



Narrowing of attention following food cue exposure in emerging adults: Does impulsivity matter?



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ABSTRACT

Obesity has reached epidemic proportions over the past few decades and research is beginning to focus on the behavioral and cognitive mechanisms that may contribute to the rise of obesity in youth and emerging adults. Based on previous models of obesity and current research on the activation of approach motivational states, we predicted that impulsive individuals and individuals with high body dissatisfaction would demonstrate a narrowing of attentional focus in response to food-cue exposure. Participants ($n = 101$) completed a task assessing attentional breadth in response to food and non-food cues, followed by measures of eating behaviors and delay discounting (a measure of impulsive decision making). The findings revealed that delay discounting and the interaction between BMI and body dissatisfaction predicted narrowing of attentional scope following the presentation of food cues. Implications for how these findings might account for the link between impulsivity, body dissatisfaction and maladaptive eating are discussed.

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1. Introduction

The prevalence of obesity is increasing at an alarming rate, with nearly two thirds of individuals in the United States (US) being classified as overweight or obese (Centers for Disease Control (CDC), 2012). Obesity has been broadly defined as an excess percentage of body fat that places individuals at risk for both chronic and acute health complications (Barlow, 2007). Quantitatively it is assessed via Body Mass Index (BMI), a ratio of one's weight to height, in which individuals with BMI scores > 30, are considered obese and individuals with a BMI between 25 and 30 percentile are considered overweight (Russell-Mayhew, McVey, Bardick, & Ireland, 2012). Obesity is the second leading cause of preventable death in the US and places individuals at risk for chronic and acute health complications including high blood pressure, high cholesterol, heart disease, type 2 diabetes, and several cancers (Danaei et al., 2009; De Pergola & Silvestris, 2013; Ogden, Carroll, & Flegal, 2012). In addition, there are some concerning psychosocial implications, including social discrimination and marginalization which are related to both internalizing and externalizing problems, as well as poor academic and occupational functioning (Halfon, Larson, & Slusser, 2013).

Though a number of factors have been implicated in the etiology of obesity, the major behavioral contributors to being overweight or obese are when energy intake exceeds energy expenditure over a

prolonged period of time (one example being excessive intake of high caloric food coupled with decreased physical activity) (Stroebe, van Koningsbruggen, Paies, & Aarts, 2013). One issue is that highly palatable food can be consumed for purposes other than nutritional need (Davis, Levitan, Muglia, Bewell, & Kennedy, 2004; Meye & Adan, 2014). Particularly, this 'hedonic' feeding can be triggered not only by environmental cues but also affective states or potentially a combination of both (Lowe & Levine, 2005; Meye & Adan, 2014).

The Goal Conflict Model of eating behavior suggests that weight regulation is a self-control dilemma between two goals: (1) positive affect resulting from eating enjoyable foods and (2) weight control (Stroebe et al., 2013). Based on this model, palatable food cues are thought to prime eating enjoyment and lead to goal directed behavior aimed at consuming palatable food. Obese individuals have shown increased reactivity to high calorie food cues in brain regions thought to mediate affective and motivational responses (Stice, Spoor, Bohon, Veldhuizen, & Small, 2008; Stoeckel et al., 2008), though the pattern of increased reactivity may differ depending on factors such as presence of a co-occurring binge eating disorder. Additionally, evidence in human studies is equivocal as to group differences between obese individuals, individuals with binge eating disorders, and controls (Ziauddeen, Alonso-Alonso, Hill, Kelley, & Khan, 2015; Ziauddeen, Farooqi, & Fletcher, 2012).

Most relevant to the present research, Motivational Intensity Model (MIM) suggests appetitive cues trigger approach-related affective states that influence cognition in a variety of ways (Harmon-Jones, Gable, & Price, 2013; Harmon-Jones, Price, & Gable, 2012; Hicks, Fields, Davis, & Gable, 2015; Juergensen & Demaree, 2015). These researchers

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conceptualize approach motivation as the impulse to go towards the object (Harmon-Jones, Harmon-Jones, & Price, 2013). Using this model as a guide, researchers have shown that approach related traits (e.g., trait approach motivation), emotions associated with approach motivation (e.g., desire, determination, anger), and appetitive stimuli (e.g., pictures of delicious deserts), prompt a general narrowing of attentional scope (see Harmon-Jones, Gable, & Price, 2012, for a review). For instance, after exposure to pictures of desserts, individuals are more likely to attend to local elements in their visual field (e.g., the details that make up a large figure) compared to the global properties (e.g., the figure itself; Gable & Harmon-Jones, 2008). This narrowed attentional is argued to be an adaptive consequence of approach motivational states because it helps individuals keep their “eye on the prize” or focus on the immediate goal (e.g., consuming palatable food) and inhibits access to information related to more broad or long terms goals (e.g., a desire to maintain or lose weight) that might otherwise impede goal pursuit. Over 20 studies have now supported this argument and even demonstrated that narrowed attentional scope mediates the influence of appetitive stimuli on neurophysiological markers of approach motivation (i.e., left relative to right hemispheric activation).

