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OCD and Impulsivity: Considering the Role of Emotion

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UNIVERSITY OF MIAMI

OCD AND IMPULSIVITY:
CONSIDERING THE ROLE OF EMOTION

By

Stephanie E. Hudiburgh

A THESIS

Submitted to the Faculty
of the University of Miami
in partial fulfillment of the requirements for
the degree of Master of Science

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CONSIDERING THE ROLE OF EMOTION

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Obsessive-compulsive disorder (OCD) is a condition marked by recurrent and distressing thoughts, images, and impulses that are typically accompanied by repetitive physical or mental rituals. Previous research has explored impulsivity as a potential risk factor for OCD using a variety of self-report and behavioral measures; however, these studies have yielded inconsistent results. An emerging line of work suggests that emotional precipitation may be an important consideration when looking at the role of impulsivity across the spectrum of psychopathology, including OCD. The current study examined the relationship between symptoms of OCD and emotion-based impulsivity using the Three Factor Impulsivity Index, a self-report measure developed by Carver et al. (2011), which allows for the separate assessment of emotion- and non-emotion-based impulsive responding. Within a large-community based sample supplemented with at-risk young adults, we found that emotion-based impulsivity was associated with greater severity of self-reported OCD symptoms both overall and across symptom subtypes. Non-emotion-based impulsivity (*Lack of Follow Through*) was negatively associated with OCD symptoms, when any significant relationship emerged. Within our at-risk young adult sample, we further investigated these relationships using interview-based and

behavioral measures of OCD symptoms. In both cases, factors reflecting emotion-based impulsivity, but not their non-emotion-based counterpart, predicted greater symptom severity. Finally, interaction analyses showed that the positive relationship between emotion-based impulsivity and OCD symptoms was moderated by a belief in the importance and control of thoughts (ICT). Those who were elevated on ICT had the strongest relationship between emotion-based impulsivity and severity of symptoms as assessed by self-report and interview. This interaction was not present for our behavioral outcomes. Overall, these findings suggest that it is important to consider the role of emotion when studying the relationship between OCD and impulsivity.

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Chapter 1: Introduction

Obsessive-compulsive disorder (OCD) is a condition marked by distressing and time-consuming obsessions and compulsions. Obsessions are characterized as intrusive, unwanted thoughts, images, or impulses, while compulsions are the physical or mental acts carried out to reduce the distress or discomfort evoked by obsessions. Obsessions and compulsions are functionally related, and can be captured by several symptom dimensions, including contamination, harm/checking, repugnant thoughts, and symmetry, making OCD a notably heterogeneous condition (Mataix-Cols, 2005). OCD has a prevalence rate of 1-2% both nationally and worldwide (Ruscio, Stein, Chiu, & Kessler, 2010; Weissman, Bland, Canino, & Greenwald, 1994), and its course is typically chronic, though symptoms will often wax and wane over time (Kichuk et al., 2013). Both obsessions and compulsions are characterized as being dimensionally distributed (Olatunji, 2008), and even subclinical symptoms can interfere markedly with daily functioning (Angst, 2004; Adam, 2012).

Given the debilitating nature of OCD, research has sought to identify individual difference factors that can account for features of this disorder. Impulsivity is one proposed yet relatively understudied risk factor, likely due in part to how impulsivity has been conceptualized in relationship to compulsivity (Fineberg et al., 2010). In the literature of OCD, impulsivity and compulsivity have historically been placed at opposite ends of a single spectrum (Hollander, 2005). In this view, OCD has been considered a disorder of excessive *compulsivity*, that is, marked by low levels of impulsivity. However, as noted by multiple authors on this matter, placing impulsivity and compulsivity at opposite ends of a single continuum produces an oversimplified

dichotomy (Fineberg et al., 2010), obscuring these constructs' similarities (Dalley, Everitt, & Robbins, 2011), and producing an imprecise operationalization of both. In this light, the presence of compulsive features does not necessarily preclude the occurrence of impulsive behaviors.

Several past studies have examined associations between OCD symptoms and perceived impulsivity. The vast majority of these investigations have utilized the Barratt Impulsiveness Scale (BIS-11; Patton, Stanford, & Barratt, 1995), a self-report measure that consists of three subscales: attentional, motor, and non-planning impulsiveness. Of the three subscales, the attentional subscale has most often been found to be elevated in OCD samples relative to healthy controls (Benatti, Dell'Osso, Arici, Hollander, & Altamura, 2014; Boisseau et al., 2012; Grassi et al., 2015; Gupta, Khess, & Venkatesan, 2013; Onur et al., 2016; Sohn, Kang, Namkoong, & Kim, 2014). This subscale reflects difficulty focusing on the task at-hand and general instability of thoughts. However, as noted by Boisseau et al. (2012), the consistent elevations in the BIS-11 attentional subscale may be a reflection of the tendency to attend to and be distracted by intrusive thoughts, rather than "impulsivity" as others would typically characterize it. Thus, although the present literature points to a potential association between impulsivity and OCD, there remain ambiguities about this relationship.

A growing literature suggests that there are in fact diverse conceptualizations of impulsivity. One that has recently attracted attention highlights the role of emotions in spurring impulsive behaviors. More specifically, while some impulsive reactions may reflect simply "acting without thinking," other impulsive reactions may follow directly from the experience of strong emotions (Cyders et al., 2007; Whiteside & Lynam, 2001).

Accumulating evidence indicates that this latter form of impulsive reactivity represents a vulnerability to the development of externalizing, internalizing, and thought disorders (Carver, Johnson, & Timpano, 2017). One way of assessing the contribution of emotion to impulsive responding is via the Three Factor Impulsivity Index (TFII; Carver, Johnson, Joormann, Kim, & Nam, 2011). This self-report assessment was derived from a number of preexisting and newly generated impulsivity scales, and includes three factors: impulsive cognitive responses to emotion (*Pervasive Influence of Feelings*), impulsive action in response to emotion (*Feelings Trigger Action*), and impulsivity without any reference to affect (*Lack of Follow Through*). This separation of impulsivity into emotionally-driven and non-emotionally-based factors allows us to look at the relative contribution of each within the context of a disorder.

Although impulsive reactivity to emotions has been identified as a risk factor for several types of psychopathological symptoms, only a few studies have looked at the relationship between emotion and impulsivity in OCD. These studies have used the UPPS-P Impulsive Behavior Scale (Cyders et al., 2007; Whiteside & Lynam, 2001) which includes two impulsivity scales linked to emotion: one capturing negative urgency (NU), and another positive urgency. These scales are both included in the *Feelings Trigger Action* TFII factor, and reflect a tendency to act rashly in response to either intense negative or positive affect. Studies using all or parts of this measure have found that NU is associated with aspects of OCD: for example, one linked greater NU to increased obsessions, particularly in the presence of low distress tolerance (Cogle, Timpano, & Goetz, 2012), and another found elevated NU to be linked to greater repugnant obsessions (Macatee et al., 2016). One study found that individuals with OCD

were more likely to score highly on the UPPS-P as a whole than were healthy controls (Prochazkova et al., 2017). Thus, a picture has begun to emerge in which it seems important to consider the relative roles of emotion- and non-emotion-based impulsivity in individuals with OCD.

