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Relations between impulsivity, anxiety, and obsessive–compulsive symptoms in a non-clinical sample

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ABSTRACT

Debate exists on the relationships between impulsivity, anxiety, and obsessive–compulsive symptoms. Due to the heterogeneity in impulsive symptoms, various symptoms of impulsivity (e.g., pathological gambling, chronic hair pulling) were analyzed to allow for comparisons between impulsive and compulsive symptoms. From this analysis, three distinct impulsivity factors emerged. The first factor consisted of measures of chronic hair pulling and impulsivity (e.g., rash impulsiveness), the second contained measures of impulsivity (e.g., rash impulsiveness) without hair pulling symptoms, and the third factor contained only symptoms of pathological gambling. Secondly, associations between impulsive and compulsive symptoms were explored for males and females in a non-clinical sample of 330 participants. Anxiety symptoms were associated with obsessive–compulsive symptoms for both males and females. However, for males, no differences were found in the strength of associations between obsessive–compulsive symptoms and anxiety or the hair pulling impulsivity factor and obsessive–compulsive symptoms. For females no differences were found in the strength of associations between obsessive–compulsive symptoms and anxiety symptoms or between the impulsivity factor without hair pulling symptoms and obsessive–compulsive symptoms. Thus, these results support a clear relationship between obsessive–compulsive symptoms and anxiety but only provide partial support for the association between obsessive–compulsive symptoms and impulsivity.

1. Introduction

Mixed support exists on the relationship between symptoms of obsessive–compulsive disorder (OCD) and impulsivity despite the intuitive appeal of an impulsivity–compulsivity disorder dimension that includes impulsive and compulsive disorders (see Storch, Abramowitz, & Goodman, 2008 for a review). Patients with OCD commonly experience higher levels of impulsive behavior than do nonclinical controls (Ettelt et al., 2007; Stein, Hollander, Simeon, & Cohen, 1994). However, these findings need further replication in nonclinical samples to support an impulisvity–compulsivity disorder dimension that spans across clinically significant and nonclinical levels of symptomatology. Although limited reserach exists on the presentation of both impulisve and compulisve symptoms in nonclinical populations, a study by Ketzenberger and Forrest (1998) failed to find an association between obsessive–compulsive and impulsive symptoms in a nonclinical sample of 405 individuals. Furthermore, a more recent study by Zermatten and Van der Linden (2008) found mixed results on the relationship between various obsessive–compulsive (e.g., ordering, checking) and impulsive symptoms (e.g., urgency, sensation-seeking) in a non-clinical sample of 220 individuals. In the aforementioned study, obsessive–compulsive symptoms were found to be only associated with "urgency" impulsivity symptoms (i.e., difficulties with inhibiting immediate responses). Thus, from current research, it is not clear if elevated rates of impulsivity are more of a reflection of having a psychiatric disorder in general rather than being specific to having obsessive–compulsive symptoms.

Mixed results regarding the associations between impulsive and compulsive symptoms may be related to the heterogeneity of symptoms. Results from factor analytic studies indicate that at least two main impulsivity types have been identified, which differ by how individuals respond to specific reinforcers (Dawe, Gullo, & Loxton, 2004). Some impulsive behaviors appear to result from attempts to obtain specific reinforcers (e.g., stimulation) or to offset a

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"reward deficiency" and others are more closely related to "rash impulsiveness" or from an inability to inhibit immediate responses (Dawe & Loxton, 2004). Impulsive behaviors that are motivated by a "reward deficiency" tend to increase stimulation or arousal and are purported to have strong dopaminergic effects (Blum et al., 2000). On the other hand, rash impulsiveness tends to be more commonly associated with impaired impulse control and the tendency to engage in spontaneous behavior (Dawe & Loxton, 2004). Considering the noted differences in impulsivity types, it is important to include multiple impulsivity measures when making cross-comparisons between impulsive and compulsive symptoms as results may be affected. For example, research by Lochner, Hemmings et al. (2005) suggests that obsessive–compulsive symptoms are more closely related to impulsive symptoms characterized by reward deficiency (i.e., chronic hair pulling, pathological gambling) than they are to impulsivity symptoms that are more closely related to rash impulsiveness (e.g., compulsive shopping).

