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Illusion of Control and Behavioral Control Attempts in Obsessive–Compulsive Disorder

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The present research used the illusion-of-control paradigm to examine the relationships among obsessive–compulsive disorder (OCD) symptoms, behavioral control attempts, and illusory sense of control. Participants were presented with a preprogrammed sequence of aversive and neutral visual stimuli and were encouraged to attempt to control the sequence with keyboard presses. Participants rated their perceived level of control 3 times during the task. In addition, the authors used the repetitiveness of keyboard presses as a measure of rigid, compulsive-like behavior. In Study 1, this procedure was administered to a sample of 55 students who also completed measures of OCD and depression. In Study 2, the task was administered to 22 participants with OCD and 22 matched participants without OCD. In line with predictions, OCD symptoms were correlated with higher illusory sense of control and with more repetitive behavioral control attempts. The authors discuss the central role of control in OCD and specifically the relationships between need for control and compulsive rituals, which may be conceptualized as means for achieving an illusory sense of control over stressful life events.

Keywords: control, illusion of control, obsessive–compulsive disorder

Many common symptoms in obsessive–compulsive disorder (OCD) appear to reflect a high need for control and may be understood as attempts to establish control. Examples include repeated checking (to avoid mistakes), hoarding (to avoid losing something that may be useful in the future), and performing rituals to prevent harm to oneself or to others. Those with OCD typically engage in excessive and tense monitoring of their own thoughts and actions, use strict rules to guide their behavior, and undertake severe restrictions to avoid losing control (e.g., acting violently or inappropriately or spreading contamination).

Early theories of OCD assigned various roles to control in explaining obsessions and compulsive behavior. Janet (1903) defined obsessions as mental exhaustion, which is manifested in weak control of thoughts and actions, whereas Freud (1913/1966) and later Fenichel (1945) understood obsessions as failed attempts to control a conflictual thought. According to Adler (1936), the compulsive individual's excessive striving for control is an attempt to compensate for feelings of inadequacy and inferiority. Shapiro (1965) ascribed a particularly central role to control in his classic characterization of the obsessive–compulsive (OC) style. According to Shapiro (1965), the OC person suffers from a low sense of autonomy and attempts to compensate for this deficit with a rigid effort to control all actions, thoughts, impulses, and emotions.

Early cognitive models of OCD (Carr, 1974; McFall & Wollersheim, 1979) conceptualized compulsive behaviors as attempts to achieve a sense of control over unfavorable outcomes. In modern cognitive theories of OCD, control issues are implied in the concept of inflated responsibility, which involves attributing to oneself exaggerated "power which is pivotal to bring about or prevent subjectively crucial negative outcomes" (Salkovskis, 1996, pp. 110–111). Cognitive models of OCD also focus on control of thoughts, suggesting that those with OCD misinterpret the importance of normal intrusive thoughts, leading to excessive attempts to control them. Thought control is believed to paradoxically worsen the intrusions and to foster compulsive neutralization (Clark & Purdon, 1993; Rachman, 1997, 1998; Salkovskis, 1985, 1996; Wells, 1997).

Moulding and Kyrios (2006) focused on two control-related constructs that have been shown to be especially relevant to anxiety. The first is the *sense of control* (or perceived control), which refers to the individual's belief about the level of control that is available in a particular context (Skinner, 1996). Low sense of control is suggested to lead to the inability to cope with threat, which in turn leads to anxiety and to the avoidant behaviors characteristic of anxiety disorders (Bandura, 1997; Barlow, 2000; Chorpita, Brown, & Barlow, 1998). The second construct is *desire for control* (or need for control), which refers to the general motivation to exert control over life events (Skinner, 1996). Desire for control can motivate individuals to manipulate events to ensure the desired outcome and, therefore, tends to be positively correlated with sense of control (Burger, 1992). Conversely, failure to achieve the desired level of control is believed to lead to negative emotional states, particularly to anxiety (Burger, 1992; Evans, Shapiro, & Lewis, 1993).

In the case of OCD, these two constructs were incorporated into research focused on thought control (Moulding & Kyrios, 2006). Studies showed that participants with OCD reported a lower sense of control over intrusive thoughts in comparison with community control participants (Freeston & Ladouceur, 1997; Ladouceur et

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al., 2000). Participants with OCD also reported a greater need to control thoughts than participants without an anxiety disorder or participants with other anxiety disorders (Obsessive Compulsive Cognitions Working Group, 2001; Steketee, Frost, & Cohen, 1998).

Some empirical data suggest that the pattern of low sense of control combined with high desire to control in OCD is relevant not only to thoughts but also to external events. McLaren and Crowe (2003) found that high OCD scores were associated with low perceived control over stressful life events in both OCD and student samples. Sookman, Pinard, and Beck (2001) found a higher need for control in OCD participants compared with individuals with other anxiety and emotional disorders and compared with control participants.

The concept of inflated responsibility, mentioned earlier, combines a belief about the ability to control or sense of control ("I *can* control these outcomes") and a belief about moral responsibility ("I *should* control these negative outcomes"), which conveys a strong motivational factor or desire for control. The interrelations between these components were addressed to some extent in Rhéaume, Ladouceur, Freeston, and Letarte (1995). In a study that examined the operational definition of inflated responsibility, participants without OCD were asked to evaluate OCD-relevant situations in terms of probability, severity, and influence. Perceived influence was the best predictor of responsibility, suggesting that inflated responsibility is more closely related to a heightened sense of control over outcomes than to the perceived severity of the outcomes.