The current investigation sought to examine the relationship between OCD symptoms and emotion-based impulsivity as conceptualized by Carver et al. (2011). Aims were examined in a large community sample recruited via Amazon's Mechanical Turk (MTurk) and a supplemental young adult sample at-risk for developing OCD. MTurk allowed us to collect a large sample, an approach (Buhrmester, Kwang, & Gosling, 2011) that has become increasingly popular, given reports of elevated psychiatric indicators (Shapiro, Chandler, & Mueller, 2013), including OCD symptoms (Arditte, Çek, Shaw, & Timpano, 2016), within this population. Given that OCD most commonly develops or worsens during young adulthood (Angst et al., 2004), the at-risk young adult sample allowed us examine our hypotheses within a particularly vulnerable population. Furthermore, we invited the at-risk sample into the lab, which allowed us to extend our investigation beyond self-report, including both interview-based and experimental methods. We felt it was important to use a multi-modal assessment of OCD symptoms, given that self-reported symptom severity does not always align with other modes of assessment (Federici et al., 2010).

Our first aim was to investigate whether there was a general association between self-reported OCD symptom severity and perceived impulsivity across both samples. Analyses incorporated relevant covariates, including sample source and gender, as well as general anxiety symptoms, which have been associated with both emotion-based

impulsivity (Johnson, Carver, & Joormann, 2013) and OCD (Nestadt et al., 2001). Our second aim was to extend this investigation using an interview-based assessment of OCD symptoms in the young adult sample. This allowed us to examine whether the three impulsivity factors were differentially related to the severity of obsessions versus compulsions. The third aim was to examine whether different types of impulsivity (emotion- or non-emotion-based) predicted behavioral outcomes, including level of distress and strength of urge to ritualize, in response to symptom provocation. The final aim was to explore whether cognitive factors specific to OCD moderated the association between OCD symptoms and emotion-based impulsivity. For these analyses we selected *importance and control of thoughts* (ICT; OCCWG, 2005), which captures beliefs about the value of thoughts and concern with controlling their content. ICT has been associated with symptoms of OCD, particularly repugnant obsessions (Brakoulias et al., 2014; Wheaton, Abramowitz, Berman, Riemann, & Hale, 2010). Across our first three aims, we hypothesized that greater OCD symptom severity would be associated with elevated emotion-based impulsivity (i.e., *Pervasive Influence of Feelings* and *Feelings Trigger Action*), but not *Lack of Follow Through*. For our final aim, we predicted that those who endorsed greater emotion-based impulsivity would exhibit greater OCD symptoms across assessment modalities when they also endorsed elevated dysfunctional beliefs about thoughts.

Chapter 2: Method

Participants and Procedure

General community sample. A large community-based participant group was recruited through Amazon's MTurk ($N = 547$). Data cleaning guidelines in line with recommendations in the literature were used (e.g., Behrend, Sharek, Meade, & Wiebe, 2011). Participants who either did not complete the questionnaire set or did so in less than 60% of the expected completion time ($n = 132$) were excluded, along with participants who failed to correctly answer 80% of validity items embedded in the survey ($n = 29$). The final sample ($N = 386$) was 50% female and had an average of age of 36.2 years ($SD = 12.0$, range = 19-73). As identified by self-report, the sample was 76.2% Caucasian/White, 13.5% Asian/Asian-American, 6.7% African-American/Black, 0.5% Native American, 0.3% Native Hawaiian/Other Pacific Islander, and 2.8% Other; 7% of the sample was Hispanic or Latino.

Procedures were approved by an institutional review board. Informed consent was obtained from participants online before they completed survey questions. The survey took approximately 30 minutes to complete, and participants were compensated \$4.50 for their participation, in line with standard MTurk practices.

At-risk young adult supplemental sample. To augment our community-based participant group, a sample of young adults ($N = 107$) was recruited from the University of Miami Introductory Psychology participant pool between Fall 2015 and Spring 2016. This sample was selected for having elevated scores of OC symptomatology, such that approximately 68% of the final sample had a score of 4 or greater on the *obsessing* subscale of the Obsessive-Compulsive Inventory—Revised (OCIR), which serves as the

most robust predictor of OCD diagnostic status from this inventory (Foa et al., 2002). Recruiting subjects in this manner ensured that the sample included a sufficient number of participants at risk for OCD, while still allowing for a range of reported OC symptom levels. Participants were 58% female and had an average of age 19.0 years ($SD = 1.2$, range = 17-25). As identified by self-report, the sample was 64.5% White/Caucasian, 17.8% Asian or Pacific Islander, 8.4% Black/African-American, 0.9% American Indian, and 8.4% Other; 24.3% of the sample was Hispanic or Latino.

Eligible participants were invited into the lab to complete additional questionnaires and a clinician-administered structured interview to ascertain severity of any OCD symptoms. Additionally, participants were randomized to complete one of two symptom provocation tasks (see below). As part of a larger investigation, participants were also randomized into a mindful attention training versus control condition. As this component of the investigation is not central to the current study's aims and hypotheses, nor was it significantly associated with OCD symptoms, we collapsed the sample and controlled for condition across analyses. Participants received research familiarization credit and \$2 for completing the study. All procedures were approved by an institutional review board.

Measures Relevant to Both Samples

Demographics. Basic demographic information (e.g., age, gender, ethnicity, race) was collected as part of the questionnaires sets.

Dimensional Obsessive-Compulsive Scale (DOCS). The DOCS (Abramowitz et al., 2010) is a 20-item self-report measure of obsessive-compulsive symptoms assessed across four subscales: contamination, harm/checking, unacceptable thoughts, and

symmetry. Within each domain, severity is determined via five items: symptom-related avoidance, distress, and interference, as well as time devoted to, and degree of control over, obsessions and compulsions. Each item is rated on a 0 to 4 scale for a total possible score of 0 to 80, with higher scores representing greater severity. Separate scores for each subscale can also be calculated with scores in each domain ranging from 0 to 20. Both total and subscale scores were used in our analyses. The DOCS has exhibited good to excellent internal consistency for each subscale, as well as strong evidence for convergent and discriminant validity (Abramowitz et al., 2010; Thibodeau, Leonard, Abramowitz, & Riemann, 2015).

Three Factor Impulsivity Index (TFII). The TFII (Carver et al., 2011; Johnson et al., 2013) is a measure of impulsivity that differentiates emotion-based impulsivity from other types of non-emotion-driven impulsive responding. The TFII was constructed from a set of measures reflecting different facets of impulsivity and was factor analyzed to yield three subscales, two of which reflect emotion-reactive impulsivity—*Pervasive Influence of Feelings* (e.g., “I am easily overwhelmed by feelings I have”) and *Feelings Trigger Action* (“It is hard for me to resist acting on my feelings”)—and one of which does not—*Lack of Follow Through* (“I tend to give up easily”). Participants rated the degree to which each item described them and their reactions on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), with higher scores suggesting greater impulsive responding. This measure has been used in a number of studies looking at the role of impulsivity in psychopathology (Johnson et al., 2013; Johnson, Tharp, Peckham, Carver, & Haase, 2017). The present study utilized a 44-item version.

