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Research report

Different subtypes of impulsivity differentiate uncontrolled eating and dietary restraint

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ABSTRACT

The current study explored the relationship between three subtypes of impulsivity (Reflection Impulsivity, Impulsive Choice, and Impulsive Action) and measures of uncontrolled eating (TFEQ-D) and restraint (TFEQ-R). Eighty women classified as scoring higher or lower on TFEQ-D and TFEQ-R completed the Matching Familiar Figures Test (MFFT20), Delay Discounting Task (DDT), a Go No Go task, Balloon Analogue Risk Task (BART), and the Barrett Impulsivity Scale-11 (BIS-11). To test whether these relationships were affected by enforced controls overeating, half of the participants fasted the night before and ate breakfast in the laboratory before testing and half had no such control. Women scoring higher on the TFEQ-D were significantly more impulsive on the MFFT20 and BIS-11 overall but not on DDT, Go No Go or BART. Women scoring higher on TFEQ-R were significantly less impulsive on the Go No Go task but did not differ on other measures. The eating manipulation modulated responses on the BART and BIS-11 non-planning scale depending on TFEQ-D classification. These results confirm recent data that high scores on TFEQ-D are related to impulsivity, but imply this relates more to Reflection Impulsivity rather than Impulsive Choice or Action. In contrast restrained eating was associated with better inhibitory control. Taken together, these results suggest that subtypes of impulsivity further differentiate uncontrolled eating and restraint, and suggest that a poor ability to reflect on decisions may underlie some aspects of overeating.

Introduction

Individual differences in response to foods and food cues are recognised as important components of overeating associated with weight gain and consequent obesity (reviewed by Berthoud, 2011; Epstein, Salvy, Carr, Dearing, & Bickel, 2010). One measure of individual differences in eating behaviour that has been widely discussed as a potential predictor of future weight gain is the disinhibition scale from the Three Factor Eating Questionnaire (TFEQ-D: Stunkard & Messick, 1985). High scores on TFEQ-D subscale have been shown to correlate positively with body-mass index (BMI: Gallant et al., 2010; Williamson et al., 2006) and it has been suggested that high TFEQ-D scores are representative of a trait vulnerability to opportunistic eating in an obesogenic environment (Bryant, King, & Blundell, 2008; Chambers & Yeomans, 2011), leading some researchers to refer to this as "trait disinhibition" (Lattimore, Fisher, & Malinowski, 2011). The key focus is now on identifying what specific individual characteristics underlie high scores on TFEQ-D. One idea is that women with higher scores on the TFEQ-D do so partly because of an underlying impulsive phenotype (Bryant, Kiezebrink, King, & Blundell, 2010; Yeomans, Leitch, & Mobini, 2008). Thus scores on the TFEQ-D correlate positively with measures of impulsiveness (Lattimore et al., 2011; van Strien, 1997) and on some behavioural measures of impulsivity (Houben, 2011; Nederkoorn, Guerrieri, Havermans, Roefs, & Jansen, 2009; Yeomans et al., 2008).

Various measures of both trait impulsivity (i.e. self-reported longer term impulsive behaviour) and impulsive responding (impulsive behaviour in acute behavioural tests) have been shown to have a positive relationship with body-size (Batterink, Yokum, & Stice, 2010; Daruna & Barnes, 1993; van den Berg et al., 2011; Weller, Cook, Avsar, & Cox, 2008), binge eating (Carr, 2011; Carrard, Crepin, Ceschi, Golay, & Van der Linden, 2012; Cassin & von Ranson, 2005; Krug et al., 2011; Waxman, 2009), bulimia nervosa (Engel et al., 2005; Kemps & Wilsdon, 2010; Wiederman & Pryor, 1996) and measures of food reinforcement (Epstein, Lin, Carr, & Fletcher, 2012; Epstein et al., 2010). However, impulsivity refers to a cluster of inter-related personal attributes, and further research is needed in order to gain greater insight into which of these attributes is most associated with different aspects of disordered eating. There has been significant progress in achieving this for trait measures of impulsivity. Factor-analysis of responses on self report impulsivity measures suggest four different factors:

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negative urgency, lack of planning, lack of perseverance and sensation seeking (Whiteside & Lynam, 2001). The value of recognising the role of impulsivity subtypes is clear: meta-analysis of the relationship between impulsivity in general and bulimia nervosa only found a small effect (Stice, 2002), however subsequent meta-analysis of the relationship between the four trait impulsivity factors and bulimia nervosa found that negative urgency was strongly related to bulimia (Fischer, Smith, & Cyders, 2008). These findings suggest a similar approach based on behavioural measures of impulsivity is needed.

In terms of behavioural responses, impulsivity has been suggested to comprise of three distinct manifestations of psychological dysfunction (Dalley, Everitt, & Robbins, 2011). The tendency to accept small or immediate rewards in place of larger future outcomes (Impulsive Choice) is often interpreted as a measure of reward sensitivity (Evenden, 1999). In contrast, 'Impulsive Action' reflects the failure to inhibit an inappropriate response to prepotent stimuli (Evenden, 1999). Reflection Impulsivity relates to the failure to gather needed information and evaluate it prior to making a decision (Kagan, 1966). Given the success of studies examining relationships between trait impulsivity and aspects of eating (Fischer et al., 2008), the primary aim of the present study was the extent to which a similar dissociation might be evident with behavioural measures of impulsivity, particularly on a measure of eating which is related to risk of weight gain, the TFEQ-D measure.

