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Brief research report

Self-report and startle-based measures of emotional reactions to body image cues as predictors of Drive for Thinness and Body Dissatisfaction in female college students

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ABSTRACT

The purpose was to compare self-report and psychophysiological assessment techniques in the measurement of emotional response to body image cues. Female college students ($n = 53$; % Caucasian = 53.6; M body mass index = 26.1 kg/m^2) completed the Eating Disorder Inventory (EDI-3) and viewed photos of themselves both unaltered and morphed to simulate weight gain. Response to the photos was assessed by self-report and the affect modulated startle paradigm. EDI-3 Drive for Thinness (DT) and Body Dissatisfaction (BD) scale scores were correlated with startled amplitude for the largest simulated weight gain photo. Startle eye blink amplitude predicted more variance in DT and BD subscales than self-reported response to the image. The affect modulated startle paradigm may provide unique information in the assessment of eating disorder symptomatology that cannot be captured via self-report techniques, and has potential to inform evaluation of treatment outcomes of eating and body image disorders.

Introduction

The assessment of disordered eating behavior and body image has traditionally been conducted using self-administered surveys and clinical interviews. These assessment modalities, however, are limited to an individual's accuracy and willingness to answer questions about her/his thoughts and behaviors. Self-reported responses to these assessments may not be accurate among people with eating disorders because of stigma associated with eating disorders, lack of desire for treatment/denial of illness, possible misunderstanding of what constitutes specific disordered eating behaviors (e.g., what is a binge), and high levels of alexithymia (difficulty in identifying/describing feelings; Berkman, Lohr, & Bulik, 2007; Túry, Gülec, & Kohls, 2010; Vandereycken, 2006a, 2006b). Because of these limitations it is important to consider different methods of assessment. Objective, psychophysiological measures, like the affect modulated startle eyeblink response, are less subject to reporting bias (Grillon & Baas, 2003).

Affective Startle Modulation

The startle response is a complex set of physiological changes that occur in response to unexpected and intense stimulus (Grillon & Baas, 2003). The typical way the startle reflex is measured in humans is by measuring the eyeblink component of this reflex. A large literature has demonstrated that the strength of an elicited startle eyeblink is modulated by the emotional state of the participant when the eyeblink-eliciting stimulus is presented. In picture-viewing, for example, a typical finding is for elicited startle eyeblink responses to be smallest when participants are viewing pleasant/positive pictures and largest when participants are viewing unpleasant/negative pictures (Vrana, Spence, & Lang, 1988). Based on this pattern, the affect modulated startle paradigm has been proposed as an objective measure of affect.

Eating disorder researchers have begun to investigate responses to food and body image cues using the affect modulated startle paradigm. For instance, some studies have looked at the emotional response to food cues given varying levels of food deprivation. Drobes, Miller, Hillman, Bradley, Cuthbert, and Lang (2001) elicited startle responses while viewing food images in healthy participants who had been asked to fast and in participants who were not fasting. Fasting participants exhibited a larger startle response while viewing pictures of food than non-fasting participants, suggesting that viewing photos of food elicited a more negative affective response in hungry participants than in sated participants. Further,

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the startle response of fasting individuals was greater for pictures of food than for non-food pictures, suggesting that food photos caused more negative affect than non-food photos. There were no differences between picture categories for non-fasting participants, indicating that healthy participants do not exhibit negative affect in response to food cues when they are sated.

Mauler, Hamm, Weike, and Tuschen-Caffier (2006) conducted a similar study, examining both healthy participants and participants with bulimia nervosa (BN). Their findings for the control participants again showed that fasting controls had a larger startle response for food pictures than did non-fasting controls. Interestingly, this pattern was not seen in persons with BN. In participants diagnosed with BN, fasting participants had a smaller startle response while viewing food cues than did non-fasting participants. The authors concluded that the affect modulated startle paradigm may be useful in the clinical assessment of people with eating disorders.

Other studies have used the affect modulated startle paradigm to investigate emotional response to body image cues. Friederich et al. (2006) compared startle eyeblink responses while viewing photos of slender models in participants with BN, anorexia nervosa (AN), and healthy controls. They did not find significant group differences. One possible reason for this is that images of others may not be emotionally arousing enough to elicit a differential reaction.