Depression, Anxiety, and Stress Scale (DASS-21). The DASS-21 (Lovibond & Lovibond, 1995) is a 21-item questionnaire consisting of three 7-item subscales. In the present study, only the anxiety (e.g. “I felt I was close to panic”) and depression (e.g. “I felt down-hearted and blue;” assessed in at-risk student sample only) scales were used. On a 4-point Likert scale ranging from 0 (*did not apply to me at all*) to 3 (*applied to me very much, or most of the time*), participants indicated the degree to which each item applied to them over the past week. The DASS-21 has been shown to have high internal consistency (Antony, Bieling, Cox, Enns, & Swinson, 1998; Clara, Cox, & Enns, 2001), as well as good convergent and discriminant validity (Henry & Crawford, 2005).

Measures Relevant for At-Risk Young Adult Sample Only

Obsessive-Compulsive Inventory—Revised (OCIR). The OCIR (Foa et al., 2002) is an 18-item questionnaire used to assess OC symptoms across six subscales (washing, checking, obsessing, ordering, hoarding, and neutralizing). In the present study, only the *obsessing* (e.g., “I am upset by unpleasant thoughts that come into my mind against my will”) subscale was utilized as described above. Participants responded to each item using a 5-point Likert scale to indicate the degree to which they had been distressed or bothered by that item during the past month, ranging from 0 (*not at all*) to 4 (*extremely*). The OCIR has demonstrated moderate to high test-retest reliability, high internal consistency, moderate to excellent convergent validity, and good divergent validity (Foa et al., 2002; Hajcak, Huppert, Simons, & Foa, 2004).

Yale-Brown Obsessive Compulsive Scale (Y-BOCS). The Y-BOCS (Goodman, Price, Rasmussen, Mazure, Fleischmann, et al., 1989) is a 10-question interview-based measure that separately assesses the severity of obsessions and compulsions. Both

domains are evaluated based on the amount of time they occupy, extent to which they interfere with functioning, amount of distress they cause, effort made to resist symptoms, and success in resisting. Items are rated on a scale of 0 to 4 for a total possible score of 0 to 40, with higher scores capturing greater severity of symptoms. Separate scores for obsessions and compulsions can also be calculated such that totals within each domain range from 0 to 20. Our analyses utilized these two subscale scores. The Y-BOCS has demonstrated excellent inter-rater reliability, acceptable to good internal consistency, and moderate convergent validity (Goodman, Price, Rasmussen, Mazure, Delgado, et al., 1989; Woody, Steketee, & Chambless, 1995)

Obsessive Beliefs Questionnaire—44 (OBQ-44). The OBQ-44 (OCCWG, 2005) is a 44-item self-report measure of dysfunctional assumptions about thoughts that are believed to be important to the development of OC symptoms (OCCWG, 2001, 2005). It consists of three subscales, one of which, Importance and Control of Thoughts (ICT; e.g., “I should be able to rid my mind of unwanted thoughts”), was used in the present study. Using a 7-point Likert scale, participants rated whether each item was typical of their way of looking at things most of the time, from 1 (*disagree very much*) to 7 (*agree very much*). The OBQ-44 has demonstrated good internal consistency and criterion-related validity (OCCWG, 2005).

Symptom provocation tasks. Participants in our at-risk young adult sample completed either a *repugnant thoughts* or *contamination task* intended to evoke distress and an urge to ritualize. Although the tasks differed in how they elicited these responses, both distress and urge strength were assessed in the same manner for each task, allowing us to collapse outcomes across task type. After task completion, participants rated their

distress/urge to ritualize on a visual analogue scale ranging from 0 (*not distressed/not strong*) to 100 (*very distressed/very strong*).

The *repugnant thoughts task* was a modified version of a standard thought-action-fusion paradigm (Bocci & Gordon, 2007; Rachman, Shafran, Mitchell, Trant, & Teachman, 1996). Participants were asked to identify an individual they care about and to then write the name of that individual in the following sentence: “I hope ____ is in a car accident today.” The participant was directed to visualize the written scene for 30 seconds, after which they provided their ratings for distress and urge to ritualize.

The *contamination task* was a modified version of a behavioral task described by Najmi, Tobin, and Amir (2012). Participants were shown a toilet (with lid open) made to look dirty using soil and food coloring and were told that this toilet was obtained from a construction site. They were then asked to progressively touch parts of the toilet using tissues, starting with the top of the water tank, followed by the handle, tank sides, and toilet seat. Afterward, participants provided their ratings for distress and urge to ritualize.

Statistical Analyses

All data were screened prior to analysis to ensure that measure and subscale totals were normally distributed (i.e., skewness $<|2|$ and kurtosis $<|7|$; Kline, 2011) and within expected ranges. We investigated the association between impulsivity and self-reported OCD symptoms using a combined dataset consisting of both the general community and at-risk young adult samples. All other associations were analyzed in the at-risk sample. For each association between impulsivity and OCD symptoms (whether self-reported, interview-based, or behavioral), we first performed partial correlations, controlling for relevant covariates. We then conducted multiple regression analyses to examine whether

OCD symptoms were uniquely associated with each impulsivity factor when controlling for the other factors. For our final aim, we performed a series of interaction analyses within a multiple regression framework following established guidelines (Holmbeck, 2002). Significant interactions were followed by post-hoc probing of simple slopes at one standard deviation above and below the mean of the proposed continuous moderator, ICT.

Chapter 3: Results

Association between Impulsivity and Self-Reported OCD Symptoms

Descriptive statistics, including means and standard deviations for self-report variables, are shown in Table 1. Scores on the DOCS indicated that a suitable range of OCD symptoms was captured, reflecting non-clinical, sub-clinical, and clinical symptom levels (Figure 1A). Approximately 23% of the total sample was above the clinical cut-off for the DOCS total score. We first conducted a series of partial correlations (Table 1), controlling for gender, age, general anxiety, and sample source (i.e., MTurk or at-risk sample). All three of the impulsivity factors were significantly associated with one another. The two emotion-based impulsivity factors, *Pervasive Influence of Feelings* and *Feelings Trigger Action*, were also significantly correlated with DOCS total score, such that greater impulsivity as assessed by either factor was associated with greater severity of symptoms. *Lack of Follow Through* was not correlated with DOCS total score. A similar pattern emerged for all of the DOCS subscales, in that the two emotion-based impulsivity factors were significantly correlated with all subscales, while the non-emotion-based impulsivity factor was not. One notable exception was the partial correlation between *Pervasive Influence of Feelings* and the DOCS contamination subscale, which was not significant.

