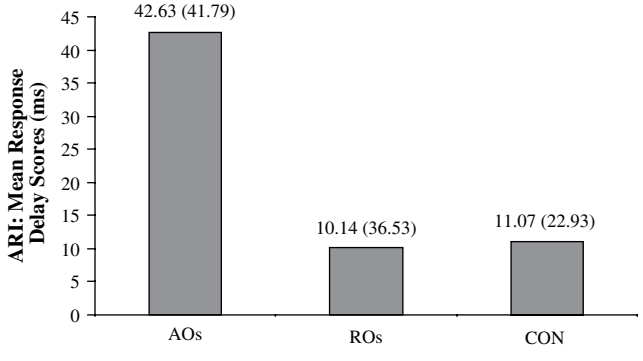

Fig. 2. Go/no-go response delay scores (ARI) across the three groups: means and standard deviations.

Statistical power to detect the group difference in go/no-go performance

We used the program G* Power 3 (Faul, Erdfelder, Lang, & Buchner, 2007) to compute power for the main analysis examining group difference in ARI mean scores based on the one-way ANOVA. Our power to detect a medium to large effect size ($f = .35$; Cohen, 1997) in the hypothesized direction with the current sample size was .81.

Results

Demographic and clinical characteristics of the groups

Table 1 presents basic demographic and clinical characteristics of the current sample across the three groups. No significant group differences were found for any of the demographic variables, including age, gender, ethnicity, race, and marital status. As expected, significant differences between groups were observed for OCD symptoms as indexed by the OCI-R [$F(2,61) = 137.30$, $p < .001$] and measures of general emotional distress as indexed by the BDI [$F(2,61) = 16.98$, $p < .001$] and STAI-T [$F(2,61) = 49.19$, $p < .001$]. Follow-up Bonferroni tests comparing the two OCD groups vs. controls were highly significant for each of the three measures (all p's $< .001$). In contrast, the AO and RO groups did not differ significantly on any of the three measures (all p's $> .10$).

Go/no-go task: attenuated response inhibition scores

Data from the go/no-go task is summarized in Table 2. The three groups did not differ in simple reaction speed, as measured by the correct RT in Block A, $F(2,61) = .04$, $p = .96$. Consistent with prediction, a significant group difference was observed for ARI scores, $F(2,61) = 5.94$, $p < .005$, partial eta square (h_p^2) = .16. Follow-up Bonferroni post-hoc comparisons revealed that AOs scored significantly higher than ROs ($p = .01$) or CON ($p = .01$), whereas ROs and CON did not differ with each other on ARI scores ($p = 1.00$). We also tested the possibility that general emotional distress or gender would account for observed group differences in ARI scores, by examining total scores of the BDI and STAI-T, and gender as covariates. The significant group differences on ARI scores remained unchanged, and none of these covariates were significant (see Fig. 2).

Table 1
Demographic and clinical characteristics across the three groups.

% Female	AOs ($N = 20$)		ROs ($N = 20$)		CON ($N = 24$)	
	70		55		71	
	M	SD	M	SD	M	SD
Age	18.15	0.75	18.65	1.09	18.71	1.20
BDI	16.05	12.86	12.45	6.61	2.29	2.51
STAI-T	54.58	10.09	50.50	7.99	31.50	6.74
OCI-R Total	33.65	11.37	38.30	6.75	3.92	2.57
OCI-R Checking	4.30	2.43	7.10	2.77	0.63	0.92
OCI-R Hoarding	6.35	3.13	6.10	2.69	1.25	1.19
OCI-R Neutralizing	4.60	3.68	4.60	3.47	0.08	0.28
OCI-R Obsessing	6.95	2.93	5.75	2.84	0.58	1.38
OCI-R Ordering	6.65	2.50	7.80	2.46	1.17	1.17
OCI-R Washing	4.80	2.93	6.95	3.79	0.21	0.59
ROII-Autogenous obsessions	48.05	35.25	25.30	18.23	5.96	5.30
ROII-Reactive obsessions	15.35	8.22	22.00	10.13	1.38	1.53

Table 2
Go/no-go performance across the three groups.

