RESEARCH ARTICLE

Decision-making Impairments in Women with Binge Eating Disorder in Comparison with Obese and Normal Weight Women

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Abstract

Objective: The purpose of the current study was to examine decision making in female patients with binge eating disorder (BED) in comparison with obese and normal weight women.
Method: In the study, 20 patients with BED, 21 obese women without BED and 34 healthy women participated. Decision making was assessed using the Iowa Gambling Task (IGT). Several questionnaires were administered measuring binge eating severity, sensitivity for punishment and reward, and self-control.
Results: The findings indicated that the BED and obese group performed poorly on the IGT. Participants who have BED and are obese did not improve their choice behaviour over time, whereas participants with normal weight showed a learning effect. An association between IGT performance and binge eating severity was found.
Conclusion: This study demonstrates that patients with BED display decision-making deficits on the IGT comparable with other forms of disordered eating. Future research should focus on unravelling the processes underlying the deficits.

Keywords
binge eating disorder; decision making; Iowa Gambling Task; obesity; learning; neuropsychology; cognitive

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Binge eating disorder (BED) is characterised by recurrent binge episodes accompanied by a feeling of loss of control (American Psychiatric Association, 1994). Typical of patients with BED is a lack of self-control (e.g. Galanti, Gluck, & Geliebter, 2007; Nassar, Gluck, & Geliebter, 2004), which, for instance, is manifested by their binge episodes: bingeing may feel immediately beneficial but will eventually be detrimental and thus seems to be the result of an impulsive decision. These features are also seen in other forms of eating disturbances; however, BED has distinctive features emphasising the uniqueness of the disorder (Dingemans, Bruna, & Van Furth, 2002). For example, binge eating episodes and experiencing a loss of control are present in both BED and bulimia nervosa (BN), but unlike BN, those with BED do not show compensatory behaviours following these binges. Acknowledging the similarities and differences with related (eating) pathologies will provide insights in the processes underlying BED and will help better understand patients with the disorder.

Evidence suggests that decision-making deficits occur in several psychiatric disorders in which self-control issues and impulsivity play a role (Moeller, Barratt, Dougherty, Schmitz, & Swann, 2001), for example, in those with a history of suicide behaviour and adolescents who engage in self-harming behaviours (Dawe & Loxton, 2004; Haaland & Landro, 2007; Johnson et al., 2008; Jollant et al., 2005; Oldershaw et al., 2009). More important, it has been found that patients with other forms of eating pathology have poor decision-making ability in that their decisions are based on short-term reward, thereby ignoring long-term negative consequences (e.g. Boeka & Lokken, 2006; Brand, Franke-Sievert, Jacoby, Markowitsch, & Tuschen-Caffier, 2007; Cavedini, et al., 2004; Davis, Levitan, Muglia, Bewell, & Kennedy, 2004; Liao et al., 2008; Tchanturia et al., 2007; Weller, Cook III, Avsar, & Cox, 2008). Previous research specifically showed that patients with BN and individuals who are obese are impaired in their decision making (Brand et al., 2007; Davis et al., 2004; Liao et al., 2008; Tchanturia et al., 2007; Weller et al., 2008). In particular, there are some evidence that decision-making deficiency is related to bulimic symptomatology (Boeka & Lokken, 2006), although this is an inconsistent finding (Brand et al., 2007).

Poor decision-making ability may also exist in BED. Such deficits not only may affect behaviour in individuals with BED in relation to their eating and self-control (i.e. bingeing despite negative long-term consequences) but also may have a more general effect on the individual (e.g. impulse control disorders are one of the main comorbidities found in BED; Hudson, Hiripi, Pope Jr., & Kessler, 2007). A relevant characteristic resulting in reduced self-control, and associated with BED, BN and obesity, is impulsivity (e.g. Fischer, Smith, & Anderson, 2003; Nassar et al., 2004; Nederkoorn, Jansen, Mulkens, & Jansen, 2006). According to Franken et al. (2008), trait impulsivity in general is related to

behavioural decision-making deficits, signifying that individuals high in impulsivity showed greater decision-making deficits than those low in impulsivity. One explanation is that decision making is based on the tendency to respond to immediate reward while ignoring the long-term negative consequences of the behaviour.

