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Research report

Facets of impulsivity interactively predict body fat and binge eating in young women ☆

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ABSTRACT

Impulsivity has been positively linked to overeating and obesity, but findings are inconsistent. Studies using the *Barratt Impulsiveness Scale* (BIS) show that measures of overeating appear to be most consistently associated with scores on the subscale *attentional impulsivity* in both non-clinical and clinical samples. Additionally, individuals with binge-eating behaviors may have elevated scores on the subscale *motor impulsivity*. In the current study, young women ($N = 133$) completed the short form of the BIS (BIS-15), the *Eating Disorder Examination – Questionnaire*, and height, weight and body composition were measured. Regression analyses showed that attentional and motor impulsivity positively predicted binge eating and general eating pathology, while non-planning impulsivity negatively predicted these variables. Moreover, attentional and motor impulsivity interactively predicted percent body fat, and the number of subjective and objective binge episodes. Results show that only specific aspects of trait impulsivity (attentional and motor impulsivity) are positively associated with body mass and binge eating. Non-planning impulsivity appears to be unrelated or even inversely related to those variables, at least in female students. Elevated levels of attentional impulsivity in conjunction with high motor impulsivity may be a risk factor for overweight and clinically relevant binge eating.

Introduction

Impulsivity can be defined as "a predisposition toward rapid, unplanned reactions to internal or external stimuli without regard to the negative consequences of these reactions to the impulsive individual or to others" (Moeller, Barratt, Dougherty, Schmitz, & Swann, 2001, p. 1784). Accordingly, it appears to be a common risk factor for several mental disorders such as certain personality disorders, substance use disorders, bipolar disorder, and attention deficit hyperactivity disorder (Moeller et al., 2001). Impulsivity is a multifaceted construct and there are a range of methods available for its measurement. Specifically, it can be assessed through self-report questionnaires or behavioral tasks such as motor response inhibition tasks or delay discounting. Motor response inhibition is usually measured using go/no-go or stop-signal tasks, in which failures to inhibit responses (e.g., button presses) are interpreted as impulsive behavior. In delay discounting paradigms, the preference for choosing small, immediate rewards over large, delayed rewards is interpreted as impulsive behavior. Self-reported impulsivity is positively correlated with impulsive reactions in behavioral measures, yet correlations are often weak and inconsistent (Cyders & Coskunpinar, 2011, 2012). Nonetheless, both self-report and behavioral measures suggest that impulsivity is positively associated with overeating and body mass.

Obesity is a condition of excessive fat accumulation in adipose tissue and is defined as a body mass index (BMI) ≥ 30.0 kg/m^2 (World Health Organization, 2000). Binge-eating disorder (BED) and bulimia nervosa (BN) are eating disorders that are marked by recurrent binge-eating episodes, which include eating large amounts of food in a discrete period of time and a sense of lack of control over eating (American Psychiatric Association, 2013). Unlike individuals with BED, those with BN additionally engage in compensatory behaviors (e.g., vomiting) in order to prevent weight gain. Some studies found greater delay discounting or poorer response inhibition in obese adults compared to normal-weight individuals (Mobbs, Iglesias, Golay, & Van der Linden, 2011; Nederkoorn, Smulders, Havermans, Roefs, & Jansen, 2006; Weller, Cook, Avsar, & Cox, 2008) or in adults with BED or BN compared to controls (Manwaring, Green, Myerson, Strube, & Wilfley, 2011; Rosval et al., 2006; Wu et al., 2013). These findings, however, are contrasted by a number of studies that did not find differences in delay discounting or response inhibition between those groups (Claes, Mitchell, & Vandereycken, 2012; Claes, Nederkoorn, Vandereycken, Guerrieri, & Vertommen, 2006; Galimberti, Martoni, Cavallini, Erzegovesi, & Bellodi, 2012; Hendrick,

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Luo, Zhang, & Li, 2012; Loeber et al., 2012; Nederkoorn et al., 2006; Van den Eynde et al., 2012; Wu et al., 2013).

Similarly, higher self-reported impulsivity was found in obese adults compared to normal-weight individuals (Mobbs, Crépin, Thiéry, Golay, & Van der Linden, 2010; Rydén et al., 2003) or in adults with BED or BN compared to controls (Claes et al., 2006; Claes, Vandereycken, & Vertommen, 2002; Rosval et al., 2006; Wu et al., 2013). However, there are again numerous studies that did not find group differences or only found differences in subgroups, for example, women (Fields, Sabet, & Reynolds, 2013; Koritzky, Yechiam, Bukay, & Milman, 2012; Loeber et al., 2012; Nasser, Gluck, & Geliebter, 2004; Nederkoorn et al., 2006; Weller et al., 2008; Wu et al., 2013). Thus, although several studies suggest an association between higher impulsivity in behavioral and self-report measures and overeating (e.g., higher scores in individuals with obesity, BED, or BN), findings are inconsistent.