To examine whether OCD symptoms were uniquely associated with each of the impulsivity factors, controlling for the other impulsivity factors, we next conducted a series of multiple regression analyses. First, DOCS total score was simultaneously regressed on each of the three TFII factors, with relevant covariates (gender, age, general anxiety, and sample source) entered in Step 1 of the model and the three impulsivity

factors in Step 2. The overall model was significant and accounted for 37% of the variance. Results revealed that both *Pervasive Influence of Feelings* ($\beta = .13, t(478) = 2.44, p = .02$) and *Feelings Triggering Action* ($\beta = .14, t(478) = 2.86, p = .004$) were uniquely associated with greater total DOCS. Controlling for the emotion-based impulsivity factors, *Lack of Follow Through* also emerged as a unique predictor of DOCS total score; however, this was an inverse relationship, such that greater OCD symptom severity was associated with *less* non-emotion-based impulsivity ($\beta = -.11, t(478) = -2.43, p = .02$).

We next used a similar multiple regression analysis approach for each of the DOCS subscales. Relevant covariates were entered in Step 1 of the model followed by the three impulsivity factors in Step 2. Results are summarized in Table 2. As with the total score, *Pervasive Influence of Feelings* and *Feelings Trigger Action* were consistently associated with specific types of OCD symptoms. *Pervasive Influence of Feelings* was significantly and positively associated with all domains except contamination, while *Feelings Trigger Action* was significantly linked to all but harm/checking symptoms. *Lack of Follow Through* was significantly associated only with symmetry; however, this was an inverse relationship, such that greater symmetry symptoms were actually associated with *less* lack of follow through.

Association between Impulsivity and Interview-Assessed OCD Symptoms

The relationship between impulsivity and OCD symptoms was next explored using the Y-BOCS, an interview-based assessment of obsessions and compulsions, in our at-risk young adult sample. Y-BOCS total scores ranged from 0 to 25, and 45% of this sub-sample endorsed sub-clinical or clinical levels of OCD symptoms (Y-BOCS total

score ≥ 8 ; Figure 1B). We first examined partial correlations between the impulsivity factors and the Y-BOCS obsessions and compulsions subscales, controlling for relevant covariates, including gender, training condition, and general mood and anxiety symptoms. Results are summarized in Table 3. A similar pattern to that observed for the self-report measures emerged, in that the non-emotion-based impulsivity factor, *Lack of Follow Through*, was not associated with either obsessions or compulsions. In contrast to the self-report findings, we noted differential relationships between the emotion-based impulsivity factors and the Y-BOCS subscales. *Pervasive Influence of Feelings* and *Feelings Trigger Action* were both positively correlated with obsession severity, whereas only *Feelings Trigger Action* was significantly correlated with severity of compulsions.

Multiple regression analyses were then carried out with Y-BOCS obsession and Y-BOCS compulsion scores simultaneously regressed on each of the three TFII factors, controlling for gender, as well as anxiety and depression symptoms. Only *Pervasive Influence of Feelings* ($\beta = .40$, $t(100) = 3.81$, $p < .001$) remained associated with Y-BOCS obsessions, such that greater impulsivity in this domain was associated with greater obsession severity. None of the three impulsivity factors was significantly associated with Y-BOCS compulsions.

Association between Impulsivity and Response to Symptom Provocation Tasks

We next examined whether the three impulsivity factors differentially predicted behavioral responses to our symptom provocation paradigms in our at-risk young adult sample. Analyses were first conducted with distress and strength of urge to ritualize, collapsed across task type (i.e., repugnant thoughts and contamination provocation tasks). Partial correlations were conducted, controlling for covariates (see Table 3). *Feelings*

Trigger Action was significantly correlated with both distress and urge to ritualize in response to the symptom provocation tasks, while *Pervasive Influence of Feelings* and *Lack of Follow Through* were not tied to either outcome. We next conducted two separate multiple regression analyses in which distress and urge to ritualize, respectively, were simultaneously regressed on the three impulsivity factors, controlling for covariates. These analyses produced similar results: only *Feelings Trigger Action* uniquely predicted both distress ($\beta = .33, t(99) = 3.02, p = .003$) and urge to ritualize ($\beta = .32, t(99) = 2.87, p = .005$) in response to the symptom provocation tasks. Neither *Pervasive Influence of Feelings* nor *Lack of Follow Through* was significantly associated with either task outcome.

In a more exploratory vein, we also investigated these relationships separately for the repugnant thoughts and contamination symptom provocation tasks. For each task, the respective behavioral outcome (distress or urge to ritualize) was simultaneously regressed on the three impulsivity factors, controlling for relevant covariates; results are summarized in Table 4. As when outcomes were combined across task type, neither *Pervasive Influence of Feelings* nor *Lack of Follow Through* was significantly associated with distress or urge in either task. For the repugnant thoughts task, *Feelings Trigger Action* remained significantly associated with task-related distress, such that greater emotion-based impulsivity predicted greater distress. The association between *Feelings Trigger Action* and urge to ritualize fell to the level of a trend ($p = .065$). For the contamination paradigm, *Feelings Trigger Action* was no longer a significant predictor of either distress or urge. It should be noted that across both tasks and across both dependent variables, *Feelings Trigger Action* was consistently the strongest predictor compared to

the other impulsivity factors, and the strength of the association was consistently in the small-moderate range.

Interaction of Impulsivity and ICT

Regression models were used to test whether a belief in the importance and control of thoughts (ICT), moderates the relationship between emotion-based impulsivity and OCD symptoms as assessed by self-report (DOCS total), interview (Y-BOCS obsessions and compulsions), and symptom provocation task outcomes (distress and urge to ritualize). Per guidelines outlined by Holmbeck (2002), both the predictor in each model (either *Pervasive Influence of Feelings* or *Feelings Trigger Action*) and the proposed moderator variable, ICT, were centered to minimize collinearity. These centered variables were then used to generate corresponding interaction terms (*Pervasive Influence of Feelings* x ICT and *Feelings Trigger Action* x ICT). Each respective outcome of interest was then simultaneously regressed on the selected predictor, moderator, and corresponding interaction term, while controlling for the remaining impulsivity factors.

We observed significant interactions for both self-report and interview-assessed OCD symptoms: the association between *Feelings Trigger Action* and DOCS total was moderated by ICT ($\beta = 0.20$, $t(100) = 2.19$, $p = .03$), as were the relationships between *Feelings Trigger Action* and Y-BOCS obsessions ($\beta = 0.26$, $t(101) = 2.86$, $p = .005$) and compulsions ($\beta = 0.24$, $t(101) = 2.51$, $p = .01$). Post-hoc probing of simple slopes at one standard deviation above (High ICT) and below (Low ICT) the mean showed that when ICT was elevated, *Feelings Trigger Action* was significantly and positively associated with symptom severity as assessed by DOCS total ($\beta = 0.38$, $t(100) = 2.77$, $p = .007$), Y-

BOCS obsessions ($\beta = 0.27, t(101) = 2.01, p = .047$), and Y-BOCS compulsions ($\beta = 0.31, t(101) = 2.16, p = .03$). When low levels of ICT were endorsed, these relationships were no longer significant. Results are depicted in Figure 2. There was not a significant interaction between *Pervasive Influence of Feelings* and ICT in predicting self-reported and interview-assessed OCD symptoms. Likewise, there were no significant interactions for behavioral task outcomes: ICT did not interact with *Pervasive Influence of Feelings* or *Feelings Trigger Action* in predicting distress or urge strength in response to the symptom provocation tasks.