Recently, the first evidence was gathered suggesting that decision making is indeed impaired in patients with BED (Davis, Patte, Curtis, & Reid, 2010; Svaldi, Brand, & Tuschen-Caffier, 2010). However, when comparing the findings with those of the obese participants without BED, the findings were inconsistent. Svaldi et al. (2010) provided evidence that individuals with BED make more risky decisions than obese individuals without BED, whereas Davis et al. (2010) showed that individuals with BED and obese individuals without BED were similarly impaired in their decision making. There are important methodological differences between these studies that may explain these seemingly inconsistent findings. Svaldi et al. (2010) examined decision making in explicitly risky situations by using the Game of Dice Task in which the probabilities of gains and losses are obvious. Another distinction was the lack of individuals with normal weight. Furthermore, similar to the study in BN by Brand et al. (2007), they did not find a relationship between the level of eating pathology and decision-making performance as was found in BN by Boeka and Lokken (2006).

Most studies examining decision making in eating disorders (and other psychiatric disorders) use the Iowa Gambling Task (IGT) in which the outcomes of choices are less obvious (Bechara, Damasio, Damasio, & Anderson, 1994). Davis et al. (2004) replicated the decision-making deficits using the IGT that were previously demonstrated in obese individuals. Unfortunately, they did not examine the relationship between decision-making performance and binge eating severity. Importantly, level of education differed between the groups resulting in a major confound in the study. It is therefore imperative that further research is conducted to examine decision-making behaviour in individuals with BED and obese individuals without BED. In the present study, it is ensured that no differences in education level exist between the groups. The first aim of the present study was to investigate decision-making performance using the IGT in female patients with BED in comparison with obese and normal weight participants without BED.

Iowa Gambling Task

The IGT is a well-known experimental task (Dunn, Dalgleish, & Lawrence, 2006). The aim of this task is to measure decision-making competence to resist immediate rewards, in order to avoid long-term negative consequences and to achieve gain in the long run. The IGT is a simple card task with the goal of earning money, in which participants have to choose a card from four different decks and with each choice they either win or lose (virtual) money. Two of these decks cause great gains but even greater losses, and in the end, cards from these decks will result in loss of money (the disadvantageous decks). The other two decks provide lower gains and losses but will finally cause one to earn money (the advantageous decks).

Performance on the IGT can be examined in different ways. Overall IGT performance is calculated by subtracting the total number of disadvantageous choices (decks A and B) from the number of advantageous choices (decks C and D). The IGT learning effect is investigated by examining IGT performance over time (Bechara et al., 1994). This is done by dividing the 100 card choices into five blocks of 20 trials. Subsequently, a number of choices from the advantageous and disadvantageous decks are counted for each block. The net score for each of the five blocks is calculated as the difference in choices between the advantageous and disadvantageous decks [(C+D) – (A+B)]. Impairment in decision making is observed if more disadvantageous than advantageous choices are made.

The second aim is to examine the relationship between binge eating severity and IGT performance, as this has not previously been examined in BED using an IGT paradigm. The present study compares two groups: an obese group without BED, consisting of women with a body mass index (BMI) higher than 25 kg/m^2, and a normal weight group, consisting of women with a normal BMI (between 19 and 25 kg/m^2). Based on the findings that obese individuals showed poor decision making (Davis et al., 2004) and that no differences between individuals with BED and obese individuals were found with the IGT (Davis et al., 2010), it is hypothesised that patients with BED will display decision-making deficits that are similar to obese women without BED but will differ from women with normal weight. There is no *a priori* expectation regarding the relationship between IGT performance and binge eating severity, as Svaldi et al. (2010) found no such relationship, and findings in BN are inconsistent (Boeka & Lokken, 2006; Brand et al., 2007). Finally, it is hypothesised that performance on the IGT will be related to other relevant characteristics such as sensitivity for punishment, sensitivity for reward and self-control.