In light of the association between inflated responsibility and OCD, the findings of Rhéaume et al. (1995) suggest that individuals with OCD may experience an increased sense of control, a conclusion that appears to be at odds with previous findings of reduced sense of control in this disorder (Freeston & Ladouceur, 1997; Ladouceur et al., 2000; McLaren & Crowe, 2003). This contradiction may be resolved by hypothesizing that the anxiety associated with reduced control may motivate individuals with OCD to attempt to regain a sense of control. Specifically, we suggest that compulsive rituals, which typically result in a temporary reduction in anxiety (Rachman & Hodgson, 1980), can be conceptualized as a means for regaining a subjective sense of control, which may at times be illusory.

The concept of illusion of control involves overestimating the extent to which one's actions control events (Alloy & Abramson, 1979; Langer, 1975). In the prototypic illusion-of-control studies, participants were requested to push a button, after which a light either turned on or did not turn on. Participants were then asked to estimate the degree of control their actions had over this outcome (Abramson & Alloy, 1981; Alloy, Abramson, & Viscusi, 1981). Many of these studies found that participants who were not depressed overestimated their degree of personal control, whereas depressed participants made lower and more accurate control estimations (e.g., Alloy & Clements, 1992; Martin, Abramson, & Alloy, 1984; Vázquez, 1987), although this finding appears to be sensitive to task parameters (e.g., Benassi & Mahler, 1985).

Using another approach to studying illusion of control, McKenna (1993) asked a sample of university students and staff to rate the probability of being involved in a car accident, either while driving or while riding as a passenger. Generally, participants thought that they would less likely to be involved in an accident as a driver, implying that people typically assume they have more control than others over negative outcomes. Thompson, Armstrong, and Thomas (1998) suggested that one of the factors that produce illusions of control is the need to experience control, which is heightened in stressful situations. In the same vein, Friedland, Keinan, and Regev (1992) proposed that a sense of control is particularly sought when individuals are under stress, because of the diminished perception of control that characterizes these situations. Later studies by Keinan (1994, 2002) showed that when the desire for control is increased or the individual's sense of control is endangered, the individual is motivated to increase subjective sense of control, even when the beliefs and actions used for this enhancement are implausible.

Although desire for control and sense of control appear highly relevant to understanding OC symptoms, we are not aware of any studies of illusion of control in OCD. In fact, few studies investigated illusion of control in anxiety disorders. In one of these, Sanderson, Rapee, and Barlow (1989) examined the effect of manipulating illusion of control over laboratory-induced panic attacks in a group of participants with panic disorder. In this experiment, the likelihood of experiencing a panic attack was influenced by a sense of control over the inhalation and resulting somatic sensations, with 80% of participants in the no-illusion group reporting panic attacks versus only 20% in the illusion-of-control group.

The present studies used the illusion-of-control paradigm to examine the relationships among OCD symptoms, illusory sense of control, and behavioral control attempts. We designed and pretested an experimental task similar to Alloy and Abramson's (1979) original task. Participants were presented with a preprogrammed sequence of visual stimuli and encouraged to attempt to control it through keyboard presses. Although the presented sequence of visual stimuli was uncontrollable, the task was designed to elicit varying degrees of control perceptions by systematically varying the probability of the desired (to be controlled) outcome. We asked participants to rate their perceived level of control at the beginning of the task, in the middle of the task, and toward the end of the task. On the basis of the theories and findings reviewed earlier, we predicted that OCD symptoms would be associated with elevated illusory control of the visual stimuli. We examined this prediction in nonclinical participants who completed OCD and depression measures (Study 1) as well as in participants with OCD and matched control participants without OCD (Study 2).

In addition to examining the illusion of control, we used the repetitiveness of the keyboard presses as a measure of the rigidity or compulsive-like nature of the behavioral control attempts. OCD symptoms are characterized as repetitive and as being guided by rigid rules (American Psychiatric Association, 1994), and neuropsychological studies have demonstrated that OCD is associated with cognitive and behavioral inflexibility in a variety of tasks (see Chamberlain, Blackwell, Fineberg, Robbins, & Sahakian, 2005, for a review). We therefore expected that OCD symptoms would be associated with more repetitive pressing patterns. Finally, whereas OCD symptoms typically arise in relation to aversive or threatening stimuli, such as dirt or violent images, we do not know the extent to which the desire for and sense of control is specific to threatening contents. We therefore presented participants with both aversive and neutral stimuli to explore how stimulus valence affected the hypothesized findings.

Study 1

Method

Participants

Fifty-five undergraduate students (41 women) from the Department of Psychology at Tel Aviv University participated in the study for course credit. Their age ranged from 19 to 29 years (M = 22.80, SD = 2.38). All participants signed an informed consent prior to participation and were fully debriefed after the completion of the study.

Apparatus and Measures

The illusion-of-control task was administered by computer, while an experimenter was present. The task consisted of 40 different pictures of either distorted faces (aversive stimuli) or household items (neutral stimuli), with each stimulus followed by a neutral screensaver. Each picture was presented for 2 to 5 s, with the screensaver serving as a filler so that the total time of stimulus plus screensaver was always 6 s. Participants were told that they should try to shorten the duration of the presentation of the stimuli by finding the right combination of five presses on two keys (the *z* key and the period key were designated as the right and left keys and were marked by stickers). The keypresses and their timing were recorded by the software. During the first 2 min of the task, the stimuli presentation time gradually increased from 2 to 5 s (with presentation time of the screensaver decreasing correspondingly from 4 to 1 s), whereas during the last 2 min of the task, the stimuli presentation time gradually decreased from 5 to 2 s (with presentation time of the screensaver increasing correspondingly from 1 to 4 s). On the basis of previous studies on illusion of control (e.g., Presson & Benassi, 2003), we reasoned that a gradual decrease in presentation time would enhance the illusion of control (presumably by providing a false positive feedback on the success of the participant's control attempts), whereas an increase in presentation time would reduce the illusion of control.