	AOs ($N = 20$)		ROs ($N = 20$)		CON ($N = 24$)	
	M	SD	M	SD	M	SD
Block A average correct RT	275.95	64.56	275.53	57.57	271.20	57.60
Block B average correct RT	367.41	71.91	378.99	52.93	368.87	70.48
Block B omission error #	0.00	0.00	0.00	0.00	0.00	0.00
Block B commission error #	2.30	2.25	1.55	1.32	1.67	1.58
Block C average correct RT	410.04	90.15	389.13	67.21	379.94	63.68
Block C omission error #	0.00	0.00	0.10	0.45	0.00	0.00
Block C commission error #	0.55	0.83	0.15	0.37	0.33	0.56

Go/no-go task: commission and omission errors in Blocks B and C

We also compared the number of omission and commission errors from Blocks B and C across the groups using Kruskal–Wallis tests. Although AOs made more commission errors (i.e., responding to the non-target stimulus) than ROs or CON, these differences were not statistically significant.

Discussion

Several authors have suggested that individuals with OCD are characterized by impaired inhibitory control, which may contribute to their difficulty in inhibiting inappropriate internal stimuli such as unwanted mental intrusions (e.g., Pénadés et al., 2007; Chamberlain, Fineberg, Blackwell, Robbins, & Sahakian, 2006). The current go/no-go task with a response set reversal block assesses: (a) the general difficulty in inhibiting response to non-target stimuli (i.e., commission errors); and (b) the difficulty in switching between contradictory stimulus-response sets (i.e., response delay in the reversal block). Both go/no-go and reversal paradigms have been shown to be sensitive to prefrontal dysfunction (particularly orbitofrontal/ventral frontal areas) thus providing evidence that the go/no-go and reversal paradigms tap inhibitory control mechanisms (Dias et al., 1996; Fellows & Farah, 2003; Godefroy et al., 1996; Harris & Dinn, 2003; Iversen & Mishkin, 1970; Lapierre et al., 1995; Watkins et al., 2005). Relatedly, neuroimaging studies in OCD have consistently shown the involvement of the orbitofrontal cortex (see Mataix-Cols, Rosario-Campos, & Leckman, 2005). Go/no-go studies including a reversal component have successfully demonstrated deficient inhibitory control among individuals with OCD (e.g., Aycicegi et al., 2003; Watkins et al., 2005).

Our data suggest that OCD individuals presenting with the autogenous obsessional subtype (AOs) are likely to display greater difficulty in inhibiting response to non-target items particularly when the go/no-go contingency is reversed, relative to OCD individuals presenting with the reactive obsessional subtype (ROs) or non-OCD controls. In contrast, OCD individuals presenting with the reactive obsessional subtype showed no greater difficulty in inhibitory control relative to controls as indexed by their response latencies in the reversal go/no-go block as compared with the original response set. Taken together, these findings fail to support the view that individuals with OCD display global impairment in response inhibition. Rather, they suggest deficient inhibitory control specific to reversal or set-shifting tasks (see Watkins et al., 2005). Moreover, our data suggest that the degree of difficulty in inhibitory control is likely to vary among individuals with OCD as a function of their obsessional presentations. This indicates the importance of considering obsessional presentations in understanding the clinical heterogeneity of OCD and its subtypes.

Lee and Telch (2007) have suggested that there are two action tendencies in OCD: (a) a struggle with thoughts themselves (the autogenous subtype) in which the core threat is focused on the thoughts themselves; and (b) a struggle with thought-triggering contextual cues (the reactive subtype) in which the core threat is focused on the undesirable consequences or conditions of the cues. It may be that AOs' attenuated inhibitory cognitive control puts them at greater risk of being caught in a strenuous and counterproductive struggle with unwanted intrusive thoughts. In contrast, ROs are more focused on rectifying thought-triggering contextual cues (e.g., dirt, germs, disarrayed rooms, situations with probable accidents or mistakes, etc.) as opposed to suppressing/neutralizing the thoughts themselves. One possibility is that ROs' mental intrusions are more strongly associated with catastrophic interpretations about the thought-triggering contextual cues and their undesirable conditions/consequences (see Rachman, 1997), whereas AOs' mental intrusions may be more strongly associated with weakened ability to exert inhibitory cognitive control and maladaptive interpretations centered on the mere presence of the thoughts.

The autogenous-reactive subtype research has classified *individuals* into two groups (i.e., AOs vs. ROs) according to their primary obsession. Our studies have provided partial support for the validity of this classification strategy (Lee, Kwon et al., 2005; Lee, Kim et al., 2005): (a) most individuals seem to present one of the two obsessional subtypes more dominantly as their primary; (b) the primary obsession seems to reflect the *overall* obsessional subtype within individuals fairly well, as shown by the autogenous-reactive factor scores differing between AOs and ROs; and (c) individuals can also be reliably sub-grouped based on clinician ratings on their primary obsessional subtype. Nevertheless, it is unlikely for the two subtypes of obsessions to exist mutually exclusively within individuals (Lee, Lee et al., 2005).