Method

Participants

A total of 75 women participated in the study: 20 patients with BED diagnosis (patient group), 21 obese women without BED diagnosis (obese group) and 34 women with normal weight (normal weight group). The patients with BED were recruited from the psychiatric unit from Mesos Medical Centre Utrecht in the Netherlands. The women with normal weight were recruited at Utrecht University consisting of students and staff members. To ensure that women with normal weight were comparable with the other participants, they were also recruited in neighbourhoods in Utrecht by asking women door to door to participate. The obese women without BED were recruited at dietician practices.

Inclusion and exclusion criteria

The women with normal weight were included if their BMI was between 19 and 25 kg/m^2 and they did not binge eat in the month before the study. The obese women were excluded when their BMI was lower than 25 kg/m^2 or also when they experienced binge eating in the month before participation. Women with BED were included when their diagnosis was determined by a psychiatrist according to the criteria of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition. Participants in all groups were excluded in case of excessive alcohol or drug use. Finally, they were excluded when no questionnaire was returned.

In total, four participants in the normal weight group, three participants in the obese group and one participant in the patient group were excluded.

Demographic information of the participants was assessed with a self-report questionnaire asking about their age, weight and height (to calculate BMI of participants) and education (see Table 1 for the mean and SD).

Measures and materials

The study consisted of the IGT and several questionnaires to assess illness severity and level of depression (high levels are common in BED; Dingemans et al., 2002) and some relevant personality traits. The mean scores and SDs of the questionnaires are presented in Table 1, and the correlations between the questionnaires and overall IGT score are presented in Table 2.

Iowa Gambling Task

Decision making was assessed using a computerised version of the original IGT (van den Bos, Houx, & Spruijt, 2006). The task consisted of 100 trials (see also Bechara, Tranel, & Damasio, 2000), and the participants had to choose one card at a time by choosing a card from one of four decks. A specified amount of gain is awarded following each choice. However, at certain times, losses of different fixed amounts also occur resulting in a net loss following these choices. Of the four decks (A, B, C and D), two decks (A and B) contained not only high gains but also high losses, and these decks were disadvantageous with a negative net value of minus 250 euro per 10 cards. Decks C and D contained cards with not only smaller gains but also smaller losses, and in the long run, these decks were advantageous with a positive net value of plus 250 euro per 10 cards. Participants were informed that the goal was to maximise their profit and to continue choosing cards until instructed to stop. Furthermore, they were instructed that they received money after each choice, but sometimes they would lose more money than they gained.

Binge eating severity

The binge eating scale (BES; Gormally, Black, Daston, & Rardin, 1982) is designed to measure binge eating severity (Timmerman, 1999). It is a 16-item scale measuring behavioural manifestations of binge eating (eight items), and feelings and cognitions associated with binge eating (eight items). A series of differently weighted statements yield a continuous measurement of binge eating pathology between 0 and 46, where a higher score indicates more severity. The purpose of this questionnaire was twofold: to measure severity of BED in patients and to screen for disordered eating behaviour in the other groups. Cronbach's alpha was .92.

Self-control

The self-control scale (SCS; Tangney, Baumeister, & Boone, 2004) was administered as a measure of self-control. The SCS measures the ability to override or change prepotent inner responses, as well as to interrupt undesired behavioural tendencies. A negative relation was previously found between bulimic symptoms and SCS score (Tangney et al., 2004). It consists of 36 items measured on a five-point Likert scale. The validity and reliability of the SCS has been proven to be good (Tangney et al., 2004). Cronbach's alpha was .88.