In a pilot study, 44 undergraduate students (25 women) with an age range of 19 to 31 years (M = 23.09, SD = 2.91) were presented with two sequences of stimuli as described earlier. Following each sequence, participants were asked to rate each image on 5-point semantic differential scales (pleasant–unpleasant, good–bad, pretty–ugly, and calming–scary). The manipulation check confirmed that the aversive stimuli, compared with the neutral stimuli, were rated as more unpleasant (M = 4.64, SD = 0.53, for the aversive stimuli and M = 2.09, SD = 0.88, for the neutral stimuli), more ugly (M = 4.66, SD = 0.53, for the aversive stimuli and M = 2.45, SD = 0.82, for the neutral stimuli), more scary (M = 3.93, SD = 0.85 for the aversive stimuli and M = 1.93, SD = 0.73, for the neutral stimuli), and more bad (M = 3.66, SD = 0.96, for the aversive stimuli and M = 2.14, SD = 0.85, for the neutral stimuli). All of these differences were statistically significant, all ts(43) > 7.5, $p < .001$.

Estimations of control. Participants estimated the extent of their control over the stimuli presentation time three times during the task: 30 s, 2.0 min, and 3.5 min after the beginning of the task. Control estimations were made on a scale ranging from 0 (*no control*) to 100 (*complete control*) and were marked by the experimenter while the participant continued working on the task.

Pattern variability index. We used the variability of the keypress patterns as a measure of rigid or compulsive-like behavior. There were 32 possible patterns, reflecting all possible combinations of five presses on two keys (e. g., LLLRR, representing three presses on the left key and two presses on the right key). For each participant, we computed a pattern variability index, defined as the number of different keypress patterns used by the participant during the entire task (range from 0 to 32, with lower scores reflecting use of fewer different patterns or higher repetitiveness).

Obsessive–Compulsive Inventory–Revised (OCI-R; Foa et al., 2002). The OCI-R is an 18-item measure of OC symptoms. Previous studies found its Cronbach's alpha value to be .88 (Hajcak, Huppert, Simons, & Foa, 2004). In this study, Cronbach's alpha was .90.

Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). The BDI includes 21 categories of symptoms assessing the severity of depression during the past week. The BDI is a valid and reliable measure of depression and is significantly correlated with clinical diagnosis (Shaver & Brennan, 1991). In this study Cronbach's alpha was .84.

Procedure

Participants were invited to individual sessions and informed that the session would include a computerized task and several questionnaires. Participants first completed the OCD and depression inventories, followed by the aversive and neutral versions of the computerized task presented sequentially. The presentation order of the aversive and neutral stimuli was counterbalanced and did not have any significant effects on the results.

Results

OC Tendencies and Overall Control Estimations

The student sample had a mean OCI-R of 18.49 (SD = 11.01), essentially identical to the figures reported by Foa et al. (2002) for the nonanxious control sample (M = 18.82, SD = 11.10). We predicted that OC tendencies would be positively correlated with estimations of control of the visual stimuli. Overall estimations of control were obtained by averaging the three estimations registered during the presentation of each stimulus type. As predicted, estimations of control were significantly associated with OCI-R scores for both aversive stimuli, $r(55) = .44$, $p = .001$, and neutral stimuli, $r(55) = .31$, $p = .022$ (see Table 1).[1]

Because OCD often coexists with depressive symptoms and because depressed individuals tend to report lower estimations of control than nondepressed ones (Alloy & Abramson, 1979; Alloy & Clements, 1992; Martin et al., 1984), we examined the possible effects of depression on the relations between OC tendencies and estimations of control. As Table 1 shows, the relations between

[1] We also examined the correlations of control estimations with all the subscales of the OCI-R (Washing, Checking, Ordering, Obsessing, Hoarding, and Neutralizing). All the correlations were in the same direction, and there were no significant differences among them.

Table 1
Pearson Correlations of Study 1 Variables (N = 52–55)

Measure	1	2	3	4	5	6
1. OCI-R	—					
2. BDI	.26	—				
3. Overall estimations of control, aversive	.44**	.17	—			
4. Overall estimations of control, neutral	.31*	−.07	.68**	—		
5. Pattern variability index, aversive	−.36**	−.16	−.30*	−.08	—	
6. Pattern variability index, neutral	−.22	−.09	−.31*	−.37**	.56**	—

Note. OCI-R = Obsessive–Compulsive Inventory–Revised; BDI = Beck Depression Inventory.
* $p < .05$. ** $p < .01$.

BDI and estimations of control were not significant. Additionally, we examined the correlations presented in Table 1 while controlling for participants' depression levels. The partial correlation coefficients between OCI-R, estimations of control, and pattern variability indexes (controlling for BDI scores) were very similar to the zero-order correlations presented in Table 1, indicating that depression did not contribute to these relationships.

OC Tendencies and Pattern Variability

We examined whether high OC tendencies would be related to more repetitive pressing patterns. As predicted, OCI-R scores were significantly related to the pattern variability index (the number of different patterns used by each participant) in the aversive stimuli condition, $r(53) = -.36$, $p = .009$. The correlation between OCI-R scores and the pattern variability index in the neutral stimuli condition was in the same direction but was nonsignificant, $r(53) = -.22$, $p = .123$ (see Table 1).

Aversive Versus Neutral Stimuli

To examine whether stimuli valence affected the relations between OC tendencies and the illusion-of-control task measures (estimations of control and pattern variability index), we tested the significance of the differences between the correlations obtained during the presentation of the aversive versus the neutral stimuli (see Table 1). A series of *t* tests for dependent correlations (McNemar, 1949) indicated that none of the differences between the correlations of OCI-R and the illusion-of-control task measures in the aversive stimuli condition and the neutral stimuli condition were statistically significant (all *ps* > .09).