Similar to research on associations between obsessive–compulsive symptoms and symptoms of impulsivity, studies also have explored relationships between obsessive–compulsive symptoms and anxiety (e.g., LaSalle et al., 2004; Nestadt et al., 2001). However, no study has directly compared these symptoms concomitantly. One study by Summerfeldt, Hood, Antony, Richter, and Swinson (2004) explored impulsivity levels in patients with OCD ($n = 40$), panic disorder ($n = 37$), and social phobia ($n = 24$) and identified higher levels of impulsivity in all anxiety disorder groups compared to the nonclinical controls. These results are consistent with studies exploring the association between OCD and impulsivity (e.g., Ettelt et al., 2007; Stein et al., 1994); however, Summerfeldt et al. (2004) found no differences in impulsivity scores between patients with OCD, panic disorder, and social phobia as all groups reported higher levels of impulsivity than the included non-clinical controls did. Thus, elevated rates of impulsivity may be more related to having a psychiatric disorder in general than to having OCD specifically.

The lack of attention to demographic variables (e.g., gender, race, age) in research on associations between obsessive–compulsive and impulsive symptoms also may contribute to mixed research findings. Notable gender differences have been found in the prevalence of impulse-control disorders, including trichotillomania (Lochner, Seedat et al., 2005) and pathological gambling (Ibáñez, Blanco, Moreryra, & Sáiz-Ruiz, 2003). Considering these differences, it may be important to explore how males and females differ in the presentation of impulsive and compulsive symptoms to better understand the relationship between these symptoms.

Considering gaps in current research, this study employed a non-clinical college sample to allow for dimensional comparisons to be made between symptoms of impulsivity, anxiety, and obsessive–compulsive symptoms. First, the underlying structure of the various impulsivity symptoms was tested to determine the feasibility of a single unified impulsivity construct. Based on research suggesting that impulsivity symptoms are heterogeneous (Dawe & Loxton, 2004; Dawe et al., 2004), we expected that multiple impulsivity constructs would emerge. Second, we sought to examine how such impulsivity factors along with anxiety symptoms relate to obsessive–compulsive symptoms. We expected to find an association between symptoms of anxiety and obsessive–compulsive symptoms. However, specific *a priori* predictions were not made regarding the associations between obsessive–compulsive symptoms and symptoms of impulsivity due to the mixed findings on these associations. Although, from previous research findings, we did expect impulsivity symptoms characterized by reward deficiency (e.g., pathological gambling and compulsive hair pulling) to be associated with obsessive–compulsive symptoms (e.g., Lochner, Hemmings et al., 2005). Lastly, we explored the influence of demographic variables (i.e., gender, ethnicity, age, and educational attainment) on associations between obsessive–compulsive symptoms and symptoms of anxiety and impulsivity.

2. Method

2.1. Participants

Participants ($n = 330$) were recruited from undergraduate courses at a large university located in a medium-sized city in the Southern United States. The included sample consisted of 115 males and 211 females (four participants did not indicate their gender). Ages of participants ranged from 18 to 24 years ($M = 19.41$, $SD = 1.38$). Most participants (95%) listed their age between 18 and 21 years. Participants were ethnically diverse, as approximately 53% listed their ethnic background as White/Caucasian, 21% as Black/African American, 15% as Hispanic/Latino, 7% as Asian, and 4% as mixed race or "Other."

2.2. Measures

2.2.1. Obsessive–compulsive inventory—revised

The Obsessive–Compulsive Inventory—Revised (OCI-R; Foa et al., 2002) is a shortened 18-item version of the Obsessive–Compulsive Inventory (OCI; Foa, Kozak, Salkovskis, Coles, & Amir, 1998) that measures the presence and severity of OCD symptoms concomitantly. Each item on the measure assesses the degree of distress experienced by a respondent on a 5-point scale. The OCI-R assesses hoarding, washing, ordering, checking, obsessing, and mental neutralizing symptoms and the measure correlates highly with the OCI ($r = .98$) (Foa et al., 2002). The OCI-R demonstrates good internal consistency ($\alpha = .86$–$.88$) and acceptable test–retest reliability ($r = .67$–$.70$) in non-clinical samples (Fullana et al., 2005; Hajcak, Huppert, Simons, & Foa, 2004).

