



## The relationship between decision-making and perfectionism in obsessive-compulsive disorder and eating disorders



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### ABSTRACT

**Background and objectives:** Obsessive-compulsive disorder (OCD) and eating disorders (EDs) show phenotypic similarities and have been independently associated with deficits in decision-making and maladaptive perfectionism. However, research directly comparing the two disorders is sparse and the significance of observed similarities remains in question. Therefore, the present study compared decision-making in OCD and EDs in relationship to perfectionistic personality traits.

**Methods:** Sixty-one women were enrolled in the study comprising 3 mutually exclusive groups: 19 with OCD, 17 with EDs, and 21 healthy controls. Decision-making performance on the Iowa Gambling Task under two conditions, ambiguity and risk, was examined in relationship to perfectionistic traits.

**Results:** Behavioral results indicated that EDs participants, relative to both OCD and control participants, were impaired in decision-making under conditions of risk. Heightened perfectionism was associated with less risky decision-making in OCD, but more risky decision-making in EDs.

**Limitations:** Sample size was small and all participants were women, which may limit generalizability.

**Conclusion:** Results support decision-making deficits in EDs, which may be related to a dysfunctional determination of risk versus reward. This study is the first to suggest that the relationship between perfectionism and risk taking may manifest differently in these phenotypically similar disorders.

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### 1. Introduction

Research investigating the association between obsessive-compulsive disorder (OCD) and eating disorders (EDs) has highlighted phenomenological and functional similarities between the two disorders (Hollander, Friedberg, Wasserman, Yeh, & Iyengar, 2005; Murphy, Nutzinger, Paul, & Leplow, 2004). Obsessive-compulsive disorder and EDs involve a range of ritualistic behaviors motivated by obsessional anxiety and perceived catastrophic outcomes should such behaviors not be completed (Altman & Shankman, 2009; Lawson, Waller, & Lockwood, 2007; Rachman & Hodgson, 1980). Researchers have noted the affective regulatory similarities between OCD compulsions (e.g., hand washing, ordering and arranging, checking), and the compensatory and/or

ritualistic behavior (e.g., bingeing, purging, body checking, compulsive exercise) in EDs (Altman & Shankman, 2009).

Parallel investigations in OCD and EDs have highlighted decision-making deficits as potential vulnerability markers of the disorders with researchers suggesting that the ritualistic behaviors result from a detrimental sensitivity to immediate reward without appropriate consideration to long-term consequences of such behavior (Altman & Shankman, 2009; Cavedini et al., 2002). Indeed, dysfunction in the brain's reward system has been implicated in OCD and binge and/or purge EDs (Cavedini, Gorini, & Bellodi, 2006; Schafer, Vaitl, & Schienle, 2010), which may explain the reinforcing efficacy of both ritualistic behavior and compensatory ED behaviors. Such deficits in decision-making may provide an endophenotype, or an intermediate marker of brain dysfunction, that could lend further clarification to the classification of and relationship between OCD and EDs.

However, neuropsychological investigations on decision-making have only lent partial support for this hypothesis with some investigations highlighting impairments in task performance in both OCD and EDs (Boeka & Lokken, 2006; Cavedini et al., 2004; Cavedini et al., 2002; Garrido & Subira, in press; Svaldi, Brand, & Tuschen-Caffier, 2010) and others reporting intact performance

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(Guillaume et al., 2010; Nielen, Veltman, De Jong, Mulder, & Den Boer, 2002). Conflicting findings in both populations may, in part, be due to varying degrees of ambiguity in decision-making paradigms. Recent research highlights two types of decisions, the first under conditions of ambiguity that relies upon implicit learning mechanisms based on previous feedback and the second under risk conditions that relies upon the ability to accurately calculate the probability of risk versus reward (Bechara, 2004). The former is associated with working memory and the latter with emotional processing (Bechara, 2004; Brand, Labudda, & Markowitsch, 2006). Ritualistic behavior in OCD and EDs may be differentially associated with the type of decision, with greater association to situations relying on the processing of reward.