Nevertheless, some individuals are able to withstand these approach cues and maintain motivation towards weight goals in the face of strong affect. As such, identifying behavioral styles associated with the ability to withstand these cues represents an important step in potentially improving prevention and intervention methods for this population. The role of impulsivity in the manifestation and maintenance of being overweight and obese has emerged as a potential mechanism of discussion.

Research and theory demonstrates a strong connection between impulsivity and the manifestation and maintenance of maladaptive eating behaviors (e.g., Nasser, Gluck, & Geliebter, 2004). Impulsivity describes the tendency to act with less forethought and predisposes an individual towards rash, unplanned reactions without regard to negative consequences and more rational long-term choices for success (International Society for Research on Impulsivity, 2013 ISRI: <http://www.impulsivity.org/>). It is a multidimensional construct, which can be conceptualized as a failure of attention (inattention), a failure to inhibit responses (inhibition), and a failure to consider the probable negative long-term consequences of behavior (delay discounting or decision making; Reynolds, Penfold, & Patak, 2008).

Based on the dimensions of impulsive behavior defined by Reynolds et al. (2008), delay discounting is an assessment that falls into the impulsive decision making category and has been theorized to be a trans-disease process underlying a number of health risk behaviors (Bickel, Jarmolowicz, Mueller, Koffarnus, & Gatchalian, 2012). Impulsive decision making, as previously mentioned, refers to the ability to forgo immediate gratification for greater long-term rewards. Specifically, assessments of delay discounting require participants to make choices between more valuable but delayed rewards versus less valuable rewards that are immediate. For weight maintenance in particular, this may refer to the ability to choose between the immediate gratification of eating certain foods versus long-term health consequences. Delay discounting has been linked to eating behaviors, generally, and obesity in particular (e.g., Guerrieri, Nederkoorn, & Jansen, 2007; Nasser et al., 2004; Thamotharan, Lange, Zale, Huffhines, & Fields, 2013). Studies have shown that individuals with higher body fat percentages discount more than healthy-weight control participants (i.e. make comparatively more choices for smaller immediate rewards at the expense of larger but delayed rewards) for monetary and food rewards (Rasmussen, Lawyer, & Reilly, 2010; Weller, Cook, Avsar, & Cox, 2008). However, these findings have been mixed depending on the gender and/or age of participants studied. Thus, if appetitive-related stimuli include approach-motivational properties, as discussed above, it stands to reason that individuals who discount more could be most negatively affected by such cues (i.e., attentional narrowing), such that they would be more focused on the short-term consumption of palatable foods and not on the long-term health consequences.

These effects may be tempered by the type of long term goal on which the individual is focused. People who engage in weight management strategies differ in the goals they wish to achieve by regulating their eating, with some pursuing the increased health benefits from dieting and others pursuing the physical standard of beauty and social approval (even if they are of healthy weight) (Evans, 2003; Groesz, Levine, & Murnen, 2002; Ogden, 2010). According to Self Determination Theory, extrinsic goals are characterized by more outward focus (e.g. appearance) whereas intrinsic motivation is characterized by more internal focus (e.g. health), and research has shown that focus on more extrinsic goals may be related to poorer outcomes in dieters (Verstuyf, Vansteenkiste, Soenens, & Soenens, 2016).

Based on previous research, we tested whether impulsive individuals and individuals high on eating disorder indices will display greater approach motivation, as indicated by a narrowing of attention, in the presence of appetitive food cues. In the present study, participants were exposed to either appetitive (dessert) or neutral cues before completing a measure of attentional scope. It was hypothesized that impulsive individuals and individuals high on eating disorder indices would demonstrate a narrowing of attentional scope following exposure to appetitive cues.

2. Materials and methods

2.1. Participants

One hundred and one students (65% female) enrolled in an introductory psychology course participated for partial completion of course credit. Participants reported a mean age of 18.62 (SD = 0.86) years old and were predominantly White (69.3%) and non-Hispanic (81.2%). One outlier, >4 SD from the mean on the delay discounting measure, was excluded from the analyses.

2.2. Measures

2.2.1. Food cues and attentional scope task

A within-participants procedure developed by Hicks, Friedman, Gable, and Davis (2012) was used for the present study (adapted from Gable & Harmon-Jones, 2010a). Participants viewed 32 dessert images and 32 neutral images of rocks. On each trial, a single image was displayed for 3 s following a 500 ms fixation cross. After each picture, another fixation cross appeared for 500 ms followed by an image of a Navon (1977) letter that was presented until the participant responded or 5 s elapsed. The inter-trial interval varied between 6 s and 11 s depending on how quickly participants responded to the target image.

To assess attentional breadth, we used an established measure of global/local processing (Navon, 1977) in which large letters composed of smaller letters are presented. Each vertical and horizontal line of a large letter was made up of five closely spaced smaller letters (e.g., a T made up of L's; see Fig. 1). Participants indicated as quickly as possible

		Respond “T” or “H”	
Global Trials	FFFFF	L	L
	F	L	L
	F	LLLLL	
	F	L	L
	F	L	L
Local Trials	TTTTT	H	
	T	H	
	TTTTT	H	
	T	H	
	T	HHHHH	

Fig. 1. Stimuli for global and local responses.

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