2.2.2. Beck Anxiety Inventory

The Beck Anxiety Inventory (BAI; Beck & Steer, 1990) is a commonly used self-report anxiety measure that contains 21-items that are rated on a 4-point scale. The BAI has been found to have high internal consistency ($\alpha = .92$) and moderately high test–retest reliability ($r = .75$) (Beck, Epstein, Brown, & Steer, 1988).

2.2.3. Barratt Impulsiveness Scale-15

The Barratt Impulsiveness Scale-15 (BIS-15; Spinella, 2007) is a 15-item shortened version of the Barratt Impulsiveness Scale-11 (Patton, Stanford, & Barratt, 1995), a 30-item self-report measure of impulsive thoughts and behaviors often used in non-clinical populations (Stanford, Greve, Boudreaux, Mathias, & Brumbelow, 1996; Patton et al., 1995). The BIS-15 is rated on a 4-point scale and the measure was designed to assess various aspects of impulsivity on three subscales: Non-planning (e.g., "I say things without thinking"), Motor Impulsivity (e.g., "I act on impulse"), and Attention Impulsivity (e.g., "I do not pay attention"). The BIS-15 total score has good internal consistency ($\alpha = .81$).

2.2.4. The Massachusetts General Hospital Hairpulling Scale

The Massachusetts General Hospital Hairpulling Scale (MGH-HPS; Keuthen et al., 1995) is a 7-item self-report measure of hair pulling behaviors with items rated on a 5-point scale. The MGH-HPS assesses the frequency, intensity, and control of hair pulling urges over a month's time and the measure allows for the calculation of total severity scores for hair pulling behaviors. The MGH-HPS demonstrates good internal consistency ($\alpha = .89$) (Keuthen et al., 1995) and test–retest reliability ($r = .97$) (O'Sullivan et al., 1995).

2.2.5. The Gambling Attitudes and Beliefs Scale—Revised

The Gambling Attitudes and Beliefs Scale—Revised (GABS-R; Strong, Daughters, Lejuez, & Breen, 2004) is an abbreviated 10-item version of the 35-item Gambling Attitudes and Beliefs Scale (Breen & Zuckerman, 1999). The GABS-R employs a self-report format and is rated on a 4-point scale. The GABS-R demonstrates strong internal consistency in a non-clinical sample of college students ($\alpha = .93$).

2.3. Procedures

A trained research assistant administered a survey packet containing the OCI-R, BAI, BIS-15, MGH-HPS, GABS-R, and a brief demographic questionnaire to participants. Data was collected in undergraduate courses while instructors were absent from the room. Participation was voluntary and no compensation was provided. Some participants did however receive course credit for participating as determined by their professor. Students were informed that all of their responses would remain confidential and that they were not required to provide any identifying information on questionnaires. All data collection procedures used in this study were approved by the local Institutional Review Board. Data were entered by trained research assistants and analyzed using SPSS version 16.0.

3. Results

3.1. Preliminary analyses and data reduction

Descriptive statistics and reliability coefficients for included variables are presented in Table 1. Preliminary analyses examined relations between the demographic variables (e.g., gender, ethnicity, age, and educational attainment) and the independent (e.g., BAI, BIS-15, GABS-R, MGH-HPS) and dependent variables (OCI-R). A multivariate analysis of variance (MANOVA) revealed significant gender differences among the variables, $F(5, 234) = 4.64$, $p < .001$. Follow-up analysis of variance (ANOVA) analyses indicated significant gender differences in anxiety symptoms, $F(1, 238) = 13.57$, $p < .001$. and in pathological gambling symptoms, $F(1, 238) = 6.37$, $p < .05$. Specifically, females reported higher symptoms of anxiety ($M = 16.11$, $SD = 9.53$) and lower symptoms of pathological gambling ($M = 19.44$, $SD = 7.77$) compared to males ($M = 12.53$, $SD = 11.28$ and $M = 22.53$, $SD = 6.22$). No other significant differences were found in demographic variables. Main analyses were conducted separately for males and females due to noted gender differences in anxiety and pathological gambling symptomatology.