At the same time, decision-making performance may be moderated by personality traits, such as perfectionism. Research examining the relationship between perfectionism and decision-making has highlighted the role of perfectionism in situations when risk contingencies are both known and high (Brand & Altstotter-Gleich, 2008). Indeed Brand and Altstotter-Gleich (2008) observed that concern over mistakes increases performance on laboratory-based decision-making tasks in healthy participants under conditions of risk but not under ones of ambiguity. The relationship of perfectionism to decision-making may be of particular importance to OCD and EDs as researchers have argued that perfectionism is a shared underlying vulnerability to both disorders (Altman & Shankman, 2009). Perfectionistic traits of concern over mistakes and doubts about actions have shown consistent elevation in both disorders (Bulik et al., 2003; Frost & Steketee, 1997; Lee et al., 2009; Sassaroli, Gallucci, & Ruggiero, 2008; Sassaroli, Lauro, et al., 2008), but to our knowledge have not been studied in relationship to decision-making performance in OCD and EDs.

The purpose of the current investigation was to investigate the relationship between decision-making performance and perfectionism in OCD and EDs characterized primarily by ritualistic binge and/or purging behavior. Using the Iowa Gambling Task (IGT) individuals with OCD, EDs and matched healthy controls initially selected cards with rules for gains and losses not explicitly explained and later, as learning from feedback proceeds, on the basis of the contingencies of the task. At the behavioral level, we expected that both clinical groups would be impaired on the IGT relative to controls and evidence more disadvantageous decision-making as the task progressed. Further, we hypothesized that perfectionism would be positively associated with decision-making performance under conditions of risk, but not under conditions of ambiguity.

## 2. Methods

### 2.1. Participants

The study was approved by the Institutional Review Board at Boston University and all participants provided written, informed consent before participating. Obsessive-compulsive disorder ( $n = 19$ ) and ED ( $n = 17$ ) participants were recruited through the Eating Disorders and Adult Anxiety Disorders Programs at the Center for Anxiety and Related Disorders at Boston University. Diagnoses were made based on *DSM-IV* criteria using the Mini-International Neuropsychiatric Inventory (M.I.N.I.; Sheehan et al., 1998). Severity of obsessive and compulsive symptoms was assessed using the Yale-Brown Obsessive-Compulsive Scale (Y-BOCS) and Symptom Checklist (Goodman et al., 1989) and ED severity was assessed using the Eating Disorders Examination Questionnaire (EDE-Q; Fairburn & Bèglin, 1994). Due to our focus on ritualistic (binge and/or purge) behaviors as well as the potential confounding effects of malnutrition on neuropsychological task

performance (Kingston, Szmukler, Andrewes, Tress, & Desmond, 1996), the ED sample was limited to individuals with bulimia nervosa (BN;  $n = 12$ ) or eating disorder not otherwise specified (EDNOS;  $n = 5$ ) with a symptom presentation characterized by binge eating and/or purging at a frequency less than required for full-syndrome diagnosis. Consistent with convergent research evidence suggesting that individuals with EDNOS are equally as severe as their full syndrome counterparts (Agras, Crow, Mitchell, Halmi, & Bryson, 2009), there were no significant differences between BN and EDNOS participants in eating disorder symptoms (EDE-Q score), disorder onset or duration. The OCD group was limited to individuals with non-hoarding symptom presentations. Compulsive hoarding was excluded because of distinct differences in neuropsychological functioning relative to other OCD symptom dimensions (Grisham, Brown, Savage, Steketee, & Barlow, 2007) and research supporting the separation of hoarding from OCD in DSM-5 (Mataix-Cols et al., 2010). To reduce overlap between the two clinical groups, 4 women reporting lifetime history of both disorders were excluded. Other exclusion criteria included current or lifetime diagnosis of psychotic disorder, bipolar disorder, or substance dependence, and reported history of traumatic brain injury or neurological disease. Eight of the clinical participants were taking psychiatric medication, including antidepressants ( $n = 6$ ), anxiolytics ( $n = 2$ ), and atypical neuroleptics ( $n = 1$ ).