To date no study has examined simultaneously all three behavioural components of impulsivity in the same study, although all three types have been studied independently. Thus, one study has reported higher Reflection Impulsivity on the Matching Familiar Figures Task (MFFT20) in overweight relative to normal weight children (Braet, Claus, Verbeken, & Van Vlierberghe, 2007), and more Impulsive Choice on the Delay Discounting Task (DDT) has been reported both for obese relative to normal weight women (Kishinevsky et al., 2011; Weller et al., 2008) and critically, in relation to the present study high versus low scores on TFEQ-D (Yeomans et al., 2008). Likewise, Impulsive Action as measured by the Go No Go task has been shown to be related to overeating (Guerrieri, Nederkoorn, & Jansen, 2012; Houben, 2011). Thus, all three aspects of behavioural impulsivity appear to have some relationship with overeating, but the absence of any study which included measures of all three components does not allow any inference on which aspect is most important.

Analysis of trait impulsivity has identified some aspects that are not obviously captured by the core three components of behavioural impulsivity explored here, most notably sensation-seeking and risk-taking (Fischer et al., 2008; Mobbs et al., 2010). There is some debate as to whether risk taking is an impulsive behaviour (Zuckerman & Kuhlman, 2000), or an element of sensation seeking, and risk taking may be better described as a condition that combines sensation seeking with reward driven motivation. We therefore also included the Balloon Analogue Risk Task (Lejuez et al., 2002), which has been used to investigate risk taking in a variety of contexts with addictive and sensation seeking behaviours (Crowley, Raymond, Mikulich-Gilbertson, Thompson, & Lejuez, 2004; Hopko et al., 2006; Lejuez et al., 2003).

Finally, in order to contrast behavioural measures with trait responses, participants also completed the Barratt Impulsiveness Scale BIS-11 (Patton, Stanford, & Barratt, 1995), which has previously been related to binge-eating and overweight: women with active symptoms of Bulimia Nervosa score higher on BIS-11 than do healthy controls (Bruce et al., 2005), as do overweight women who binge eat in contrast to those who do not (Arias et al., 2006) and most recently Lattimore et al. (2011) found a positive relationship between scores on the BIS and TFEQ- uncontrolled and emotional eating sub-scales from the shortened version of the TFEQ. High scores on the motoric sub-scale of the BIS-11 have been reported in bulimic populations compared to lean or restricting type anorectics (Steiger & Bruce, 2007), and high motoric impulsivity has been reported in women with high TFEQ-D scores (Lyke & Spinella, 2004).

The present study sought to address these prior limitations. First, we include measures of all three forms of behavioural impulsivity (Impulsive Choice, Impulsive Action, Reflection Impulsivity). Second, we include a behavioural measure of risk taking along with a self-report measure to be consistent with the trait impulsivity literature. Third, to avoid interpretational issue inherent in using individuals who are overweight or have an eating disorder, the present study used a younger normal-weight population (BMI < 25), using both the TFEQ-D and the TFEQ restraint scale (TFEQ-R) to characterise eating in line with recent studies in our laboratory (Chambers & Yeomans, 2011; Haynes, Lee, & Yeomans, 2003; Yeomans & Coughlan, 2009; Yeomans, Tovey, Tinley, & Haynes, 2004) and elsewhere (de Lauzon et al., 2004; Gallant et al., 2010). The study included measures of restrained eating since some studies in the literature have reported higher levels of impulsivity in women characterised by high levels of dietary restraint (Guerrieri, Nederkoorn, & Jansen, 2008; Guerrieri, Nederkoorn, Schrooten, Martijn, & Jansen, 2009; Guerrieri et al., 2007; Jansen et al., 2009; Nederkoorn, Van Eijs, & Jansen, 2004). Fourth, we examined the impact of motivational state by manipulating time since last eating occasion. The present study tested women in two conditions: either with requirements to control their eating prior to test (Controlled eating condition) or with no such requirements (Unrestricted eating condition).

In regard to the relationship between impulsivity and TFEQ-D, two different outcomes were anticipated. Firstly, high scores on TFEQ-D might arise from a heightened response to rewards, consistent with this group showing greater sensitivity to palatability (Yeomans et al., 2004). If so, we predicted that high TFEQ-D scores would be most strongly associated with greater Impulsive Choice, in line with findings of a positive correlation between TFEQ-D and performance on the DDT (Yeomans et al., 2008). As the BART measure has also been suggested to relate to reward sensitivity (Bornovalova et al., 2009), high TFEQ-D might also be associated with greater risk taking on the BART task. A second possibility, also supported by the literature (Guerrieri et al., 2012; Houben, 2011; Nederkoorn et al., 2004), was that a lack of impulsive inhibitory control (i.e. Impulsive Action) marks a general tendency for overeating, suggesting that performance on the Go No Go may relate to TFEQ-D scores. This suggestion is consistent with the negative correlation between response inhibition and BMI (Elias, Elias, Sullivan, Wolf, & D'Agostino, 2003; Gunstad et al., 2007; Waldstein & Katzel, 2006), and slower latencies on stop signal tasks in restrained women (Nederkoorn et al., 2004) and obese children (Nederkoorn, Coelho, Guerrieri, Houben, & Jansen, 2012). The report of higher impulsive behaviour on the MFFT20 in overweight children (Braet et al., 2007) could suggest high TFEQ-D would also be associated with higher scores on the MFFT20 measure.

Method

Participants

Since the focus of this experiment was to contrast impulsivity between normal weight women with higher or lower scores on the TFEQ-D scale, we only tested women with BMI between 18 and 25 kg/m^2, and TFEQ-D scores greater than nine or less than six. However, since previous work has both suggested that impulsivity may be related to restrained eating (Nederkoorn et al., 2004) it was also important to control for restraint, we also classified women according to restraint resulting in four groups of participants. The TFEQ-D cut-offs used in the present study represented