Additional Analysis With High Versus Low OC Tendencies

To make the results of this study compatible with those of Study 2, in which we compared participants with and without OCD, we divided participants into two groups, high on OC symptoms (high OC, $n = 28$) and low on OC symptoms (low OC, $n = 27$), on the basis of the OCI-R median sample value ($Mdn = 16$). The mean OCI-R score was 26.31 ($SD = 9.67$) in the high-OC group and 10.37 ($SD = 4.51$) in the low-OC group.[2] Mean estimations of control in the three estimation points for high- and low-OC participants are presented in Figure 1.

We examined the effects of OC tendencies, stimuli valence, and time on estimations of control with a 2 (high vs. low OC) × 2 (aversive vs. neutral stimuli) × 3 (estimation points) mixed model analysis of variance (ANOVA). The analysis yielded a significant effect of OC tendencies, $F(1, 53) = 4.46$, $p = .039$, with participants high in OC tendencies giving higher estimations of control than those with low OC tendencies. There was also a significant effect of estimation points, $F(2, 106) = 30.96$, $p < .001$. Figure 2 shows that consistent with the structure of the task, estimations of control decreased when stimuli presentation time increased (during the first 2 min of the task) and increased when stimuli presentation time decreased (during the last 2 min of the task). This pattern was further examined with trend analysis. Consistent with the observed pattern, both the linear, $F(1, 53) = 30.69$, $p < .001$, and the quadratic, $F(1, 53) = 31.31$, $p < .001$, components were significant. There were no other significant effects (all *ps* > .09), including the effect of stimuli valence, $F(1, 53) = 0.12$, $p = .74$.

Study 2

Method

Participants

Participants were 22 individuals with a clinical diagnosis of OCD and 22 control participants without psychiatric history who were matched in age, gender, and education to the OCD sample. Participants' ages ranged from 18 to 55 years (for OCD, $M = 30.0$, $SD = 9.9$; for control, $M = 30.1$, $SD = 10.1$), $t(42) = -0.05$, *ns*. Both samples included a slightly higher proportion of men (54.5%) and reported similar numbers of years of education (for OCD, $M = 14.1$, $SD = 2.3$; for control, $M = 14.5$, $SD = 2.1$).

Participants in the OCD group responded to advertisements in local newspapers and on the Internet, which included a brief description of the study and promised a compensation of 100 new Israeli shekels (NIS; $22 at the time of the study) for participation. All those who responded to the advertisements were invited to a personal interview with a trained clinical psychologist, which included a diagnostic interview (see the *Apparatus and Measures* section). The purpose of this interview was to verify that respondents met diagnostic criteria for OCD and to assess any comorbid disorders. Participants who met criteria for present or past psychotic episodes or features were excluded from the study. Of the 22 participants with OCD included in the study, 6 also met criteria

[2] For comparison, note that the mean OCI-R score for the OCD group was 28.01 ($SD = 13.53$) in Foa et al.'s (2002) study and was 29.22 ($SD = 15.22$) in our Study 2.

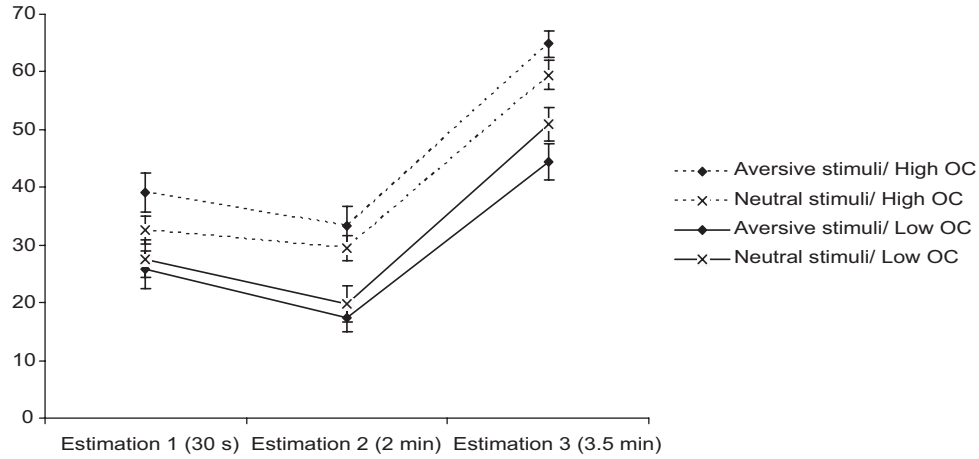

Figure 1. The three control estimations (0–100) for aversive and neutral stimuli by obsessive–compulsive (OC) tendencies ($N = 55$). Error bars are one standard error of the mean values.

for dysthymia, 4 met criteria for dysthymia and a past major depressive episode, and 4 met criteria for panic disorder without agoraphobia. Of the 22 participants with OCD, 14 were receiving pharmacological treatment with various serotonin reuptake inhibitors.

Participants in the control sample were selected to match the OCD sample in age, gender, and education. The control sample also completed the diagnostic interview to rule out current or past anxiety or psychotic disorders. All participants signed a written consent form and received 100 NIS for participation.

Apparatus and Measures

The illusion-of-control task and self-report scales were the same as in Study 1. In addition, primary and comorbid diagnoses were assessed in individual clinical interviews with the Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1998). The MINI is a short structured diagnostic interview for *Diagnostic and Statistical Manual of Mental Disorders*(4th ed.) and ICD-10 psychiatric disorders. It takes approximately 20 min to administer and is considered to be a valid and time-efficient alternative to the SCID-P and CIDI (Sheehan et al., 1997; Lecrubier et al., 1997).