Healthy control participants were recruited through advertisements and were healthy females without a lifetime diagnosis of a psychiatric illness on the M.I.N.I who were within a normal weight range and not taking any psychiatric medication. All participants were female and native English speakers. The three groups were matched for age, handedness, education level, and general intellectual ability as measured by the National Adult Reading Test (Blair & Spreen, 1989) and all participants completed the Beck Depression Inventory (BDI; Beck, Steer, & Brown, 1996) as a measure of depressive symptoms.

### 2.2. Measures and task

#### 2.2.1. Perfectionism

Perfectionism was assessed with the 35-item self-report Frost Multidimensional Perfectionism Scale (FMPS; Frost, Marten, Lahart, & Rosenblate, 1990). The FMPS measures 6 aspects of perfectionism: concern over mistakes, personal standards, parental expectations, parental criticism, doubts about actions, and organization. The FMPS has shown moderate to excellent convergent and discriminant validity (Frost, Heimberg, Holt, Mattia, & Neubauer, 1993; Frost et al., 1990). In this investigation, the primary focus was on concern over mistakes and doubts about action subscales, given prior associations between these two subscales and OCD and ED psychopathology (Bulik et al., 2003; Frost & Steketee, 1997). Internal consistency reliabilities in this sample are .91 (concern over mistakes), and .82 (doubts about actions).

#### 2.2.2. Decision-making

Decision-making was assessed using a computerized version of the IGT (Bechara, Damasio, Damasio, & Anderson, 1994). The IGT involves four decks of 100 cards, decks A, B, C and D. Each time a participant selects a card a specified amount of facsimile money is awarded. However, interspersed amongst these rewards at certain times are punishments (monetary losses at different fixed amounts). Two of the decks of cards, decks A and B, produce high immediate financial gains, however, are disadvantageous in the long run. The other two decks, C and D, are considered advantageous, as they result in small, immediate gains, but will reward more money than they take in the long run. Participants are free to switch from any deck to another at any time. Initially, performance

on the IGT reflects decision making under conditions of ambiguity, as reward contingencies are unknown. However, as the task progresses participants learn which decks advantageous versus disadvantageous. These later trials, where the likelihood of risk versus reward is known, represent decision-making under conditions of risk (Bechara, 2004; Bechara & Martin, 2004; da Rocha, Malloy-Diniz, Lage, & Correa, 2011). Net scores for the gambling task are calculated by subtracting the number of disadvantageous choices (decks A and B) from the number of advantageous choices (decks C and D), with higher scores signifying more advantageous decision-making.

### 2.3. Statistical analysis

Statistical analyses were carried out using SPSS 18.0 for Windows. Data obtained from the individual measures was continuous in nature and conformed to the requirements for parametric analysis using analysis of variance (ANOVA). To analyze performance on the IGT, the 100-card task was divided into five blocks of 20 card selections. Within each block, a net score was calculated by subtracting the number of disadvantageous choices from the number of advantageous selections.

Performance was then analyzed using a repeated measures ( $5 \times 3$ ) ANOVA with the net score of all five blocks (as repeated measures) and group (OCD, ED or control) as the between-subjects factor. Pearson's product-moment correlation coefficients were calculated between IGT blocks and perfectionism subscales. All statistical tests were two-tailed with level of significant set at  $p < .05$ .

## 3. Results

### 3.1. Demographic and clinical characteristics

Table 1 presents clinical and demographic characteristics of OCD, ED and control participants. The three groups did not differ significantly with respect to age, body mass index, education, or estimated verbal IQ. In addition, the two clinical groups did not differ with respect to duration of illness, likelihood of being in treatment, or likelihood of taking psychiatric medication. As expected, there were significant main effects for group on Y-BOCS total score,  $F(2, 54) = 265.10, p < .0001, \eta^2 = .91$  and on EDE-Q total score,  $F(2, 54) = 81.74, p < .0001, \eta^2 = .76$ , with post-hoc analyses indicating significantly higher Y-BOCS scores in the OCD group and significantly higher EDE-Q scores in the ED group relative to the other two groups. Compared to the HC group, OCD and ED groups reported higher levels of depression on the BDI,  $F(2, 54) = 22.14,$