A principal component analysis with a promax rotation was used due to the expected interrelationships among variables (Petry, 2001). Symptoms of pathological gambling (GABS-R), the two subscales of the MGH-HPS (severity of hair pulling and resistance/control of hair pulling), and the two subscales of the BIS-15 (Attention Impulsivity and Motor Impulsivity) were analyzed to determine if a single latent impulsivity construct emerged or if multiple factors emerged from scores on the aforementioned indicator variables. The Non-planning BIS-15 subscale was excluded from this analysis due to concerns about its poor internal consistency. From the principal components analysis, three distinct factors emerged that explained 86.2% of the total variance across measures. An inspection of scree plots and individual eigenvalues illustrated a precipitous drop in eigenvalues between the third and fourth factors. The first factor ($\lambda = 2.01$) accounted for 40.2% of the total variance across measures and the second factor ($\lambda = 1.29$) and third factor ($\lambda = 1.01$) accounted for 25.9% and 20.1% of the variance respectively. Table 2 lists factor analysis results and the loadings of indicator variables on each factor.

The first factor consisted of measures of chronic hair pulling and rash-impulsiveness impulsivity as both subscales of the MGH-HPS (e.g., Hair Pulling Severity, Resistance to Hair Pulling Urges) as well as the Attention Impulsivity and Motor Impulsivity subscales of the BIS-15 had positive loadings on this factor. Measures of Attention Impulsivity and Motor Impulsivity from the BIS-15 uniquely loaded on the second factor. Lastly, total scores from the GABS-R loaded uniquely on the third factor. These results suggest that symptoms of chronic hair pulling might be associated with features of attention and Motor Impulsivity or rash impulsiveness (e.g., doing things without thinking, being easily bored or distracted), whereas pathological gambling may be independent from the former.

3.2. Associations between impulsivity factors, obsessive–compulsive symptoms, and symptoms of anxiety

Linear regression analyses were conducted to assess the associations between impulsivity factors, obsessive–compulsive symptoms, and anxiety symptoms. Results from these analyses are

Table 1
Number of items, means, standard deviations, and internal consistencies of included measures and subscales.

Measures	Number of items	Mean	*SD*	α
1. OCI-R total score	18	14.79	11.26	.87
2. BIS-15 attention total score	5	9.75	2.40	.68
3. BIS-15 motor total score	5	9.70	2.99	.80
4. BAI total score	21	14.90	10.40	.89
5. MGH-HPS severity total score	4	1.65	3.00	.81
6. MGH-HPS resistanceand control	3	1.14	2.40	.88
7. GABS-R total score	10	20.49	7.39	.85

Note: *SD* = standard deviation.

Table 2
Factor loadings from the principal components analysis.

	Impulsivity and hair pulling	Impulsivity	Pathological gambling
1. BIS-15 attention	.539	.652	−.222
2. BIS-15 motor	.545	.675	.003
3. GABS total score	.103	.160	.975
4. MGH-HPS severity total score	.855	−.408	−.034
5. MGH-HPS resistance and control total score	.823	−.470	.056

Table 3
Associations between impulsivity factors, obsessive–compulsive symptoms, and symptoms of anxiety.

Predictor	β	R^2	*F*
Males ($n = 86$)			
Anxiety symptoms (BAI)	.43***	.37	12.00***
Impulsivity/hair pulling factor	.23*		
Impulsivity factor without hair pulling	.08		
Gambling factor	.08		
Females ($n = 170$)			
Anxiety symptoms (BAI)	.38***	.25	13.95***
Impulsivity/hair pulling factor	.06		
Impulsivity factor without hair pulling	.24**		
Gambling factor	.11		

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

presented in Table 3. For both males and females, anxiety symptoms were associated with obsessive–compulsive symptoms. Additionally, an association was found between the rash impulsiveness impulsivity factor containing features of hair pulling and obsessive–compulsive symptoms in males. However, on the other hand, the rash impulsiveness impulsivity factor without hair pulling features (i.e., only the Motor Impulsivity and Attention Impulsivity scales on the BIS-15) was associated with obsessive–compulsive symptoms in females. Although these results suggest that symptoms of anxiety and impulsivity are associated with obsessive–compulsive symptoms, they do not compare the relative strengths of these associations. Thus, Fischer's *r*-to-*z* transformation analyses were conducted to compare the strength of associations between impulsivity factors, obsessive–compulsive symptoms, and anxiety symptoms. No differences were found in the strengths of associations between obsessive–compulsive symptoms and anxiety symptoms and between obsessive–compulsive symptoms and impulsivity factors for males or females.

