Motivation and Emotion, Vol. 28, No. 3, September 2004 (© 2004)

Emotional Responses to Pictures of Oneself in Healthy College Age Females

Sarah M. Buck,[1] Charles H. Hillman,[1,3] Ellen M. Evans,[1] and Christopher M. Janelle[2]

Emotional responses related to self-perceptions were investigated in healthy college-aged females using a picture-viewing paradigm that consisted of four categories of pictures (pleasant, neutral, unpleasant, and full body pictures of themselves). The startle eye-blink reflex, facial EMG, and self-reported valence, arousal, and dominance measures were recorded for each picture. Startle reflex and facial EMG measures exhibited decreased activation for self-pictures compared to the other affective categories. Self-reports indicated self-pictures were rated as moderately pleasant, low arousing, and moderately dominant relative to the other affective picture categories. The findings of reduced startle blink reflex coupled with decreased activation for all facial EMG measures and the moderate self-report ratings suggest increased attentional processing for self-pictures. These findings provide an understanding of emotional responses to self-perceptions in healthy young females.

KEY WORDS: startle reflex; attentional inhibition; IAPS; facial EMG; picture viewing, body image.

The assessment of self-perceptions is a complex task given the multidimensional construct of self-image (Fisher, 1986). Body image is one component of such self-perceptions, and is itself multidimensional, encompassing perceptual, cognitive, emotional, and behavioral dimensions (Lox, Martin, & Petruzzello, 2003). When considering body image, in particular, perceptual and cognitive dimensions have received much attention (see Cash & Pruzinsky, 2002, for a review). However, there have been far fewer affective measures developed to assess feelings about the

[1]University of Illinois at Urbana-Champaign, Urbana, Illinois.
[2]University of Florida, Gainesville, Florida.
[3]Address all correspondence to Charles H. Hillman, PhD, Department of Kinesiology, University of Illinois at Urbana-Champaign, 213 Freer Hall, 906 South Goodwin Avenue, Urbana, Illinois 61801; e-mail: chhillma@uiuc.edu.

0146-7239/04/0900-0279/0 © 2004 Springer Science+Business Media, Inc.

body, such as worry, anxiety, comfort, or pride (Lox et al., 2003), thereby leaving a paucity of knowledge concerning the emotional component of self-perception. The present report examines affective responses associated with perceptions of oneself in a healthy sample of college age females.

Previous research involving self-perceptions while viewing images of oneself has utilized distortion techniques, wherein participants are allowed to adjust a television monitor or a mirror until they believe the image on the screen matches their actual size (e.g. Ben-Tovim & Walker, 1990; Gardner, Gallegos, Martinez, & Espinoza, 1989). For example, Ben-Tovim and Walker (1990) tested whether increasing visual information of the body would enhance body-size estimation accuracy. Healthy (i.e., noneating disordered) participants adjusted on-screen figures of themselves with and without a mirror present. Regardless of whether the mirror was present, all estimates of body size were significantly greater than participants' actual body size (Ben-Tovim & Walker, 1990). Similarly, Gardner et al. (1989) compared healthy individuals that were either obese or of normal weight. Results showed that participants were more accurate in body width estimation when first presented with an image that was smaller than their actual body size. However, participants still overestimated their actual size by greater than 10%, regardless of whether a mirror was present (Gardner et al., 1989). Further, obese participants were better able than those of normal weight to determine when the image on the screen was distorted from the actual image, suggesting those of normal weight spend less time evaluating their bodies (Gardner & Morrell, 1991).

Other research on the cognitive component of body image has utilized self-report to determine individuals' attitudes and degree of satisfaction toward their body. One common method used to investigate the degree of satisfaction toward one's body has been to have participants choose silhouettes that they believe most closely resemble their current size and their ideal size (e.g., Marsh, 1999; Sanders & Heiss, 1998). The disparity between the two chosen silhouettes is thought to indicate the participant's degree of body dissatisfaction.