**Table 1**  
Participant descriptive and clinical characteristics.

	OCD (n = 19)	ED (n = 17)	HC (n = 21)	Pair-wise comparisons <sup>a</sup>
Age	22.32 (4.24)	23.12 (4.80)	24.24 (3.47)	n.s.
Race/ethnicity (% Caucasian)	14 (73.7)	14 (82.4)	16 (76.2)	n.s.
BMI (kg/m <sup>2</sup> )	24.82 (4.70)	22.05 (3.15)	22.22 (2.28)	n.s.
Estimated verbal IQ (NART)	115.79 (6.27)	118.41 (5.55)	118.91 (5.90)	n.s.
Education (years)	14.63 (2.67)	14.94 (2.14)	16.00 (1.41)	n.s.
Duration of illness (years)	6.74 (4.92)	6.79 (4.95)	–	n.s.
Psychiatric medication (% on med)	5 (26.3)	3 (17.6)	–	n.s.
Treatment (% in treatment)	8 (42.1)	7 (41.2)	–	n.s.
Y-BOCS total score	22.53 (3.92)	3.35 (4.01)	.57 (.84)	OCD > ED, HC
EDE-Q total score	1.24 (1.25)	4.28 (1.04)	.44 (.47)	ED > OCD, HC
BDI	13.53 (11.20)	19.41 (11.14)	.76 (1.48)	ED, OCD > HC

BMI, body mass index; NART, National Adult Reading Test; Y-BOCS, Yale-Brown Obsessive Compulsive Scale; EDE-Q, Eating Disorders Examination-Questionnaire; BDI, Beck Depression Inventory; n.s., not significant.

Values given as mean (standard deviation) or n (%).

<sup>a</sup>  $p < .001$ .

**Table 2**

Self-reported perfectionism in obsessive-compulsive disorder (OCD), eating disorder (ED), and healthy control (HC) groups.

	OCD (n = 19)	ED (n = 17)	HC (n = 21)	Pair-wise comparisons <sup>a</sup>
<b>Total score</b>	120.11 (22.67)	117.82 (18.08)	88.33 (14.52)	OCD, ED > HC
Doubts about actions	14.00 (2.92)	11.76 (3.07)	6.24 (1.87)	OCD > ED > HC
Concern over mistakes	27.59 (7.51)	32.29 (5.70)	16.52 (5.87)	ED > OCD > HC
Parental expectations	17.74 (4.34)	16.29 (4.86)	13.48 (2.91)	OCD > HC
Parental criticism	11.37 (5.38)	10.94 (3.83)	6.05 (1.85)	OCD, ED > HC
Personal standards	25.42 (4.81)	25.82 (6.83)	22.86 (4.66)	n.s.
Organization	23.68 (6.03)	20.71 (6.48)	23.19 (4.77)	n.s.

Values given as mean (standard deviation); n.s., not significant.

<sup>a</sup>  $p < .05$ .

$p < .0001, \eta^2 = .45$  (Table 1). No significant correlations were found between BDI and performance on the IGT ( $p = .67$ ) and associations remained non-significant in separate analysis by group (all  $ps < .20$ ).

### 3.2. Perfectionism

Both clinical groups reported higher levels of overall perfectionism compared to the control group (Table 2). One-way ANOVA also revealed significant main effects for group on doubts about actions,  $F(2, 54) = 46.19, p < .001, \eta^2 = .63$ , and concerns over mistakes,  $F(2, 54) = 30.79, p < .001, \eta^2 = .53$ . While both clinical groups scored higher on both subscales compared to controls, post-hoc analyses also indicated that the OCD group reported greater levels of perfectionistic related doubt over actions but lower concern over mistakes compared to the ED group.