One explanation for the lack of associations between self-reported impulsivity and measures of overeating in many studies may be that only specific facets of impulsivity are relevant in this context. For instance, studies using the *UPPS Impulsive Behavior Scale* consistently show that its subscales *urgency* (i.e., tendency to experience strong impulses, frequently under conditions of negative effect) and *lack of perseverance* (i.e., problems to remain focused on a task that may be boring or difficult), but not its other subscales – *lack of premeditation* (i.e., not thinking and reflecting on the consequences of an act before engaging in that act) and *sensation seeking* (i.e., enjoying and pursuing exciting activities and openness for new experiences) – are associated with obesity, BED, BN, and other measures of overeating (Dir, Karyadi, & Cyders, 2013; Fischer, Smith, & Anderson, 2003; Fischer, Smith, & Cyders, 2008; Manwaring et al., 2011; Mobbs et al., 2010; Mobbs, Ghisletta, & Van der Linden, 2008; Murphy, Stojek, & MacKillop, 2014). Likewise, the *Barratt Impulsiveness Scale* (BIS) consists of several subscales, which assess an inability to focus attention or concentrate (*attentional impulsivity*), acting without thinking (*motor impulsivity*), and a lack of future orientation or forethought (*non-planning impulsivity*). A recent examination of studies that used the BIS revealed that particularly its *attentional impulsivity* subscale is related to various measures of overeating, but that *non-planning impulsivity* appears to be unrelated to these measures (Meule, 2013). Additionally, it appears that *motor impulsivity* is elevated in individuals with clinically relevant binge-eating behaviors (i.e., BED, BN, and anorexia nervosa – binge/purge type; Claes et al., 2006; Nasser et al., 2004; Rosval et al., 2006). Accordingly, it has been proposed that there may also be interactive effects between BIS-subscales that have not been considered in previous research. Specifically, high attentional impulsivity may be related to moderate overeating, but may be particularly crucial in combination with high motor impulsivity, increasing the risk to become overweight and engaging in clinically relevant binge eating (Meule, 2013).

In the present study, we investigated this issue in a sample of young women. Specifically, relationships between subscales of a short form of the BIS with self-reported eating disorder symptoms such as binge eating and objectively measured body mass were examined. As BMI only represents an indirect estimate of body fat, body composition was also measured. We hypothesized that attentional impulsivity would be most strongly, positively associated with eating disorder pathology, for example binge eating, as well as with BMI and percent body fat. Motor impulsivity was also expected to be positively associated with those measures, but to a lesser extent. Importantly, interactive effects between attentional and motor impulsivity were expected such that individuals with both high attentional and high motor impulsivity would show the highest levels of binge eating and BMI/percent body fat. Non-planning impulsivity was expected to be unrelated to those eating- and weight-related variables.

Material and methods

Participants

Female university freshmen were recruited at the University of Würzburg (Würzburg, Germany) via notices posted on campus and student councils' Facebook groups. Advertisements did not reveal the purpose or procedure of the study, except stating that the study would involve presentation of food pictures. There was no prescreening; that is, no participants were excluded due to any disorders. One hundred and thirty-three students took part in the study. Mean age was $M = 20.08$ years ($SD = 2.68$, Range: 18–45). Mean BMI and percent body fat are reported in Table 1. According to the guidelines of the World Health Organization (2000), $n = 10$ women (7.52%) were underweight (BMI < 18.50 kg/m^2), $n = 107$ (80.45%) had normal-weight (BMI = 18.50–24.99 kg/m^2), and $n = 16$ (12.03%) were overweight (BMI = 25.00–29.99 kg/m^2). Participants received either course credits or 7€ for compensation.

Measures

BMI

Height (in cm) was measured with a body height meter. Weight (in kg) was measured with a personal scale (SECA, Hamburg, Germany). BMI was calculated as weight in kilogram divided by squared height in meters.

Body composition

Bioelectrical impedance analysis (BIA) was carried out with the BIA 101 (RJL Systems, Detroit, MI) in supine position with limbs away from the trunk with two electrodes placed on the dorsal surfaces of the hands and feet on the non-dominant side of the body. Hand electrodes were placed at the distal metacarpals, and also between

Table 1
Descriptive statistics of and correlations between study variables.

$N = 133$	M	SD	Range	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. BIS-15 – Attentional impulsivity	9.61	2.23	6–18	–								
2. BIS-15 – Motor impulsivity	11.29	2.39	6–18	.08	–							
3. BIS-15 – Non-planning impulsivity	10.84	2.95	5–17	.09	.47***	–						
4. Body mass index (kg/m^2)	22.01	2.66	15.11–29.67	–.08	.08	–.05	–					
5. Body fat (%)	25.97	3.19	17.70–33.90	–.04	.10	–.05	.92***	–				
6. EDE-Q – Overeating	3.14	4.67	0–28	–.02	.05	–.01	.01	–.00	–			
7. EDE-Q – Loss of control	1.60	3.39	0–20	–.01	.11	–.10	.06	.04	.70***	–		
8. EDE-Q – Binge days	1.55	3.27	0–20	.06	.09	–.10	.01	.00	.69***	.93***	–	
9. EDE-Q – Total score	1.32	1.11	0.00–5.21	.17	.12	–.20*	.30***	.31***	.24**	.47***	.50***	–

Note: BIS-15 = short form of the Barratt Impulsiveness Scale; EDE-Q = Eating Disorder Examination – Questionnaire.
* $p \leq .05$, **$p < .01$, ***$p < .001$.