Chapter 4: Discussion

This study sought to clarify the relationship between impulsivity and symptoms of OCD. Importantly, we considered a multi-faceted definition of impulsivity (Carver et al., 2011), and included a multi-modal assessment of OCD symptoms capturing self-report, interview, and behavioral domains. Within our combined sample of community participants and at-risk young adults, factors reflecting impulsive responding in the context of strong emotion were consistently associated with greater symptoms of OCD, both overall and across symptom subtypes. This relationship was notably *not* found for non-emotion-based impulsivity. In fact, when any significant association between this impulsivity factor and OCD symptoms did emerge, it was an inverse relationship, such that greater symptom severity was associated with decreased impulsivity. Analyses conducted using interview-based and behavioral assessments of OCD symptoms further emphasized the importance of emotion-based impulsivity, but in unique ways: interview-based symptoms, specifically obsessions, were associated with greater cognitive emotion-based impulsivity, while findings from behavioral data highlighted that in vivo distress and urge to ritualize were linked to *Feelings Trigger Action*.

Our finding that OCD symptoms are associated with impulsive responding in the context of emotion, but not with non-emotional impulsivity, emphasizes the importance of considering the role of emotion in OCD. Most past research linking impulsivity to OCD symptoms has failed to differentiate emotion- and non-emotion-based impulsive responding. Those studies that have looked at emotion-based impulsivity have primarily focused on negative urgency (NU), one facet of the *Feelings Trigger Action* factor used in the present study. These studies most consistently found that obsessions, particularly

repugnant thoughts, were associated with NU in both young adult and community-based samples (Cogle et al., 2012; Gay, Schmidt, & Van der Linden, 2011; Macatee et al., 2016; Zermatten & Van der Linden, 2008). In line with this work, we found that *Feelings Trigger Action* was significantly associated with the unacceptable thoughts subscale of the DOCS; however, in using a more comprehensive assessment of emotion-based impulsivity (*Feelings Trigger Action* reflects negative and positive urgency, and general reflexive reaction to feelings) and a multi-modal evaluation of OCD symptoms, we also observed that *Feelings Trigger Action* was associated with contamination and symmetry symptoms, overall OCD symptom severity, and in vivo distress and urge to ritualize. By expanding our consideration of emotion-based impulsivity to include cognitive aspects, we further saw that harm/checking symptoms and interview-assessed obsession severity (across symptom types) were associated with emotion-based impulsivity as assessed by *Pervasive Influence of Feelings*. These findings reaffirm that it is important to consider the role of emotion when we look at impulsivity in OCD, but also suggest it is important to look beyond just NU to see how reflexive cognitive and behavioral reactions to a range of emotions may be tied to symptoms. They also demonstrate that emotion-based impulsivity is not exclusively linked to self-reported symptoms, and that this association remains when symptoms are assessed by clinician or in the context of symptom provocation.

By separately assessing a dimension of impulsivity without reference to affect, we saw an interesting pattern emerge: *Lack of Follow Through*, when associated with OCD symptoms at all, had an inverse relationship with them. This was true for both overall self-reported symptom severity, and more specifically, symmetry

obsessions/compulsions. Difficulty following through with tasks, although sometimes observed clinically when symptoms begin to interfere with broader functioning, does not seem to be directly associated with OCD symptoms, given our results. In fact, if we consider how individuals with OCD will often go to great lengths to complete their rituals, even when doing so comes at increasing personal cost, OCD could be viewed as a disorder in which an almost pathological degree of persistence prevails. This may be particularly true for those who manifest symptoms in the symmetry domain, given the negative association seen between *Lack of Follow Through* and symmetry obsessions/compulsions. The specificity of this finding is interesting in that there is growing evidence that this symptom subtype may be more strongly motivated by “not-just right experiences” (NJREs) than other symptom types (Coles & Ravid, 2016). In contrast to the desire to avoid harm or reduce anxiety typically associated with compulsive behavior, NJREs capture a drive to carry out a behavior until it feels “right” or “complete.” In this sense, *Lack of Follow Through* is in many ways the antithesis of this drive, reflecting a tendency to leave tasks unfinished without concern. Without separately assessing this type of impulsivity, we would not have been able to identify its differing relationship with OCD symptoms relative to other manifestations of impulsive responding. This further highlights the fact that impulsivity is a multi-faceted construct, and that although different traits may be joined under the umbrella term of “impulsivity,” disorder-specific features may not have a consistent relationship with all its forms.

Turning to the relationship between OCD symptoms and *Feelings Trigger Action*, we see this contrast clearly: with the exception of interview-assessed symptoms, this impulsivity factor was consistently and positively associated with OCD symptoms. As

noted above, our self-report findings align with previous literature linking NU to repugnant obsessions; however, our findings were not limited to a single symptom domain as in most past studies. This difference may arise from the fact that *Feelings Trigger Action* captures behavioral reactivity to a broader range of feelings than does NU alone. As highlighted in our discussion of NJREs, the literature on OCD has come to acknowledge that emotions other than anxiety may motivate compulsive behavior. Disgust, for example, has been associated with OCD symptoms, particularly contamination concerns, even when controlling for general anxiety (Olatunji et al., 2007) and depression (Tolin, Woods, & Abramowitz, 2006). Thus, in addition to capturing reactivity to anxiety, *Feelings Trigger Action* may also reflect impulsive responding to such feelings as incompleteness and disgust, allowing associations with other symptom domains to emerge. Moving beyond self-reported symptoms, our results also demonstrate that the tendency to react behaviorally in response to strong emotions can predict actual urge to ritualize in symptom-provoking contexts. Interestingly, *Feelings Trigger Action* was also significantly linked to distress in response to our two symptom provocation paradigms. This result seems to underscore the relationship between distress and urge to ritualize, emphasizing that the tendency to react behaviorally to emotion seems to be, in part, tied to the experiencing of greater emotion.

Though it was not linked to our behavioral outcomes, *Pervasive Influence of Feelings* was associated with both self-reported and interview-assessed OCD symptoms. Of note, it was the only impulsivity factor associated with severity of obsessions, as assessed by clinician interview. This result suggests that the severity of obsessions, in particular, is associated with a broader tendency for emotions elicited by thoughts or

events to heavily influence how one sees the world or oneself. Past research suggests that most people experience occasional unwanted intrusive thoughts like those seen in OCD (Rachman & de Silva, 1978). In fact, a recent international study found that over 90% of participants surveyed worldwide had experienced unwanted intrusive thoughts in recent months (Radomsky et al., 2014). However, based on prevalence rates for the disorder we know that most do not develop OCD in response to these thoughts. If individuals manifest a broader emotion-driven cognitive impulsivity, it may partially explain why individuals with OCD become more attached to, and ultimately impacted by, intrusive thoughts. Here we characterize this tendency as a sort of bottom-up cognitive impulsivity and show that it is associated with OCD symptom severity both across self-reported symptom domains, as well as interview-based assessment.