Sensitivity for reward and punishment

The behavioural inhibition system/behavioural activation system scale (BIS/BAS scales; Carver & White, 1994) is a self-report measure designed to assess dispositional sensitivity for reward and punishment. It is a validated scale (see also Franken, Muris, & Rassin, 2005) consisting of 20 items divided to assess a

Table 1 Mean (and SD) of demographic and clinical characteristics per group (BED women, obese non-BED and normal weight women) as well as the mean (and SD) scores on binge eating severity (BES), sensitivity for punishment (BIS) and reward (BAS), self-control (SCS) and finally the overall score on the Iowa Gambling Task (IGT total)

Group	BED ($n = 19$)		Obese ($n = 18$)		Normal weight ($n = 30$)				
	Mean	SD	Mean	SD	Mean	SD	F	p	η_p^2
Age	38.05	10.97	44.56	13.36	36.13	14.09	2.39	NS	
Educational level	6.21	2.59	7.00	2.70	6.90	2.38	0.57	NS	
BMI	38.74	6.25	30.84	3.00	22.32	1.96	105.79†	<.001	.77
No. of binges	3.50	21.57	0	0	0	0	21.44‡	<.001	.41
Depression	30.47	12.57	9.44	6.17	6.83	4.87	54.11‡	<.001	.63
BES	25.11	8.40	24.31	5.43	11.17	8.84	24.17§	<.001	.43
BIS	23.37	4.15	14.83	3.28	18.67	4.64	19.42†	<.001	.38
BAS	12.53	2.20	8.93	1.94	8.90	5.37	5.76‡	.005	.15
SCS	106.00	14.94	124.28	13.53	122.87	124.28	8.15‡	.001	.20
IGT total	2.74	12.10	−0.94	23.30	11.20	18.34	3.36	.041	.10

Note: BED, binge eating disorder; SD, standard deviation; NS, not significant; BMI, body mass index; BES, binge eating scale; BIS, behavioural inhibition system; BAS, behavioural activation system; SCS, self-control scale; IGT, Iowa Gambling Task.

†*Post hoc* comparisons indicated that all three groups differ.

‡*Post hoc* comparisons indicated that the BED group differs from the other groups.

§*Post hoc* comparisons indicated that the normal weight group differs from the other groups.

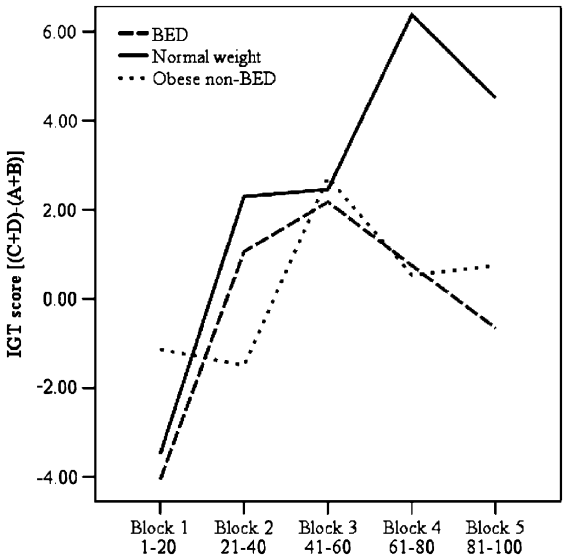

Figure 1 The mean net number of chosen cards {i.e. [(C + D) − (A + B)]} by women with BED, obese non-BED and normal weight women across five blocks each consisting of 20 trials. Positive net scores reflect advantageous performance, whereas negative net scores reflect disadvantageous performance

BIS score and a BAS score. The BIS/BAS scales were assessed on a five-point scale ranging from 1 'strongly disagree' to 5 'strongly agree'. Cronbach's alpha was .74 for the BIS scale and .81 for the BAS scale.

Level of depression

The inventory for depressive symptomatology self-rated (Rush, et al., 1986) is a valid self-report questionnaire used to assess depressive signs and symptoms. It consists of 30 items associated with mood, anxiety, weight, sleep and atypical features. A higher score indicates a more severe level of depression. Cronbach's alpha was .94.