Other studies have used self-photos as the stimulus. For example, Overduin, Jansen, and Eilkes (1997) compared people who reported restrained eating behavior to control participants on their startle reaction while viewing self-photos; no group differences were found. A similar study by Buck, Hillman, Evans, and Janelle (2004), however, suggests that the affect modulated startle paradigm may be useful in studying body dissatisfaction. In healthy participants, they compared startle responses while viewing full-length, self-photos to startle responses elicited while viewing positive (e.g., scenes of families), neutral (e.g., neutral faces), and negative (e.g., mutilated humans) images from the International Affective Pictures System (IAPS; Lang, Bradley, & Cuthbert, 2008). Participants exhibited smaller startle responses when viewing self-photos than when viewing any other photo category. These findings suggest that healthy people do not view self-photos as aversive, which would be consistent with a healthy body image, because viewing a picture of one's own body should not elicit a negative affective response if one is not dissatisfied with one's appearance.

The findings of studies using the affect modulated startle paradigm to investigate aspects of body image and eating disorders have several implications. First, people with eating disorders differ from controls in affective response to food cues. Participants without eating disorders show negative affect (possibly frustration) while viewing food cues when hungry, while participants with eating disorders show negative affect (possibly fear) while viewing food cues when sated. Second, the affect modulated startle paradigm may be useful in studying body image, but only when self-photos are used, suggesting that photos of others are not salient as body image stimuli.

The Current Study

The current study sought to extend the literature by examining the relationship between startle eyeblink response and self-report measures of disordered eating behavior and body image in a population with varying levels of body dissatisfaction using salient body image cues (i.e., self-photos). We predicted that startle amplitude for unaltered and simulated weight gain self-photos would predict scores on measures of body dissatisfaction above and beyond self-report ratings of the same photo.

Methods

A power analysis was conducted using GPower, and as recommended by Cohen (1988), power was set at 0.80. To detect a medium sized effect ($f^2 = .20$) at alpha = .05 using linear multiple regression with two predictors, 52 participants were needed.

Female undergraduate students ($n = 69$) from a medium-sized Midwestern university were recruited for participation. Startle data for 16 participants were unusable due to non-response ($n = 5$), invalid response (e.g., blinked just prior to startle stimulus; $n = 3$), movement ($n = 3$), or equipment failure ($n = 5$), leaving a final sample of $n = 53$. On average 5–10% of adults are startle non-responders (Blumenthal et al., 2005), consistent with the rate in our study.

Body image concern was measured with the EDI-3 (Garner, 2004). The scales utilized in this study were the Drive for Thinness (DT), Body Dissatisfaction (BD), and Bulimia (B) scales. DT assesses preoccupation with dieting and being thin and fear of fatness. BD measures the degree to which one is unhappy with one's body appearance. B quantifies binge eating and purging behavior. Internal consistency for the current study was good, with alpha = .91 for BD, alpha = .90 for DT, and alpha = .82 for B.

Procedure

Upon providing informed consent, a picture of the participant's face was taken. Self-photos were used to increase the salience of the photos (i.e., a picture of one's own face should be more relevant than a picture of a stranger's face). After taking the photo, Alterimage software (Seattle Software Design, 2007) was used to simulate varying levels of weight gain: large (LG; 1–2 cm heavier), extra large (XL; 3–5 cm heavier; see Appendix A).

While photos were morphed, the participant completed a demographic questionnaire and then was seated in a sound attenuated testing chamber. A researcher placed disposable recording sensors below the participant's left eye and behind the participant's left ear.

A blocked design was used for this study. Each of the six trial blocks was comprised of the altered photos and the original photo. The order of the photos within the blocks was random, but all participants viewed the same random order. Participants viewed each photo six times and four of the six photo presentations were accompanied by a 95 dB white noise burst, presented binaurally through headphones 3000 ms after the presentation of the photo. Startle stimuli were only presented for a subset of the trials to reduce the degree of habituation (a lessening in response to the startle stimulus over time). When participants can predict when the startle stimulus will occur (e.g., every time a photo is shown there is a loud noise), they respond less to it. The rise time for the noise burst was less than 1 ms and duration was 50 ms. Eyeblink responses were recorded as electromyographic (EMG) data recorded from the orbicularis oculi muscle. EMG data were collected using a Biopac mp 150 recording system with a gain setting of 5000 and filters passing a signal of 50–500 Hz. Prior to scoring, the EMG response to each startle stimulus was integrated and rectified using a time constant of 5 ms. Researchers scored the peak magnitude of each EMG response.

After completing the startle procedure, participants viewed the series of photos again and rated them from 0 (unpleasant) to 10 (pleasant). While rating the photos, participants were instructed to rate the photos according to how the participant *felt* while looking at the photo, rather than providing a rating based on what they thought about the photo. Finally, they completed the EDI-3 and had their height and weight measured.

Variable Creation

Before analyzing the data, rating scores and startle scores were calculated. The rating scores were created by averaging the