In addition to demonstrating that emotion-based impulsivity is consistently and positively related to OCD symptoms, our findings suggest that emotion-based impulsivity may interact with other known cognitive risk factors for OCD, as demonstrated by our moderation analyses. We found that importance and control of thoughts (ICT) was a positive moderator of the relationship between *Feelings Trigger Action* and both self-reported and interview-based assessments of OCD symptoms. As a growing body of work has linked emotion-based impulsivity to a variety of psychopathological features, including both anxiety symptoms (Johnson et al., 2013) and lifetime depression diagnosis (Carver, Johnson, & Joormann, 2013), this interaction may be one route through which symptom specificity emerges. This may also account for why we did not see a main effect of *Feelings Trigger Action* on interview-assessed symptom severity, since, based on our findings, this emotion-based impulsivity factor significantly predicts both greater

obsession and compulsion severity, but only when elevated ICT is present. This finding fits with past research suggesting that emotion-based impulsivity may interact with other risk factors to predict symptom severity. For example, Cogle et al. (2012) found that NU interacted with distress tolerance, to predict greater repugnant obsessions. Thus, while for some manifestations of symptoms, the presence of emotion-based impulsivity alone seems to be sufficient for an association to emerge, at other times, known risk factors appear to interact with emotion-based impulsivity to predict severity of symptoms.

Limitations of the present study should be noted. First, we utilized community-based and at-risk young adult participants, and results will need to be replicated in a clinical sample. However, we derive confidence that such findings will parallel our own, given the dimensional nature of OCD and the fact that our locally recruited subsample included multiple individuals with elevated OCD symptoms. A second limitation is our study's cross-sectional nature. While our conceptualization of emotion-based impulsivity presupposes that it is a trait-like feature that confers vulnerability to the development of disorders such as OCD, we cannot demonstrate that elevated emotion-based impulsivity precedes the onset of OCD symptoms without longitudinal assessment. We were able to demonstrate that pre-existing emotion-based impulsivity predicted greater distress and stronger urge to ritualize in response to a behavioral task, but further work is needed to elucidate how emotion-based impulsivity relates to the development of symptoms and change in severity over time. Our study was also limited by the size of our at-risk young adult sample. This was particularly the case when conducting more complex interaction analyses for the behavioral outcomes, which were not collected in the large community-based sample.

Overall, our investigation demonstrates the importance of considering the role of emotion when studying impulsivity in the context of OCD, adding to the limited but growing literature on this topic. By utilizing a multi-faceted assessment of impulsivity and multi-modal evaluation of OCD symptoms, we found that different manifestations of impulsivity were significantly associated with different aspects of OCD. These findings suggest that we cannot assess impulsivity as a unitary construct without losing important information. Future research should consider whether emotion-based impulsivity interacts with other known risk factors to influence the development of OCD symptoms. Furthermore, emotional context and differences in emotion-based impulsivity should be considered when looking at performance in behavioral paradigms intended to assess impulsive responding in individuals with OCD.

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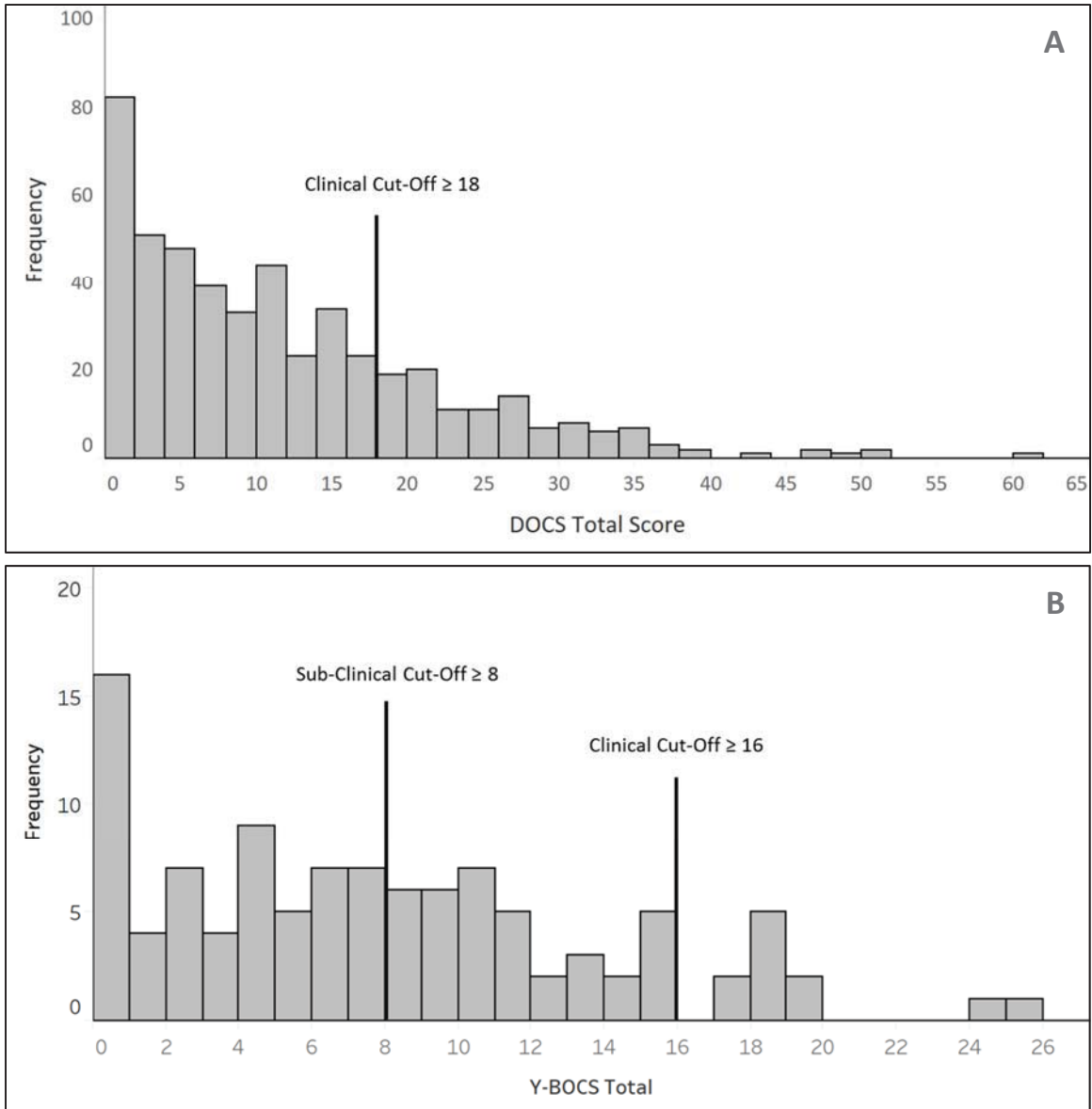