### 3.3. Decision-making

Results from the Iowa Gambling Task are presented in Table 3. Because the assumption of sphericity was not met (Mauchly's  $W = .52, p < .001$ ), the degrees of freedom for tests of within-subjects effects were conservatively corrected using the Greenhouse-Geisser  $F$  test. Results indicated no main effect of group,  $F(2, 54) = 2.38, p = .10$ , but a significant main effect of Block,  $F(3.05, 162.87) = 14.96, p < .001$  and a significant Block  $\times$  Group interaction,  $F(6.03, 185.67) = 3.16, p < .01$ . Follow up one-way ANOVAs revealed significant group differences in IGT performance on the fourth  $F(2, 54) = 4.73, p < .05, \eta^2 = .15$  and fifth blocks  $F(2, 54) = 5.62, p < .01,$

**Table 3**

Decision-making in obsessive-compulsive disorder (OCD), eating disorder (ED), and healthy control (HC) groups.

	OCD	ED	HC	Pair-wise comparisons <sup>a</sup>
Block 1 raw score <sup>b</sup>	-4.11 (4.78)	-.94 (10.13)	-3.33 (7.25)	n.s.
Block 2 raw score	4.42 (6.82)	2.00 (8.97)	5.81 (4.29)	n.s.
Block 3 raw score	4.21 (6.39)	4.82 (8.56)	4.19 (7.80)	n.s.
Block 4 raw score	6.53 (8.05)	.24 (9.94)	8.38 (7.20)	ED < OCD, HC
Block 5 raw score	8.00 (7.60)	.00 (10.75)	8.48 (7.15)	ED < OCD, HC

IGT, Iowa Gambling Task; n.s., not significant.

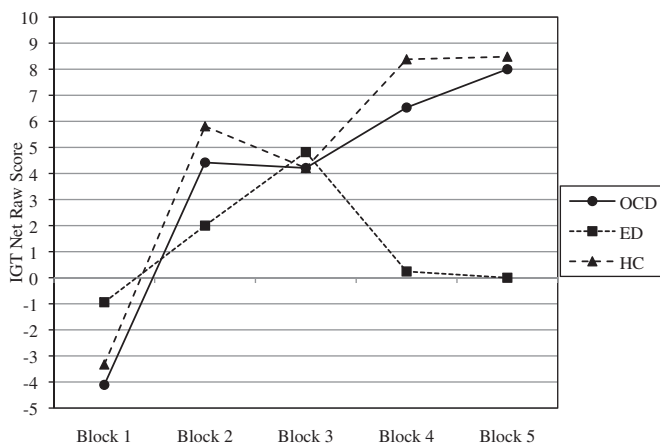
<sup>a</sup>  $p < .05$ .<sup>b</sup> For all values, lower scores indicate greater preference for disadvantageous decks. Values are given as mean (standard deviation).

$\eta^2 = .17$ , with the ED group showing greater preference for the disadvantageous decks compared to the OCD or control group. As shown in Fig. 1, both the OCD and control group show a gradual improvement in their pattern of choices over the five blocks whereas the ED group shows initial improvement but after the 60th card makes more and more disadvantageous choices.

Medication may have an impact on cognitive performance and several studies suggest that the serotonin system is involved in decision-making (Jollant et al., 2007; da Rocha et al., 2008). To address the possibility of bias due to psychiatric medication, a repeated measures ANOVA was conducted with the 14 ED, 14 OCD participants without medication and control participants. Results remained consistent including follow-up one-way ANOVAs indicating significant differences in group performance on the fourth  $F(2, 46) = 3.23, p < .05, \eta^2 = .12$  and fifth blocks,  $F(2, 46) = 4.36, p < .05, \eta^2 = .16$ . Post-hoc analyses indicated impaired decision making in the ED group relative to controls ( $ps < .05$ ) on fourth and fifth blocks, and a trend for more disadvantageous choices in the ED group relative the OCD group in the fifth block ( $p = .06$ ).