Procedure

The procedure was identical to the one described in Study 1, although the sessions with the OCD participants lasted 1.5 hr, on average, in comparison to 30 min with the participants without OCD. This was because of the longer evaluation process with the OCD participants, but also because this sample tended to have more questions throughout the session and required more thorough debriefing.

Results

OCD and Control Estimations

Participants' estimations of control in Study 2 are presented in Figure 2. As in Study 1, we examined the prediction that partici-

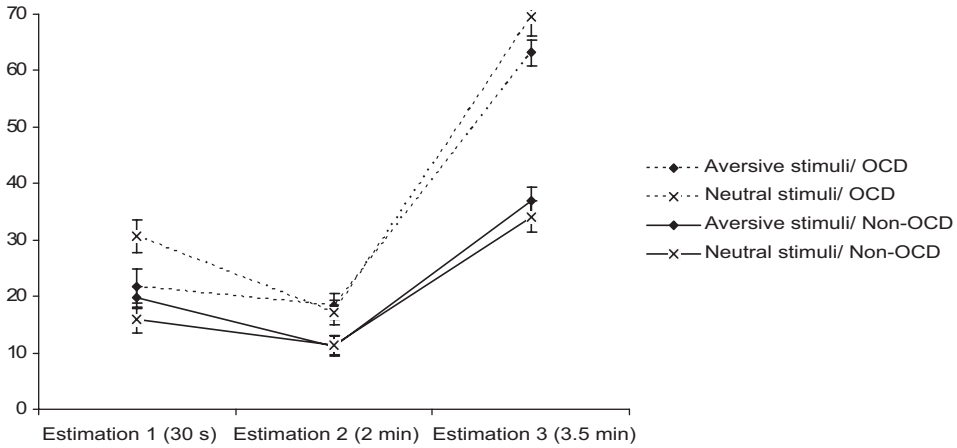

Figure 2. The three control estimations (0–100) for aversive and neutral stimuli by OCD and non-OCD control participants ($N = 44$). Error bars are one standard error of the mean values. OCD = obsessive–compulsive disorder.

pants with OCD would give higher estimations of control than those without OCD. We examined the effects of OCD, stimuli valence, and time on control estimations with a 2 (OCD vs. control) × 2 (aversive vs. neutral stimuli) × 3 (estimation points) mixed model ANOVA. As in Study 1, the analysis yielded a significant effect of OCD, $F(1, 42) = 8.81$, $p = .005$, with OCD participants giving higher control estimations than those without OCD. There was also a significant effect of estimation points, $F(1, 42) = 74.59$, $p < .001$. Figure 2 shows that estimation of control decreased when stimuli presentation time increased (during the first 2 min of the task) and increased when stimuli presentation time decreased (during the last 2 min of the task). This pattern was further examined with trend analysis. Consistent with the observed pattern, both the linear, $F(1, 42) = 71.57$, $p < .001$, and the quadratic, $F(1, 42) = 78.93$, $p < .001$, components were significant. The Estimation Points × OCD interaction was also significant, $F(1, 42) = 9.17$, $p < .001$, but there were no other significant effects (all ps $> .13$), including the effect of stimuli valence, $F(1, 42) = 0.33$, $p = .57$.

OCD and Pattern Variability

We hypothesized that OCD participants would show more repetitive pressings patterns than control participants. Means of the pattern variability index are presented in Table 2. We conducted a 2 (aversive vs. neutral) × 2 (OCD vs. control) ANOVA on the pattern variability index, which revealed a main effect of stimuli valence, $F(1, 39) = 7.11$, $p = .011$, and a significant interaction effect of stimuli valence and OCD, $F(1, 39) = 10.33$, $p = .003$. The main effect of OCD was not statistically significant, $F(1, 39) = 3.25$, $p = .08$, although it was in the predicted direction. As Table 2 shows, participants with OCD were more repetitive (used fewer patterns) than control participants in the aversive but not in the neutral stimuli condition.

Discussion

The present research aimed at clarifying the relations between OC tendencies, estimations of control, and behavioral control attempts. We predicted that high OC tendencies would be associated with increased estimations of control of the visual stimuli (illusion of control) and restricted variability in patterns of keypresses, which we used as a measure of compulsive-like rigid behavior. Both of these predictions were borne out in Study 1, in which OC tendencies were positively related to estimations of control and negatively related to variability of press patterns. In Study 2, OCD participants, as compared to participants without OCD, gave higher estimations of control and used a more restricted range of press patterns during exposure to the aversive but not to the neutral stimuli.

Table 2
Pattern Variability Indexes (0–32) for Aversive and Neutral Stimuli by OCD and Control Participants (N = 43)

Participant group	Pattern variability index			
	Aversive stimuli		Neutral stimuli	
	M	*SD*	*M*	*SD*
OCD	13.71	3.89	13.90	3.79
Control	16.90	4.34	14.85	3.23

Note. OCD = obsessive–compulsive disorder.

Notably, depression was not related to illusion of control in our study, which may appear to contradict previous studies in which depressed patients had lower (and more accurate) illusion of control as compared to nondepressed participants (Alloy & Clements, 1992; Martin, Abramson, & Alloy, 1984; Vázquez, 1987). A series of studies by Benassi and Mahler (1985), however, demonstrated that these findings break down when participants complete a contingency learning task in the presence of an observer and when outcomes occur independently of response at a high frequency. Because both of these conditions were present in our procedure, the lack of relationship between depression and control estimations in our studies does not present an anomaly.