4. Discussion

The goal of the current study was to explore the associations between obsessive–compulsive symptoms and symptoms of anxiety and impulsivity. Associations between the included independent (i.e., symptoms, of anxiety, impulsivity, chronic hair pulling, and pathological gambling) and dependant variables (e.g., obsessive–compulsive symptoms) were assessed separately for males and females since gender differences were identified in these variables. With the exception of the Non-planning BIS-15 subscale, which demonstrated poor internal consistency, a principal components analysis was conducted on scales and subscales of included impulsivity measures (e.g., the BIS-15, MGH-HPS, GABS-R). Three distinct factors resulted from this analysis. The first factor contained features of chronic hair pulling and rash-impulsiveness impulsivity (e.g., Motor Impulsivity and Attention Impulsivity); the second factor contained only features of rash-impulsiveness impulsivity (e.g., Attention Impulsivity and Motor Impulsivity); and the third factor contained only gambling symptoms. These results do not support the existence of a distinct "reward deficiency" construct containing symptoms of compulsive hair pulling and pathological gambling (e.g., Lochner, Hemmings et al., 2005) and instead suggest that pathological gambling may be independent from the other symptoms. Although unexpected, this finding is supported by findings from a study that failed to identify other impulsivity symptoms (i.e., failing to plan ahead, acting without thinking) as a predictor of (or even related to) gambling pathology in male college students (Langewisch & Frisch, 1998).

Even though several disorders contain impulsive symptoms, there may be important differences in these symptoms across disorders. For example, the loss of control associated with pathological gambling might be different from the loss of control experienced by chronic hair pullers. Pathological gambling behaviors are better characterized as pleasure seeking or risk-taking behaviors (Robbins & Bryan, 2004) and hair pulling behaviors tend to be related to self-regulation (e.g., self-stimulatory behaviors, anxiety-reduction) (Stemberger, Stein, & Mansueto, 2003). Thus, instead of being interrelated as reward deficiency disorders, pathological gambling and trichotillomania may differ in that pathological gambling is better characterized by a failure to resist gambling urges, whereas hair pulling behaviors associated with trichotillomania can serve different functions—functions that may be impulsive (e.g., failing to resist urges), compulsive (e.g., reducing anxiety, perfecting skin blemishes), or mood altering (e.g., sadness or boredom reducing) (Stanley, Borden, Mouton, & Breckenridge, 1995).

Overall, results from this study support our hypothesis that an association exists between symptoms of anxiety and obsessive–compulsive symptoms for both genders. However, various impulsivity factors were found to be equally related to obsessive–compulsive symptoms, even if these factors differed across genders. For females, no difference was found in the strength of associations between the rash-impulsiveness impulsivity factor and anxiety symptoms in relation to obsessive–compulsive symptoms, suggesting that females with obsessive–compulsive symptoms were equally likely to have symptoms of impulsivity or anxiety. However, before concluding that obsessive–compulsive symptoms have impulsive underpinnings or vice versa, it is important to consider how this finding may be influenced by how the BIS-15 assesses Attention Impulsivity. The BIS-15 Attention Impulsivity subscale contains items that assess attention regulation (i.e., "I do not pay attention," "I concentrate easily" [inverted]), which may appear similar to symptoms of inattention commonly reported by individuals with obsessive thoughts (Geller et al., 2002). Individuals afflicted with obsessive thoughts, in contrast to having attention regulation difficulties, often have difficulties sustaining their attention due to the intrusive and recurrent nature of obsessions. Moreover, obsessions tend to occur more commonly in females than in males in the general population (Torres et al., 2006), thus making it difficult to tease out symptoms of Attention Impulsivity from obsessions.