However, upon review of the extant literature, few studies have been published that investigate the affective component of body image. One notable exception is a study in which experimenters examined the effects of picture viewing on emotion in high and low body dissatisfied (BD) college age participants (Hausenblas, Janelle, Ellis Gardner, & Hagan, 2002). Male and female participants reported their immediate in-task emotional responses (i.e., pleasure and arousal) to pictures of themselves and of an ideal model (Hausenblas et al., 2002). Females with low BD reported more pleasure while viewing the self and ideal model pictures, as compared to high BD females, though females in general reported less pleasure while viewing themselves than did the males (Hausenblas et al., 2002). Similarly, Hausenblas, Janelle, Ellis Gardner, and Focht (2004) showed a group of female participants with high or low drive for thinness (DT) pictures of themselves, an ideal model, and pictures of neutral objects. Those with low DT reported

increased pleasure to pictures of themselves when compared to participants with high DT, although both groups reported less pleasure while viewing the model when compared to viewing pictures of themselves or neutral objects (Hausenblas et al., 2004). The low DT group also reported less displeasure than the high DT group 1–2 hr after viewing pictures of the model, as well as less displeasure immediately after viewing themselves (Hausenblas et al., 2004).

Additionally, Overduin, Jansen, and Eilkes (1997) showed restrained (non-clinical) or unrestrained eaters pictures of themselves, as well as pictures of food and neutral stimuli, while measuring the startle eye-blink response, facial EMG activity, skin conductance response (SCR), and heart rate (HR). Although it was hypothesized that restrained eaters would show greater negative emotional arousal to pictures of themselves, they did not rate themselves more negatively than unrestrained eaters, and no differences were reported for the startle reflex and facial EMG activity between groups (Overduin et al., 1997). The current study advances previous research on the affective component of body image by examining psychophysiological measures including the startle eye-blink response and facial EMG activity in addition to self-report, and extends research on the self-perceptions of healthy, noneating disordered participants.

Emotional responses related to self-perceptions are likely to be influenced by the direction and extent of attentional allocation. More attentional resource allocation toward a stimulus may be driven by specific motivational factors (i.e., emotional engagement). Accordingly, the degree of self-focused attention has been manipulated by having participants examine themselves in a mirror (e.g., Scheier & Carver, 1977) or view pictures of themselves (e.g., Hausenblas et al., 2002). Scheier and Carver (1977) found that males who had a mirror present reported higher attractiveness ratings for nude female slides than those without the mirror, possibly because with the mirror present participants were more aware of their emotions (i.e., increased self-awareness). In a second study, males high in private self-consciousness (i.e., high self-awareness) reported an even greater affective response than males who were low in this dimension (Scheier & Carver, 1977). Conversely, Lanzetta, Biernat, and Kleck (1982) found that the presence of a mirror attenuated emotional responses to positive (e.g. mother and child hugging) and negative stimuli (e.g. adult with tumerous skin growth) such that participants showed reduced facial expressiveness, self-reported emotions, and arousal. One reason for this attenuation of emotional intensity might be that increased attentional resources are allocated to the self (looking at themselves in the mirror) rather than to stimuli in the environment (Silvia, 2002). Silvia (2002) tested this hypothesis using four studies that examined the relationship between self-awareness and the intensity of emotions. Pleasant affect was induced via a creative-writing task in which the participants were instructed to imagine a happy event and were then left alone for 2 min either in the presence or absence of a mirror. Results indicated that participants in the mirror condition reported less intensity of pleasant

affect than those who did not have a mirror present (Silvia, 2002). The results from these studies support the "dampening hypothesis," which argues that being self-aware decreases the intensity of one's emotional experience (Silvia, 2002, p. 210).