We used aversive and neutral stimuli with the aim of examining how stimulus valence would affect the relations between OC tendencies and the dependent variables of control estimations and press pattern variability. Our findings suggest that the effect of OC tendencies on these variables may be somewhat more pronounced with negative stimuli than with neutral stimuli. In Study 1, OC tendencies were significantly correlated with press pattern variability in the aversive stimuli condition but not in the neutral stimuli condition, although the differences between the correlation coefficients were not statistically significant. In Study 2, as mentioned earlier, participants with OCD displayed more repetitive press patterns than participants without OCD during exposure to the aversive but not to the neutral stimuli. These findings, though preliminary and suggestive, are consistent with the phenomenology of OCD, where control efforts are primarily directed at perceived threats. At the same time, the relationships between OC tendencies and illusory control were not limited to the aversive stimuli, corroborating the hypothesis that individuals with OCD have a general high need for control (e.g., Rhéaume et al., 1995; Salkovskis, 1996). This finding is also consistent with earlier studies in which OCD participants exhibited greater responsibility than control participants in low-risk situations (Foa, Amir, Bogert, Molnar, & Przeworski, 2001; Lopatka & Rachman, 1995). Further research is needed to clarify the relationships among stimuli valence, perception of control, and behavioral attempts aimed at establishing control in OCD.

Our results underscore the importance of control in OCD and demonstrate a link between illusion of control and repetitive control attempts. The causal relationships between these factors cannot be determined by the present results. We can speculate, however, that a control cycle may begin with the dread of uncontrollable life events (McLaren & Crowe, 2003). Individuals with OCD experience this dread as unbearable (Hayes et al., 1999) and are strongly driven to attain a sense of control. Because control over threatening life events is limited, OC individuals may turn their control attempts to specific thoughts and actions in an attempt to develop compensating experiences of control by proxy.

When a sense of control over life events is obtained through control of physical or mental events, routine actions, such as locking the door, become means to higher order goals of protecting oneself from life's dangers. Because no feedback is available in relation to success in achieving or progressing toward this higher

order goal (doors cannot provide reliable feedback about control over life events), success in this task is substituted by success in the local task, which is marked by reduction of anxiety or distress. Daily activities are therefore transferred into a different arena; the door is not locked only for the sake of preventing theft but rather to achieve a desired internal experience (Dar, Rish, Hermesh, Fux, & Taub, 2000). This model is consistent with the finding that OCD participants with hand washing rituals construed the act of hand washing in higher levels or more abstract terms (e.g., as showing responsibility) compared with control participants (Dar & Katz, 2005). This suggests that for compulsive washers, the details of the compulsive act are not dictated by the need to achieve a normal level of cleanliness but rather by the desire to achieve a specific internal state, such as alleviation of anxiety or a sense of control.

A related function of rituals may be that they can provide an indication for general ability to control external events. This function is similar to the function of military drilling exercises. Although drilling exercises would not be of much use in an actual war, they nevertheless serve to indicate the discipline and readiness of the army. More specifically, they are perceived as indicative of discipline, which is necessary but not sufficient for success in fighting a war. In a similar vein, we speculate that individuals with OCD are intensely occupied with attempting to achieve a sense of control in a substitute field, which becomes a test case for their ability to control events in the real world. Checking doors, washing hands, and avoiding particular words become increasingly important as indexes of general ability to control. Once anxiety reduction and a sense of control are achieved and interpreted as indicative of this general ability to control, people with OCD may experience relief and stop the substitute (ritual) activity. Unfortunately, the relief is short lived (success in the drill does not really guarantee success in the war), and when anxiety returns, the ritualized activity must be renewed.

This hypothetical model of the role of control in OCD accords with and can contribute to recent theoretical developments in this area. For example, if one function of rituals is to index control abilities, other people's actions are largely irrelevant. This may help explain the finding of inflated responsibility in OCD (e.g., Lopatka & Rachman, 1995; Rhéaume, Freeston, Dugas, Letarte, & Ladouceur, 1995; Rhéaume et al., 1995; Shafran, 1997), where the obligation to take extreme measures to prevent dreaded outcomes is assigned to oneself but not to others.

The present studies may also have significant clinical implications. For example, in cognitive–behavior therapy with OCD patients, identifying the processes involved in achieving an illusory sense of control may decrease the compulsive efforts by defusing the critical meaning assigned to the substitute activity and simultaneously increasing self-efficacy and a sense of control over real and relevant life areas. In a similar vein, correcting excessive feelings of responsibility has been established as an important component in psychotherapy with OCD patients (e.g., Ladouceur, Léger, Rhéaume, & Dubé, 1996; van Oppen & Arntz, 1994).

Finally, future research should address issues related to the conceptualization of compulsions as an attempt to control stressful life events by proxy. For example, it would be useful to investigate whether and how individuals with OCD infer control in their lives through control of specific objects. Another question for investigation is whether control of thoughts in OCD is motivated not only by thought–action fusion beliefs (e.g., Amir, Freshman, Ramsey, Neary, & Brigidi, 2001) but also by the perception that control of objects indexes the ability to control external events. Because thought control is essentially guaranteed to fail (e.g., Wegner, 1994), using it as proxy for the perceived ability to control events would contribute to the continuous and futile cycle of obsessions and suppression attempts.

References

Abramson, L. Y., & Alloy, L. B. (1981). Depression, non-depression, and cognitive illusions: A reply to Schwartz. *Journal of Experimental Psychology: General, 110,* 436–447.

Adler, A. (1936). Compulsion neurosis. *International Journal of Individual Psychology, 2,* 3–22.

Alloy, L. B., & Abramson, L. Y. (1979). Judgment of contingency in depressed and nondepressed students. Sadder but wiser? *Journal of Experimental Psychology: General, 108,* 441–485.