Statistical analyses

All statistical analyses were conducted using the Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, USA) version 16.0 for Windows. Analyses of variance (ANOVA) were used to compare demographics and clinical characteristics (e.g. age, educational level, binge eating severity) between the three groups. Repeated measures ANOVA were conducted[1] to examine intergroup (BED versus obese versus normal weight women) and intragroup (performance across the blocks) differences. In the analyses, we controlled for age and level of depression contrary to Davis et al. (2010) as these factors may influence decision making. Finally, to explore relations between binge eating severity, sensitivity for punishment and reward, self-control, BMI and overall IGT performance, partial correlations were calculated controlling for age and level of depression.

[1]Assumptions for parametric analyses were not violated.

Results

Sample characteristics

Demographic and clinical characteristics are presented in Table 1. There was no difference in age or educational level between the groups, but as expected, the groups differed significantly in clinical characteristics (BMI, binges, depression, binge eating severity and self-control) and on the BIS and BAS score. Although the patient and obese groups differed in number of binges, there was no difference in binge eating severity score between these groups [$F(1, 65) = 0.11$, not significant (NS)]. Furthermore, patients experienced more depression and less self-control in comparison with the other two groups together [$F(1, 65) = 106.76$, $p < .001$, $\eta_p^2 = .62$ and $F(1, 65) = 16.44$, $p < .001$, $\eta_p^2 = .20$, respectively].

Iowa Gambling Task performance

Overall Iowa Gambling Task score

To test the performance on the IGT between the different groups, the total IGT score, as well as IGT performance over time, was examined while controlling for age and depression. To examine total IGT scores between the groups, ANOVA were conducted. The total IGT score (see IGT total in Table 1) showed a main effect of group and no effects of the control variables age and depression [$F(1, 62) = 0.14$, NS, and $F(1, 62) = 2.31$, NS, respectively]. Based on the pattern of the means, the contrast of the IGT score of the normal weight group was tested against those of the BED and the obese groups together (in weights: −2 1 1, respectively). The results showed that patients with BED and obese participants performed worse than the participants with normal weight [$F(1, 63) = 6.71$, $p = .012$, $\eta_p^2 = .10$], whereas further contrast analyses demonstrated that the BED and obese groups did not differ [$F(1, 63) = 0.54$, NS].

Iowa Gambling Task learning effect

To examine IGT performance over time, repeated-measures ANOVA were conducted. Similar to the findings with the overall IGT score, the results showed a main effect of group [$F(2, 62) = 3.30$, $p = .043$, $\eta_p^2 = .10$]. The least significant difference *post hoc* tests showed that the normal weight group differed from both the patient and obese groups ($p = .076$ and $p = .025$, respectively), whereas the patient and obese groups did not differ ($p = .77$). The analysis revealed further that there was no interaction between the block and the group [$F(8, 248) = 0.92$, NS] (the control variables depression and age also showed no effect on IGT performance; all Fs <1.5) thus contradictive with the expectations that no overall interaction was found. However, the pattern of results (learning curves in Figure 1) suggests that patients, obese and normal weight women do show different learning effects. This confirms our hypothesis that the participants in the normal weight group improve their performance over time (not necessarily with a linear increase), whereas the patient and obese groups do not. To test the choice patterns within the groups, ANOVA were conducted. Results confirmed the expectation that the normal weight group improve performance over time [$F(4, 59) = 5.45$, $p = .001$, $\eta_p^2 = .27$], whereas the patient and obese groups did not im-prove IGT performance [$F(4, 59) = 0.35$, NS, and $F(4, 59) = 0.75$, NS,

Table 2 Partial correlations (two tailed) between overall Iowa Gambling Task score (IGT total), binge eating severity (BES), sensitivity for punishment (BIS) and reward (BAS), self-control (SCS) and BMI, controlling for age and level of depression

	IGT total	BES	BIS	BAS	SCS	BMI
IGT total		−.25**	.24*	.038	−.014	−.26**
BES	−.25**		−.51***	−.58***	−.083	.41***
BIS	.24*	−.51***		.44***	−.076	−.16
BAS	.038	−.58***	.44***		−.070	.072
SCS	−.014	−.083	−.076	−.070		−.058
BMI	−.26**	.41***	−.16	.072	−.058	

Note: IGT, Iowa Gambling Task; BES, binge eating scale; BIS, behavioural inhibition system; BAS, behavioural activation system; SCS, self-control scale; BMI, body mass index.
*$p < .06$; **$p < .05$; ***$p \leq .001$.

respectively]. Hence, women with BED and obese women were found to be impaired in their decision-making ability.