#### 3.4. Relationship between decision-making and perfectionism

While overall net performance on the IGT was not associated with perfectionism in either clinical group (all  $ps > .25$ ), performance on the last two blocks of the IGT was significantly associated with perfectionism in both clinical groups. In the OCD group, IGT performance on the last two blocks was significantly associated with doubts about actions ( $r = .47, p < .05$ ), but was not significantly associated with concern over mistakes ( $r = .38, p = .11$ ). In the ED



**Fig. 1.** IGT performance by block. Raw net scores are presented. Higher scores indicate better decision-making (greater preference for advantageous over disadvantageous decks). While there were no significant group differences on the first three blocks, the ED group evidenced less advantageous decision-making on blocks 4 and 5 compared to OCD or control groups.

group, performance on the last two blocks of the IGT was negatively associated with concern over mistakes ( $r = -.45, p = .05$ ), however not significantly associated with doubts about actions ( $r = -.38, p = .13$ ). No significant associations were found between IGT performance and concerns over mistakes and doubts about action in healthy controls.

#### 4. Discussion

This study sought to examine the relationship between decision-making performance and dimensions of perfectionism in OCD and EDs. In contrast to prior investigations (Brand, Franke-Sievert, Jacoby, Markowitsch, & Tuschen-Caffier, 2007; Cavedini et al., 2002; Svaldi et al., 2010) this study did not find overall deficits in decision-making in ED or OCD participants in comparison to controls. However, researchers have argued that the IGT captures two types of decision making with the initial trials representing conditions of ambiguity and the later trials being ones under conditions of risk (Bechara, 2004; Brand et al., 2006). Consistent with this notion, analysis by block uncovered significant between-group differences in decision-making performance on late, but not early trials. Eating disorder participants begin by sampling from all decks similar to OCD and control participants; they then on the last two blocks make more and more disadvantageous choices. This impairment in decision-making under risk, characterized by a preference for short-term reward over long-term consequences, is consistent with the emotion regulatory deficits frequently observed in EDs and is commonly targeted in empirically-supported treatments for BN/EDNOS (Fairburn, Cooper, & Shafran, 2003; Shafer, Telch, & Chen, 2009).

Similar to the performance of the healthy controls, the OCD participants in this investigation showed a gradual improvement in decision-making as the task progressed. This lack of impairment in decision-making compared to controls is in contrast to some investigations (Cavedini et al., 2002) but consistent with others (Nielen et al., 2002). Prior investigations have shown that OCD patients with prominent hoarding symptoms are impaired in decision-making whereas OCD patients without hoarding are not (Lawrence et al., 2006). Thus, the results seen here may be due to the exclusion of individuals with compulsive hoarding and may be partly due to the heterogeneity of OCD.

Results from this study support the notion that differences in decision-making between OCD and ED individuals may be related to differences in the types or experience of perfectionistic traits. In this investigation, the two clinical groups showed significant differences on two of the perfectionism subscales: concern over mistakes and doubts about actions. Eating disorder participants reported significantly more concern over mistakes than OCD participants, consistent with previous studies comparing EDs to OCD (Sassaroli, Lauro, et al., 2008) and other emotional disorders (Bulik et al., 2003). Obsessive-compulsive disorder participants, on the other hand, reported significantly more doubts about actions than ED participants, consistent both extant research and the clinical manifestation of OCD (Frost, Novara, & Rhéaume, 2002). These results echo prior studies suggesting that the tendency to interpret mistakes as failures may be more strongly associated with EDs whereas the tendency to doubt the accuracy or quality of action may be more strongly associated with OCD.

While perfectionistic-related doubt and concern over mistakes showed no association with overall decision-making performance, they were differentially associated with performance on the last two blocks of the IGT in the OCD or ED groups. These findings are consistent with research suggesting that perfectionism is associated with decision-making under risky, but not ambiguous conditions (Brand & Altstotter-Gleich, 2008). In this investigation the

performance of OCD participants under risk conditions was positively associated with doubts about actions, suggesting that perfectionism in OCD is associated with the avoidance of risk. Although results from this study suggest that perfectionism aids decision-making in OCD, clinical observation and extant literature suggests that OCD may be maintained by a pathological need to avoid perceived harm (Ecker & Gönner, 2008). Although future research is needed to clarify such a relationship, it could be hypothesized that over time perfectionistic-related doubt leads to a maladaptive avoidance of risk.