Alloy, L. B., Abramson, L. Y., & Viscusi, D. (1981). Induced mood and the illusion of control. *Journal of Personality and Social Psychology, 41,* 1129–1140.

Alloy, L. B., & Clements, C. M. (1992). Illusion of control: Invulnerability to negative affect and depressive symptoms after laboratory and natural stressors. *Journal of Abnormal Psychology, 101,* 234–245.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

Amir, N., Freshman, M., Ramsey, B., Neary, E., & Brigidi, B. (2001). Thought–action fusion in individuals with OCD symptoms. *Behavior Research and Therapy, 39,* 765–776.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: Freeman.

Barlow, D. H. (2000). Unraveling the mysteries of anxiety and its disorders from the perspective of emotion theory. *American Psychologist, 55,* 1247–1263.

Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry, 4,* 561–571.

Benassi, V. A., & Mahler, H. I. (1985). Contingency judgments by depressed college students: Sadder but not always wiser. *Journal of Personality and Social Psychology, 49,* 1323–1329.

Burger, J. M. (1992). *Desire for control: Personality, social and clinical perspectives.* New York: Plenum Press.

Carr, A. T. (1974). Compulsive neurosis: A review of the literature. *Psychological Bulletin, 81,* 311–318.

Chamberlain, S. R., Blackwell, A. D., Fineberg, N., Robbins, T. W., & Sahakian, B. J. (2005). The neuropsychology of obsessive compulsive disorder: The importance of failures in cognitive and behavioural inhibition as candidate endophenotypic markers. *Neuroscience and Biobehavioral Review, 29,* 399–419.

Chorpita, B. F., Brown, T. A., & Barlow, D. H. (1998). Perceived control as a mediator of family environment in etiological models of childhood anxiety. *Behavior Therapy, 29,* 457–476.

Clark, D. A., & Purdon, C. (1993). New perspectives for a cognitive theory of obsessions. *Australian Psychologist, 28,* 161–167.

Dar, R., & Katz, H. (2005). Action identification in obsessive–compulsive washers. *Cognitive Therapy and Research, 29,* 333–341.

Dar, R., Rish, S., Hermesh, H., Fux, M., & Taub, M. (2000). Realism of confidence in obsessive–compulsive checkers. *Journal of Abnormal Psychology, 109,* 673–678.

Evans, G. W., Shapiro, D. H., & Lewis, M. A. (1993). Specifying dysfunctional control mismatches between different control dimensions. *British Journal of Psychology, 84,* 255–273.

Fenichel, O. (1945). *The psychoanalytic theory of neurosis.* New York: Norton.

Foa, E. B., Amir, N., Bogert, K. V. A., Molnar, C., & Przeworski, A.

(2001). Inflated perception of responsibility for harm in obsessive–compulsive disorder. *Journal of Anxiety Disorders, 15,* 259–275.

Foa, E. B., Huppert, J. D., Leiberg, S., Langner, R., Kichic, R., Hajcak, G., & Salkovskis, P. (2002). The Obsessive–Compulsive Inventory: Development and validation of a short version. *Psychological Assessment, 14,* 485–496.

Freeston, M. H., & Ladouceur, R. (1997). What do patients do with their obsessive thoughts? *Behaviour Research and Therapy, 35,* 335–348.

Freud, S. (1966). The disposition to obsessional neurosis. In J. Strachey (Ed. and trans.), *Standard edition of the complete works of Sigmund Freud* (Vol. 12, pp. 311–326). London: Hogarth Press. (Original work published 1913)

Friedland, N., Keinan, G., & Regev, Y. (1992). Controlling the uncontrollable: Effects of stress on perceptions of controllability. *Journal of Personality and Social Psychology, 63,* 923–931.

Hajcak, G., Huppert, J. D., Simons, R. F., & Foa, E. B. (2004). Psychometric properties of the OCI-R in a college sample. *Behaviour Research and Therapy, 42,* 115–123.

Hayes, S. C., Bissett, R., Korn, Z., Zettle, R. D., Rosenfarb, I., Cooper, L., & Grundt, A. (1999). The impact of acceptance versus control rationales on pain tolerance. *Psychological Record, 49,* 33–47.

Janet, P. (1903). *Les obsessions et la psychasthénie* [Obsessions and psychasthenia]. Paris: Bailliere.

Keinan, G. (1994). Effects of stress and tolerance of ambiguity on magical thinking. *Journal of Personality and Social Psychology, 67,* 48–55.

Keinan, G. (2002). The effects of stress and desire for control on superstitious behaviour. *Personality and Social Psychology Bulletin, 28,* 102–108.

Ladouceur, R., Freeston, M. H., Fournier, S., Rhéaume, J., Dugas, M. J., Gagnon, F., et al. (2000). Strategies used with intrusive thoughts: A comparison of OCD patients with anxious and community controls. *Journal of Abnormal Psychology, 109,* 179–187.

Ladouceur, R., Léger, E., Rhéaume, J., & Dubé, D. (1996). Correction of inflated responsibility in the treatment of obsessive–compulsive disorder. *Behavior Therapy and Research, 34,* 767–774.

Langer, E. J. (1975). The illusion of control. *Journal of Personality and Social Psychology, 32,* 311–328.

Lecrubier, Y., Sheehan, D., Weiller, E., Amorim, P., Bonara, I., Sheehan, K., et al. (1997). The MINI International Neuropsychiatric Interview (M. I. N. I). A short diagnostic structured interview: Reliability and validity according to the CIDI. *European Psychiatry, 12,* 224–231.