Figure 1. Distribution of OCD Symptoms in (A) overall sample and (B) at-risk young adult sub-sample, as assessed by DOCS and Y-BOCS, respectively

Table 1

Descriptive Statistics and Partial Correlations, Controlling for Gender, Age, Sample, and General Anxiety Symptoms, in Combined Sample

<i>Variable</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>M (SD)</i>	<i>Range</i>	<i>α</i>
1. Impulsivity-PIF	-							2.70 (.87)	1-5.00	.88
2. Impulsivity-LFT	.25**	-						2.47 (.84)	1-4.56	.90
3. Impulsivity-FTA	.54**	.15**	-					2.51 (.72)	1-4.84	.95
4. DOCS-tot	.18**	-.05	.21**	-				11.34 (10.38)	0-61	.94
5. DOCS-contam	.05	-.04	.13**	.72**	-			2.71 (3.01)	0-18	.88
6. DOCS-harm	.17**	-.02	.13**	.74**	.39**	-		2.85 (3.28)	0-16	.90
7. DOCS-unaccept	.16**	-.01	.18**	.70**	.31**	.37**	-	3.14 (3.60)	0-18	.92
8. DOCS-symm	.15**	-.08	.16**	.75**	.40**	.43**	.34**	2.65 (3.28)	0-15	.92

Note. Impulsivity-PIF = *Pervasive Influence of Feelings* impulsivity factor; Impulsivity-LFT = *Lack of Follow Through* impulsivity factor; Impulsivity-FTA = *Feelings Trigger Action* impulsivity factor; DOCS-tot = DOCS total score; DOCS-contam = DOCS contamination subscale; DOCS-harm/check = DOCS harm subscale; DOCS-unaccept = DOCS unacceptable thoughts subscale; DOCS-symm = DOCS symmetry subscale.

** $p < .01$

Table 2

DOCS Subscales Regressed on Impulsivity Factors, Controlling for Covariates, in Combined Sample

<i>DV</i>	<i>Predictors</i>	<i>B (SE)</i>	β	<i>t(478)</i>	<i>R</i>	ΔR^2
DOCS-contam	<u>Step 1:</u>				0.33	0.11***
	Gender	0.53 (.26)	0.09	2.04*		
	Age	-0.03 (.01)	-0.12	-2.26*		
	Sample	-0.29 (.40)	-0.04	-0.74		
	DASS-anx	0.11 (.02)	0.25	5.18***		
	<u>Step 2:</u>				0.36	.02*
	Impulsivity-PIF	-0.02 (.21)	-0.01	-0.10		
Impulsivity-LFT	-0.23 (.18)	-0.06	-1.26			
Impulsivity-FTA	0.58 (.23)	0.14	2.54*			
<i>DV</i>	<i>Predictors</i>	<i>B (SE)</i>	β	<i>t(479)</i>	<i>R</i>	ΔR^2
DOCS-harm	<u>Step 1:</u>				0.51	0.26***
	Gender	0.60 (.26)	0.09	2.32*		
	Age	-0.05 (.01)	-0.18	-3.72***		
	Sample	-1.34 (.39)	-0.17	-3.41**		
	DASS-anx	0.17 (.02)	0.38	8.58***		
	<u>Step 2:</u>				0.54	.03**
	Impulsivity-PIF	0.57 (.21)	0.15	2.76**		
Impulsivity-LFT	-0.26 (.18)	-0.07	-1.43			
Impulsivity-FTA	0.25 (.23)	0.06	1.10			
DOCS-unaccept	<u>Step 1:</u>				0.56	.32***
	Gender	0.56 (.27)	0.08	2.09*		
	Age	-0.03 (.01)	-0.10	-2.27*		
	Sample	-0.24 (.41)	-0.03	-0.58		
	DASS-anx	0.22 (.02)	0.46	10.76***		
	<u>Step 2:</u>				0.59	.03***
	Impulsivity-PIF	0.43 (.21)	0.11	2.00*		
Impulsivity-LFT	-0.26 (.19)	-0.06	-1.41			
Impulsivity-FTA	0.60 (.24)	0.12	2.53*			
DOCS-symm	<u>Step 1:</u>				0.40	0.16***
	Gender	0.65 (.27)	0.10	2.36*		
	Age	-0.02 (.01)	-0.07	-1.46		
	Sample	0.27 (.42)	0.03	0.65		
	DASS-anx	0.14 (.02)	0.31	6.62***		
	<u>Step 2:</u>				0.45	0.04***
	Impulsivity-PIF	0.50 (.22)	0.13	2.30*		
Impulsivity-LFT	-0.53 (.19)	-0.14	-2.79**			
Impulsivity-FTA	0.48 (.24)	0.11	2.00*			

Note. DASS-anx = DASS anxiety subscale; Impulsivity-PIF = *Pervasive Influence of Feelings* impulsivity factor; Impulsivity-LFT = *Lack of Follow Through* impulsivity

factor; Impulsivity-FTA = *Feelings Trigger Action* impulsivity factor; DOCS-contam = DOCS contamination subscale; DOCS-harm = DOCS harm/checking subscale; DOCS-unaccept = DOCS unacceptable thoughts subscale; DOCS-symm = DOCS symmetry subscale.

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

Table 3

Descriptive Statistics and Partial Correlations, Controlling for Gender, Training Condition, and General Anxiety and Depression Symptoms, in At-Risk Young Adult Sample

<i>Variable</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>M (SD)</i>	<i>Range</i>	<i>α</i>
1. Impulsivity-PIF	-						2.93 (0.73)	1-4.33	0.80
2. Impulsivity-LFT	-.06	-					3.16 (0.71)	1-4.44	0.82
3. Impulsivity-FTA	.41**	-.13	-				2.69 (0.62)	1-4.24	0.92
4. YBOCS-obs	.42**	-.13	.25*	-			3.50 (2.81)	0-12	0.83
5. YBOCS-comp	.19	.06	.20*	.59**	-		3.93 (3.75)	0-16	0.83
6. Distress	.02	-.05	.28**	-.06	-.03	-	36.12 (29.43)	0-100	<i>n/a</i>
7. Urge	.15	.00	.31**	.05	.08	.51**	36.98 (32.76)	0-100	<i>n/a</i>

Note. Impulsivity-PIF = *Pervasive Influence of Feelings* impulsivity factor; Impulsivity-LFT = *Lack of Follow Through* impulsivity factor; Impulsivity-FTA = *Feelings Trigger Action* impulsivity factor; YBOCS-obs = Y-BOCS obsessions subscale; Y-BOCS-comp = YBOCS compulsions subscale; Distress = distress in response to symptom provocation task, collapsed across task type; Urge = strength of urge to ritualize in response to symptom provocation task, collapsed across task type.