In contrast to females, a factor containing symptoms of hair pulling and rash-impulsiveness impulsivity (e.g., Attention and Motor Impulsivity) was associated with obsessive–compulsive symptoms in males. However, these symptoms might be better characterized as co-occurring phenomena as opposed to being interrelated on a single impulsive–compulsive dimension since impulsive disorders are more common in males (Ibáñez et al., 2003; Kessler et al., 2005). Males who report compulsive hair pulling symptoms may have higher overall rates of psychopathology in general since chronic hair pullers in community samples tend to have elevated psychopathology scores (Stanley, Borden, Bell, & Wagner, 1994). Patients with co-occurring tics and OCD (a condition more commonly identified in males (Holzer et al., 1994)) have reported to experience more severe obsessions than do OCD patients without tics. However, these same patients did not report experiencing more severe compulsions than did the OCD patients without tics (Summerfeldt et al., 2004). Thus, it is not clear whether the associations between symptoms of impulsivity and obsessive–compulsive symptoms in males is more of a reflection of having higher rates of psychopathology in general rather than being related specifically to having OCD.

In addition to assessing the relations between obsessive–compulsive symptoms and symptoms of anxiety and impulsivity, we also assessed for differences in included demographic variables (e.g., age, gender, ethnicity) and measured constructs (e.g., obsessive–compulsive symptoms, symptoms of anxiety, impulsivity). Results indicate that females report higher symptoms of anxiety and lower symptoms of pathological gambling as compared to males, but no significant differences were found in terms of other included demographic variables. These results support findings that higher rates of anxiety symptoms are present in females compared to males (see Yonkers and Gurguis (1995) for a review) and that pathological gambling is more prevalent in males than in females (Ibáñez et al., 2003), particularly in college-aged individuals (Lesieur & Rosenthal, 1991). However, we did not identify gender differences in hair pulling symptoms despite trichotillomania being reported more commonly in females (e.g., Lochner, Seedat et al., 2005). Perhaps, our results obtained with a college sample might have differed from those obtained with clinical samples due to possible gender-related treatment seeking biases in favor of females seeking treatment (Woods et al., 2006) or due to

unexplored social issues influencing the reporting of hair pulling behaviors such as the tacit acceptability of hair loss in men (Christenson & Mansueto, 1999). Additionally, research suggests that the younger the obtained sample, the closer the gender distribution tends to be for symptoms of trichotillomania (Reeve, 1999) and since 95% of included participants were between the ages of 18 and 21 years, the young-adult sample we employed in this study might have affected identified gender ratios in hair pulling symptoms.

Results from the current study should be interpreted within the context of several limitations. First, our statistical methods do not provide a basis for causal inferences to be made. Second, our findings may not generalize to other populations such as clinical, pediatric, or geriatric populations since our sample was composed of a relatively homogeneous group of non-clinical university students. Third, since only measures of hair pulling, pathological gambling, Attention Impulsivity, and Motor Impulsivity were included to assess impulse problems, our results may not generalize to other, less common disorders currently classified as impulsive disorders (e.g., kleptomania, pyromania). Fourth, the use of single self-report measures for each construct (e.g., anxiety symptoms) might not capture the full range of associated symptoms, which could be better illustrated using multiple measures of each construct. Lastly, participants' responses to the self-report measures may have been influenced by response bias to present a more or less favorable impression.

Hyman (2007) emphasizes the importance of basing dimensional or categorical disorder classification shifts on solid and adequately replicated empirical findings in the forthcoming edition of the DSM. Considering this suggestion and the importance of demonstrating a clear relationship between obsessive–compulsive symptoms and symptoms of impulsivity, findings from this study suggest that the reclassification of OCD as an obsessive–compulsive spectrum disorder on an impulsivity–compulsivity dimension may be premature at this time. It appears that a complex relationship exists between symptoms of impulsivity, anxiety, and obsessive–compulsive symptoms that differ between genders. Therefore, although results of this study provide additional support for the relationship between obsessive–compulsive symptoms and anxiety symptoms, only partial support is provided for the association between obsessive–compulsive symptoms and symptoms of impulsivity.

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