Lopatka, C., & Rachman, S. J. (1995). Perceived responsibility and compulsive checking: An experimental analysis. *Behaviour Research and Therapy, 33,* 673–684.

Martin, D. J., Abramson, L. Y., & Alloy, L. B. (1984). The illusion of control for self and others in depressed and nondepressesd college students. *Journal of Personality and Social Psychology, 46,* 125–136.

McFall, M. E., & Wollersheim, J. P. (1979). Obsessive–compulsive neurosis: A cognitive–behavioral formulation and approach to treatment. *Cognitive Therapy and Research, 3,* 333–348.

McKenna, F. P. (1993). It won't happen to me: Unrealistic optimism or illusion of control? *British Journal of Psychology, 84,* 39–50.

McLaren, S., & Crowe, S. F. (2003). The contribution of perceived control of stressful life events and thought suppression to the symptoms of obsessive–compulsive disorder in both non-clinical and clinical samples. *Anxiety Disorders, 17,* 389–403.

McNemar, Q. (1949). *Psychological statistics.* New York: Wiley.

Moulding, R., & Kyrios, M. (2006). Anxiety disorders and control related beliefs: The exemplar of obsessive–compulsive disorder (OCD). *Clinical Psychology Review, 26,* 573–583.

Obsessive Compulsive Cognitions Working Group. (2001). Development and initial validation of the obsessive beliefs questionnaire and the interpretation of intrusions inventory. *Behaviour Research and Therapy, 39,* 987–1006.

Presson, P. K., & Benassi, V. A. (2003). Are depressive symptoms positively or negatively associated with the illusion of control? *Social Behavior and Personality, 31,* 483–495.

Rachman, S. (1993). Obsessions, responsibility and guilt. *Behaviour Research and Therapy, 31,* 149–154.

Rachman, S. (1997). A cognitive theory of obsessions. *Behaviour Research and Therapy, 35,* 793–802.

Rachman, S. (1998). A cognitive theory of obsessions: Elaborations. *Behaviour Research and Therapy, 36,* 385–401.

Rachman, S., & Hodgson, R. (1980). *Obsessions and compulsions.* Englewood Cliffs, NJ: Prentice Hall.

Rhéaume, J., Freeston, M. H., Dugas, M. J., Letarte, H., & Ladouceur, R. (1995). Perfectionism, responsibility and obsessive–compulsive symptoms. *Behaviour Research and Therapy, 33,* 785–794.

Rhéaume, J., Ladouceur, R., Freeston, M. H., & Letarte, H. (1995). Inflated responsibility in OCD: Validation of an operational definition. *Behaviour Research and Therapy, 33,* 159–169.

Salkovskis, P. M. (1985). Obsessional–compulsive problems: A cognitive–behavioral analysis. *Behaviour Research and Therapy, 23,* 571–583.

Salkovskis, P. M. (1996). Cognitive–behavioral approaches to the understanding of obsessional problems. In R. M. Rapee (Ed.), *Current controversies in the anxiety disorders* (pp. 103–133). New York: Guilford Press.

Sanderson, W. C., Rapee, R. M., & Barlow, D. H. (1989). The influence of an illusion of control on panic attacks induced via inhalation of 5.5% carbon dioxide-enriched air. *Archives of General Psychiatry, 46,* 157–162.

Shafran, R. (1997). The manipulation of responsibility in obsessive–compulsive disorder. *British Journal of Clinical Psychology, 36,* 397–407.

Shapiro, D. (1965). *Neurotic styles.* New York: Basic Books.

Shaver, P. R., & Brennan, K. A. (1991). Measures of depression and loneliness. In J. P. Robinson, P. R. Shaver, & L. S. Wrightman (Eds.), *Measures of personality and social psychological attitudes* (pp. 195–290). San Diego, CA: Academic Press.

Sheehan, D. V., Lecrubier, Y., Sheehan. K. H., Amorim, P., Janavs, J., Weiller. E., et al. (1998). The Mini-International Neuropsychiatric Interview (M. I. N. I.): The development and validation of a structured diagnostic psychiatric interview for *DSM–IV* and ICD-10. *Journal of Clinical Psychiatry, 59,* 22–33.

Sheehan, D. V., Lecrubier, Y., Sheehan, K. H., Janavs, J., Weiller, E., Bonara, L. I., et al. (1997). Reliability and validity of the MINI International Neuropsychiatric Interview (M. I. N. I): According to the SCID-P. *European Psychiatry, 12,* 232–241.

Skinner, E. A. (1996). A guide to constructs of control. *Journal of Personality and Social Psychology, 71,* 549–570.

Sookman, D., Pinard, G., & Beck, A. T. (2001). Vulnerability schemas in obsessive–compulsive disorder. *Journal of Cognitive Psychotherapy, 15,* 109–130.

Steketee, G., Frost, R. O., & Cohen, I. (1998). Beliefs in obsessive–compulsive disorder. *Journal of Anxiety Disorders, 12,* 525–537.

Thompson, S. C., Armstrong, W., & Thomas, C. (1998). Illusions of control, underestimation and accuracy: A control heuristics explanation. *Psychological Bulletin, 123,* 143–161.

van Oppen, P., & Arntz, A. (1994). Cognitive therapy for obsessive–compulsive disorder. *Behavior Research and Therapy, 32,* 79–87.

Vázquez, C. V. (1987). Judgment of contingency: Cognitive biases in depressed and nondepressed subjects. *Journal of Personality and Social Psychology, 52,* 419–431.

Wegner, D. M. (1994). Ironic processes of mental control. *Psychological Review, 101,* 34–52.

Wells, A. (1997). *Cognitive therapy of anxiety disorders: A practice manual and conceptual guide.* London: Wiley.

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