* $p < .05$ ** $p < .01$

Table 4

Task-Specific Distress and Urge Ratings Regressed on Impulsivity Factors, Controlling for Covariates, in At-Risk Young Adult Sample

	<i>DV</i>	<i>Predictors</i>	<i>B (SE)</i>	β	<i>t(46)</i>	<i>R</i>	ΔR^2
Repugnant Thoughts Symptom Provocation Task	Distress	<u>Step 1:</u>				0.31	0.10
		Gender	-8.00 (7.64)	-0.14	-1.05		
		DASS-anx	0.87 (.85)	0.22	1.02		
		DASS-dep	-0.23 (.78)	-0.07	-0.29		
		TrainingGroup	-11.50 (7.60)	-0.21	-1.51		
	Urge	<u>Step 2:</u>				0.45	0.11
		Impulsivity-PIF	-11.91 (7.64)	-0.29	-1.56		
		Impulsivity-LFT	-3.21 (6.41)	-0.07	-0.50		
		Impulsivity-FTA	18.36 (7.84)	0.37	2.34*		
Repugnant Thoughts Symptom Provocation Task	Urge	<u>Step 1:</u>				0.26	0.07
		Gender	1.14 (8.18)	0.02	0.14		
		DASS-anx	-0.64 (.91)	-0.15	-0.71		
		DASS-dep	0.02 (.84)	0.01	0.02		
		TrainingGroup	-13.66 (8.14)	-0.23	-1.68		
	Urge	<u>Step 2:</u>				0.46	0.14
		Impulsivity-PIF	8.51 (8.18)	0.19	1.04		
		Impulsivity-LFT	1.99 (6.87)	0.04	0.29		
		Impulsivity-FTA	15.89 (8.39)	0.30	1.89		
Contamination Symptom Provocation Task	Distress	<u>Step 1:</u>				0.40	0.16
		Gender	-11.29 (8.15)	-0.19	-1.38		
		DASS-anx	0.29 (.92)	0.06	0.31		
		DASS-dep	0.71 (.89)	0.15	0.80		
		TrainingGroup	4.57 (7.95)	0.08	0.58		
	Urge	<u>Step 2:</u>				0.48	0.07
		Impulsivity-PIF	2.44 (6.07)	0.06	0.40		
		Impulsivity-LFT	2.01 (5.40)	0.05	0.37		
		Impulsivity-FTA	11.47 (7.09)	0.26	1.62		
Contamination Symptom Provocation Task	Urge	<u>Step 1:</u>				0.45	0.20*
		Gender	-10.31 (8.49)	-0.17	-1.22		
		DASS-anx	-0.17 (.96)	-0.03	-0.18		
		DASS-dep	1.58 (.92)	0.30	1.71		
		TrainingGroup	8.51 (8.27)	0.14	1.03		
	Urge	<u>Step 2:</u>				0.53	0.08
		Impulsivity-PIF	1.29 (6.32)	0.03	0.20		
		Impulsivity-LFT	6.77 (5.62)	0.16	1.21		
		Impulsivity-FTA	12.58 (7.37)	0.26	1.71		

Note. Distress = distress in response to symptom provocation task; Urge = strength of urge to ritualize in response to symptom provocation task; DASS-anx = DASS anxiety subscale; DASS-dep = DASS depression subscale; TrainingGroup = assigned training condition; Impulsivity-PIF = *Pervasive Influence of Feelings* impulsivity factor; Impulsivity-LFT = *Lack of Follow Through* impulsivity factor; Impulsivity-FTA = *Feelings Trigger Action* impulsivity factor.

* $p < .05$

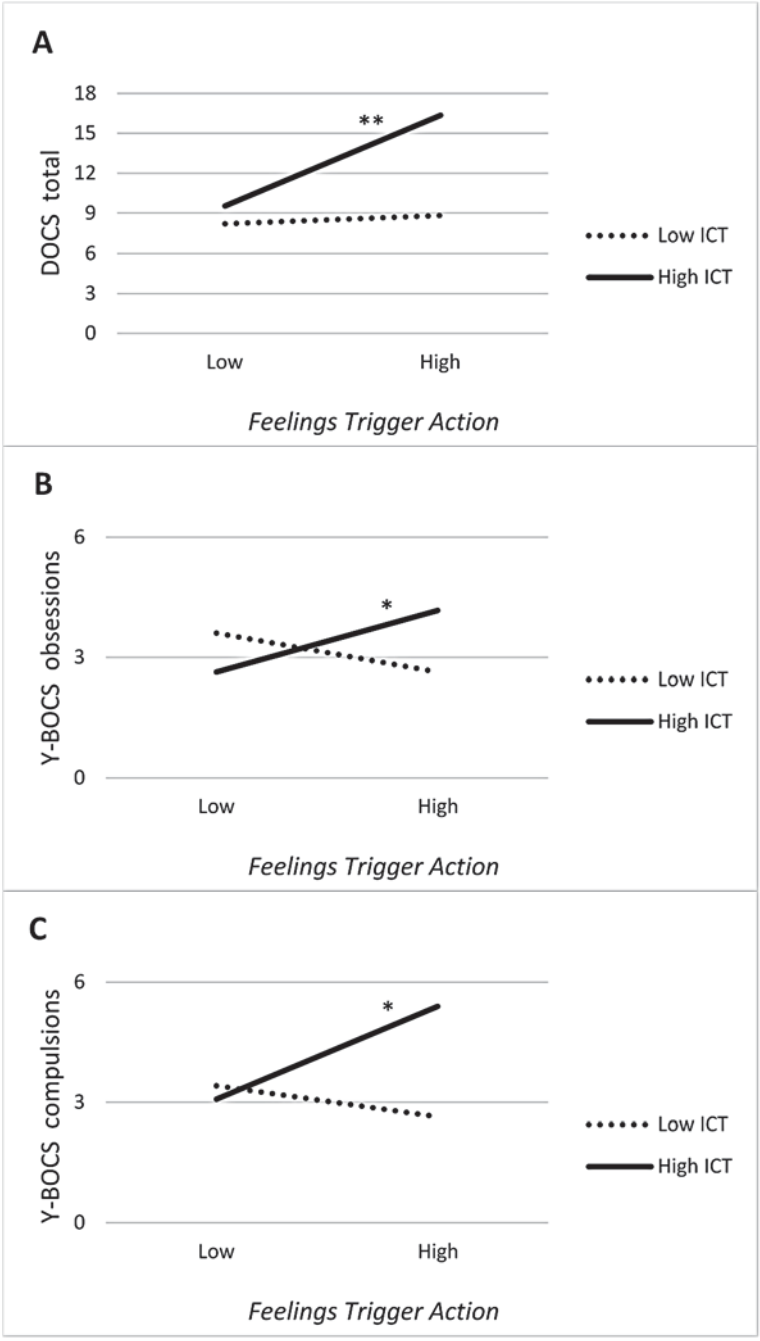


Figure 2. Interaction between *Feelings Trigger Action* and ICT predicting (A) DOCS total score, (B) Y-BOCS obsessions, and (C) Y-BOCS compulsions, controlling for *Pervasive Influence of Feelings* and *Lack of Follow Through*. Values for Low/High ICT and Low/High *Feelings Trigger Action* are -1 SD/+1SD from their respective means.

* $p < .05$ ** $p < .01$