This study extends reports on affective responses related to self-perceptions by examining psychophysiological concomitants of emotion. Conceptually, the study is framed within the biphasic theory of emotion (Lang, 1985, 2000; Lang, Bradley, & Cuthbert, 1997), which contends that emotion is fundamentally organized around two basic motivational systems: appetitive and defensive (Lang, 2000). The appetitive system is responsible for approach behaviors and involves preservative actions that underlie pleasant reactions (Bradley, Codispoti, Cuthbert, & Lang, 2001). The defensive system is responsible for withdrawal or avoidance behavior that is activated in the context of threat and underlies unpleasant reactions (Bradley, Codispoti, Cuthbert, et al., 2001; Lang, 2000). In this context, emotions are considered to be action dispositions that organize behavior along an approach–withdrawal dimension. The direction (i.e., approach–withdrawal) of an organism's response is based on the affectively motivated significance of a stimulus with responses biphasically organized along two dimensions: hedonic valence (i.e., pleasant – appetitive motivation or unpleasant – defensive motivation) and arousal (degree of motivational activation; Bradley, Codispoti, Cuthbert, et al., 2001; Lang, 1985). These responses reflect the organism's underlying emotional valence evaluation of the stimulus, which, in turn, prompts approach or withdrawal responses. Lang (2000) proposed that emotions are motivational states of readiness that prime responses through three different systems: expressive and evaluative language (i.e., verbal report), physiological changes mediated by the somatic and autonomic nervous system (e.g., expressive physiological changes such as facial electromyography –EMG), and behavioral sequelae.

This study focuses on physiological changes, including the startle eye-blink reflex and facial EMG measures. The startle reflex is an involuntary response to a sudden loud noise, which may be measured via the strength of the resultant eye-blink response, among other measures. Previous research (e.g. Lang, Bradley, & Cuthbert, 1990) indicates that the startle eye-blink reflex is augmented when one is presented with an aversive picture, and inhibited when shown a pleasant picture (Lang et al., 1990). However, Cuthbert, Bradley, and Lang (1996) found that this "affect-startle effect" was elicited only for those pictures rated high in arousal. For pictures rated low or moderate in arousal, no significant difference for the blink reflex was observed to pleasant and unpleasant pictures, which showed overall inhibition (Cuthbert et al., 1996). Such inhibition may be a reflection of arousal; that is, when arousal is lower, an approach disposition is activated for both pleasant and unpleasant pictures (Cuthbert et al., 1996). With increasing arousal, aversive motivation offsets the approach motivation, leading to startle potentiation for aversive pictures (Cuthbert et al., 1996).

The study of facial EMG via orbicularis oculi, corrugator, and zygomatic muscle activity has also been fruitful in measuring emotional expression, with increased corrugator (the primary "frown" muscle) activity for unpleasant pictures and increased zygomatic (the primary "smile" muscle) activity for pleasant pictures (Dimberg & Karlsson, 1997; Lang, Greenwald, Bradley, & Hamm, 1993). Orbicularis oculi activity covaries with subjective arousal of the picture, regardless of valence assignment; that is, as subjective arousal increases, so too does orbicularis oculi activity (Lang et al., 1993).

The aim of this study was to extend prior research on emotion by investigating self-perceptions of the body. Participants viewed pictures of themselves along with pleasant, neutral, and unpleasant pictures from the International Affective Picture System (IAPS; Center for the Study of Emotion and Attention [CSEA-NIMH], 1999) to better understand emotional responses related to self- perceptions. It was hypothesized that when viewing pictures of oneself, self-report and physiological responses would be similar to those found for low arousing pleasant pictures, indicating that participants have healthy self-perceptions.

METHOD

Participants

Thirty-two undergraduate female students, ranging in age from 18 to 24 years ($M = 19.8$; $SD = 1.4$), were recruited from the University of Illinois at Urbana-Champaign. In exchange for participation, participants received a free body composition analysis using dual energy X-ray absorptiometry (DXA). On the basis of data obtained from the Eating Disorder Inventory-2 (EDI-2; Garner, 1991) and the Social Physique Anxiety Scale (SPAS; Hart, Leary, & Rejeski, 1989), all participants reported being free of eating disorders (subscale scores <13; Garner, 1991) and fell within normal ranges for a university sample on social physique anxiety (Hart et al., 1989). In addition, all participants fell within normal ranges for this population based on body composition measures (see Table I). Data from one participant was missing from all psychophysiological measures because of experimenter error. In addition, the data from four participants were excluded from the corrugator EMG data analyses ($n = 1$) and the zygomatic EMG data analyses ($n = 3$) because of excessive artifact.