Conversely, in the ED group higher concern over mistakes was associated with worse decision-making performance under risk conditions. These results are consistent with the notion that concern over mistakes is a dysfunctional facet of perfectionism in EDs (Bulik et al., 2003). Clinically, concern over mistakes around food, shape and weight have frequently been implicated as part of the cycle maintaining ED behavior. Indeed, concern over minor “failures” related to diet or in life more globally increases negative affect which in turn leads to bingeing, purging or other maladaptive decisions (Fairburn et al., 2003), reflecting a detrimental sensitivity to immediate reward (reduction of negative affect) without appropriate consideration to long-term consequences. Taken together, these findings lead to the intriguing notion that perfectionistic concern over mistakes may over time promote maladaptive risk taking behavior in EDs. This is consistent with recent research suggesting that perceived control moderates the relationship between concern over mistakes and ED symptoms (Sassaroli, Gallucci, et al., 2008) as well as long-standing theories highlighting the centrality of control, temporary relaxation of control, and efforts to cope with lack of control in EDs (Button, 1985; Polivy & Herman, 2002; Slade, 1982).

#### 4.1. Limitations

Results from this preliminary study must be considered in the context of several limitations. First, while limiting this study to women helped maximize comparability between groups, future investigations are needed to delineate whether these results generalize to more diverse populations. Second, the exclusion of markedly underweight individuals and those with primarily restrictive presentations precludes the generalization of these results to individuals with anorexia nervosa (AN) and some individuals with EDNOS. Although research suggests deficits in reward pathways across the EDs (e.g., Kaye, Fudge, & Paulus, 2009; Schafer et al., 2010), those with AN-restrictive type (AN-R) show decreased sensitivity to reward compared to those with binge-purge presentations or healthy controls (Harrison, O'Brien, Lopez, & Treasure, 2010). Moreover, impaired decision-making in AN, but not BN, has been associated with diminished anticipatory skin conductance in response to high risk choices (Liao et al., 2009; Tchanturia et al., 2007). Future research is needed to determine whether personality traits like perfectionism underlie decision-making deficits across the EDs or, if they are differentially associated, like somatic arousal, with ED diagnostic categories. Given hypothesized relationships between AN and OCD (see Serpell, Livingstone, Neiderman, & Lask, 2002; for review), it will be worthwhile to investigate if a similar pattern between decision-making and perfectionism holds true comparing OCD to underweight or primarily restrictive ED samples. Third, the OCD and ED participants differed significantly from the controls in their self-reported depression symptom severity and approximately 40% of the participants in the clinical groups presented with a comorbid (non ED or OCD) psychiatric diagnosis. Because ANCOVA is not designed to control for naturally occurring group differences (Miller & Chapman, 2001) and depression is commonly elevated in individuals with OCD and EDs compared to

controls (Braun, Sunday, & Halmi, 1994; Brown, Campbell, Lehman, Grisham, & Mancill, 2001), we did not statistically control for depression in our analyses. However, the clinical participants did not significantly differ with respect to their report of depression, there was no significant correlation between depression severity and IGT performance, and psychiatric diagnoses known to impact cognitive functioning (e.g., substance dependence, psychosis, neurological disorders) were excluded. Thus, the results here might, therefore, mirror the impairment profiles typical of women with EDs and OCD as both disorders are frequently accompanied by comorbid symptoms. Finally, the small study sample did not allow for the exploration of the heterogeneity within the disorders.

#### 4.2. Conclusion

In summary, our findings highlight differences in decision-making in OCD and ED participants under conditions of risk. Results support decision-making deficits in EDs, which may be related to dysfunctional determination of risk versus reward and maladaptive perfectionistic traits. While the results here suggest that perfectionism may aid decision-making in OCD, future research is needed to determine if such traits are, in fact, over time associated with a pathological avoidance of risk.

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#### Conflict of interest

The authors have no conflict of interest to declare.

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