Recently, it has been suggested that OCD may be best conceptualized as a dimensional spectrum of potentially overlapping syndromes (see Bloch et al., 2008; Mataix-Cols et al., 2005). In both dimensional and categorical approaches for understanding the clinical heterogeneity observed in OCD, the fundamental task is to identify the basic symptom components that would then constitute either dimensions or subtypes (Bloch et al., 2008). In this regard, the autogenous-reactive subtype approach differs greatly from other subtype/dimensional OCD approaches. First, our subtyping is based on *obsessional* presentations rather than overt behavioral symptoms. This is important because similar overt rituals could have different meanings and functions depending on their connected obsessions. For example, hand washing may serve as a rather magical mental-purifying or thought-revoking ritual among AOs, but serve as a germ-removing or illness-preventing ritual among ROs. The traditional approach might have grouped these heterogeneous individuals together as "washers." Second, our approach does not rely exclusively on statistical data-reduction techniques (factor/cluster analysis) that have generated different symptom dimensions across studies (Mataix-Cols et al., 2005). Third, our more theoretical approach allows one to conceptualize core symptoms of OCD across different domains (e.g., checking, washing, ordering), thus reducing the problem of multiple (traditional) subtypes in the same individual with OCD (McKay, Abramowitz, & Taylor, 2008). Despite these methodological differences, factor-analytic studies have provided some support for the autogneous-reactive taxonomy. For example, a recent meta-analysis found that sexual, religious, and aggressive thoughts grouped together as a forbidden thought factor, aside from other obsessions concerning symmetry, contamination, and hoarding (Bloch et al., 2008). Future investigations are needed to determine the utility of conceptualizing the autogenous-reactive distinction as categorical vs. dimensional.

With respect to the commission error index from the go/no-go task, the current findings failed to support the hypothesized

difference between AOs and ROs. One possibility is that the 1:1 ratio between target and non-target stimuli used in Blocks B and C of our go/no-go task may have rendered the task too easy and thus insensitive to potential group differences. For instance, decreasing the proportion of non-target item trials in a given testing block to 25% while presenting target trials 75% of the time would have made the task more challenging in terms of exerting inhibitory control (see Eigsti et al., 2006). Increasing the demand for cognitive control on the go/no-go task may enable one to detect significant differences between AOs and ROs in commission errors, and differences between ROs and CON in the overall indices of inhibitory control. This hypothesis could be tested by systematically varying parameters of the go/no-go task (e.g., proportions of non-target trials, the number of consecutive target trials before the next non-target trial, etc.). It would also be worthwhile to further examine the relative difference between AOs and ROs in cognitive control using another modality of the go/no-go task (e.g., auditory go/no-go paradigm), or other similar neuro-cognitive tasks (e.g., stop-signal task; Dimitrov et al., 2003).

Several limitations of the study should be noted. First, the AO and RO groups consisted of undergraduate students. Their levels of OCD symptoms, as measured by the OCI-R (mean = 35.98, SD = 9.52), were comparable to those reported by clinical samples of patients with OCD (e.g., Abramowitz & Deacon, 2006 – mean = 27.02, SD = 13.22; Huppert et al., 2007 – mean = 26.3, SD = 12.8). Moreover, all of our participants in the AOs and ROs groups exceeded the cutoff scores of the OCI-R proposed in existing studies, as well as meeting DSM-IV criteria for OCD based on the CIDI. Nevertheless, our participants in AOs and ROs could still be different from clinical samples of OCD patients. Also, data are not available on comorbid emotional conditions, treatment history or the reliability of CIDI interviews in the present study. Clinical replication is required to address these issues. Second, we demonstrated that our findings regarding ARI scores remained unchanged even after statistically controlling for the influence of depression and trait anxiety. However, a more stringent test of the influence of other emotional conditions on the go/no-go performance would be to include a non-OCD clinical comparison group in the experimental design rather than relying on covariate adjustment which can be problematic (see Miller & Chapman, 2001).

Paradoxical consequences of intentional thought control have been well documented in the literature (e.g., Abramowitz, Tolin, & Street, 2001; Wegner, Erber, & Zanakos, 1993; Wegner, Schneider, Carter, & White, 1987). Efforts to suppress unwanted thoughts may be particularly ill-advised for OCD individuals presenting with the autogenous subtype due to their weakened ability to exert inhibitory control. If this assumption is correct, identifying and preventing covert neutralization aimed at removing/suppressing the unwanted thoughts themselves may prove to be an important treatment target for individuals who primarily struggle with autogenous obsessions.

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