Relationship between Iowa Gambling Task performance and sample characteristics

To test the relationship between binge eating severity, IGT performance (overall IGT score) and characteristics of all participants, partial correlations were calculated controlling for age and depression similar to the previous analyses (see Table 2). The overall IGT score was negatively correlated with binge eating severity and BMI, and marginal significant correlated with sensitivity for punishment. This suggests that more severe binge eating, higher BMI and lower sensitivity for punishment is related to poorer IGT performance. Furthermore, more severe binge eating was related to higher BMI and lower sensitivity for reward and punishment.

Discussion

The current study examined decision-making competence in women with BED in comparison with obese and normal weight women using the Iowa Gambling Task. The present findings provided support for our hypothesis that patients with BED are more inclined to behave in a disadvantageous manner by choosing immediate reward (high gains) despite long-term consequences (loss of money); that is, they displayed a decision-making deficiency. Comparable with the findings of Davis et al. (2010), and in contrast to the study of Svaldi et al. (2010), obese women without BED showed similar decision-making deficits as patients with BED. This finding was not attributable to differences in educational level suggesting that it may be related to impulsive traits or abnormalities in reward processing. Furthermore, decision making was more impaired with greater binge eating severity, similar to findings of Boeka and Lokken (2006) with patients with BN but in contrast to the findings of Brand et al. (2007) and Svaldi et al. (2010).

The studies that were conducted on decision making in BED (and BN) appear to show partially different results. An explanation for these seemingly inconsistent findings is that decision-making performance in these studies was examined under dissimilar circumstances, and because of this, the results have different implications. Individuals with BED and obese individuals without binge eating episodes seem to make different decisions in situations where the likelihood of gains and losses is rather clear (Game of Dice Task; Svaldi et al., 2010). Furthermore, the state of the disorder does not seem to affect decision making in these situations (Brand et al., 2007). However, when situations are more complex and one has to rely on the outcome of previous choices (IGT), both groups display impaired decision making, and the deficits are stronger when symptoms of BED are more severe. Apparently, when the consequences of choices are less obvious, obese individuals without BED are more similar to patients with BED as they also have decision-making problems by relying more on short-term outcomes. This is in line with previous studies that examined the impulsive nature of individuals with BED and obese individuals (Galanti et al., 2007; Nassar et al., 2004; Nederkoorn, Smulders, Havermans, Roefs, & Jansen, 2006) and that demonstrated the influence of impulsive personality on decision making (Franken et al., 2008). The idea underlying this relationship is that a decision is based on the anticipated (immediate) rewarding effect of the behaviour.

Decision-making processes in the IGT are proposed to be based on affective signals, also called somatic markers, which are physiological signals that are formed in situations in which people repeatedly experience reward or punishment (Damasio, 1994). Individuals with BED and with obesity without BED have abnormalities in reward sensitivity, thereby responding in a different way to hedonic food cues (e.g. Davis et al., 2008; Friederich et al., 2006; Schienle, Schäfer, Hermann, & Vaitl, 2009; Soetens & Braet, 2007). Studies on the relationship between obesity and substance dependence showed disturbances in neurobiological mechanisms related to the control of desire for natural rewards when confronted with food-related stimuli (e.g. Pelchat, Johnson, Chan, Valdez, & Ragland, 2004; Schienle, et al., 2009; Volkow & Wise, 2005; Wang, Volkow, Thanos, & Fowler, 2004). These results were argued to involve similar mechanisms to those relevant in drug-addictive states. For example, involvement of the medial orbitofrontal cortex has been associated with enhanced reward sensitivity in BED (Schienle et al., 2009) and with impaired decision making in cocaine abusers in relation to reward responsiveness (Bolla et al., 2003) and, in general, has been associated with reinforcement processes in decision making (Rolls, 2000).

Results in the present study did not directly support the idea of reward sensitivity as the underlying factor causing impaired decision making in participants with BED and obese participants as no correlation was found between IGT performance and reward sensitivity. We did find a marginal[2] association between a lowered IGT performance and lower punishment sensitivity, but it remains speculative whether reduced punishment sensitivity affected choice behaviour in the IGT, especially as reward and punishment sensitivity relied on self-report measures. Hence, future studies may want to examine the role of reward sensitivity on decision-making performance in BED and obesity more directly, which may be able to disentangle the different circumstances, causing poor decision making in these individuals.

[2] $p = .054$.

Finally, there were two other noteworthy results in the present study. The level of eating disorder severity in patients with BED and obese women without BED seemed similar. Both groups scored equally high on severity of binge eating, and this might suggest that the obese participants without BED were actually having BED. However, there were important qualitative differences between these two groups: obese women did not have binge episodes, reported more self-control and had lower depression scores indicating that they were different from the patients with BED. Binge eating severity was measured with the BES (Gormally et al., 1982), which does not only assess binge eating frequency but also include behavioural manifestations (e.g. snacking behaviour) and cognitive factors (e.g. feeling conscious about your body in the presence of others) that may be of relevance to obese people who are not having binge episodes. A more detailed examination of the specific responses of the obese group on the BES revealed that they scored higher on more general items, such as eating when being bored, whereas they scored lower on specific BED items, such as controlling eating urges. This taken together with the inconsistent findings so far on the relationship between binge eating severity and decision-making problems (present study; Boeka & Lokken, 2006; Brand et al., 2007; Svaldi et al., 2010), a more thorough investigation of this relationship is required.

The second finding was that participants with a higher BMI displayed stronger decision-making impairments. This may suggest that decision making is not specific for BED and is simply a result of weight increase. However, it may also be that other factors important in obesity and BED (e.g. impulsivity or disturbed reward sensitivity) affecting decision making also underlie behaviours contributing to weight increase [e.g. difficulties resisting (food) temptations]. There are also several other findings that argue against a direct influence of BMI on decision making. Decision-making performance, for example, was also related to binge eating severity. In addition, there were differences in BMI between all groups: BMI was highest in the BED group and lowest in the normal weight control group. These differences also accounts for the strong correlation between BMI and binge eating severity. It is important to clarify the role of BMI and binge eating severity in decision making in future research. This may help to gain more understanding of the similarities and differences in decision making between various types of disordered eating.

Limitations and future directions

There are some limitations in the study that are worth mentioning. Most variables in this study were measured using self-reports including weight and height to determine BMI. Future studies may consider using alternative measures to assess, for example, self-control or sensitivity for reward. Because a relationship was found between decision making and BMI, especially, weight and height should be measured directly to be able to examine the influence of BMI on decision making.

Another issue that should be considered in prospective studies is diagnostic crossover in eating and related disorders. It is unlikely that crossover from other eating disorders (e.g. BN) will explain the decision-making impairments in the present study, as decision-making impairments have been found across eating and other disorders and is already demonstrated in BED using two distinct tasks. However, it may be interesting to examine whether the crossover would explain some of the similarities and differences in decision making between different eating disorders or would account for inconsistent findings between different studies. It may be that individuals with a history of other eating disorder diagnoses may have distinct features or differ in psychological or neurobiological characteristics that affect decision making and, potentially, other neurocognitive functions.

In conclusion, the present results may provide an important first insight into the processes underlying the (destructive) behaviour of patients with BED. It is one of the first that demonstrates decision-making impairments as measured with IGT in patients with BED. The results suggest that patients with BED have difficulties making good decisions. Their choices are immediately rewarding but are disadvantageous in the long run. The findings provide further understanding of the destructive and tenacious behaviours in BED. Future research should focus on the implications and origin of this decision-making deficiency and investigate similarities and differences with other forms of eating pathology (e.g. BN), in order to gain more insight into why similar distortions in decision making seem to underlie distinct disorders.

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