Apparatus and Response Measures

The startle eye-blink reflex was recorded using a 32-channel Neuroscan Synamps amplifier (Neuro, Inc., El Paso, TX) and Acquire 4.2 software controlled by a microcomputer. An acoustic startle probe was used to evoke the eye-blink response, which was measured by recording electromyographic (EMG) activity

Table I. Sample Characteristics

Measure	Mean	Standard deviation
Height (cm)	165.3	5.8
Weight (kg)	60.9	9.1
Body fat % (DXA)	26.1	5.6
Arm (cm)	27.2	2.7
Waist (cm)	71.2	5.9
Hip (cm)	97.2	7.7
Thigh (cm)	53.0	4.7
SPAS	25.8	6.0
EDI-DT	3.6	4.6
EDI-BD	8.0	5.7

Note. DXA = Dual Energy X-Ray Absorptiometer; SPAS = Social Physique Anxiety Scale; EDI-DT = Eating Disorder Inventory Drive for Thinness; EDI-BD = Eating Disorder Inventory Body Dissatisfaction. Scores below 14 on the EDI-2 subscales are considered healthy (Garner, 1991). Mean SPAS scores fell below those reported by Hart et al., 1989.

from the lower arc of the left orbicularis oculi muscle using two side-by-side 4-mm Ag/AgCl electrodes (In Vivo Metric, Ukia, CA) filled with Quik Gel (Neuro, Inc., El Paso, TX). Two 4-mm Ag/AgCl electrodes were placed over both the left corrugator and zygomatic muscles to record changes in facial expression during picture viewing. All facial EMG placements were based on the guidelines of the Society for Psychophysiological Research (Fridlund & Cacioppo, 1986). The ground was an 8-mm Ag/AgCl electrode taped to the left collarbone. Raw EMG signals were amplified using a gain of 150 and sampled at a rate of 2000 Hz with a 60 Hz notch filter. Raw EMG signals were bandpass filtered from 30 to 500 Hz (24 dB/octave), rectified, and integrated at 30 Hz (24 dB/octave) offline using Neuroscan Edit 4.2 software. Offline epochs were created for the eye-blink response from 50 ms before to 250 ms after the acoustic startle probe and peaks were picked from a window of 20–150 ms after probe onset. A z score was applied to startle data prior to statistical analysis to normalize the data. Change scores were used for facial EMG data (corrugator, orbicularis oculi, and zygomatic muscles), wherein epochs from 1000 ms before picture onset to 6000 ms after the picture onset were created. The average EMG responses from the 1-s period preceding picture onset were subtracted from the 6 s following picture onset. For each participant, average data across all trials in a given picture category were calculated for each of the four picture categories (pleasant, neutral, unpleasant, and self) and measures.

To record subjective ratings of pleasure, arousal, and dominance for each picture, a computerized version of the Self Assessment Manikin (SAM; Lang, 1980) was used. The SAM was shown on a 12-in. monitor approximately 1 m from the participant and immediately to the left of the picture-viewing monitor.

Ratings were collected along a 21-point scale and were made using a joystick controlled via a 486 microcomputer.

Stimulus Materials and Design

Participants viewed 24 pictures[4] (i.e. 8 pleasant, 8 neutral, 8 unpleasant) from the International Affective Picture System (IAPS; CSEA-NIMH, 1999) for 6-s each. Pictures were selected on the basis of valence and arousal such that both the pleasant and unpleasant pictures included images that were similarly arousing across both picture categories. Pleasant pictures included scenes of families and attractive men; neutral pictures involved household objects and neutral faces; and unpleasant pictures contained images of mutilated and disfigured humans, and animal and human attack. Also included were 8 full-length pictures taken in 45° increments of each participant in her bathing suit. Given that people have a tendency to mimic facial expressions (Dimberg, Thunberg, & Elmehed, 2000), participants were instructed to keep a neutral face for each picture. A total of 32 pictures were presented to participants in a sound-attenuated, private room. Presentation and timing of the pictures and startle probes were controlled by a microcomputer using Inquisit software (Millisecond Software, Inc., Seattle, WA). Pictures were presented on a 21-in. monitor approximately 1 m from where the participant was seated (24.3° viewing angle) in a comfortable chair. Two picture orders were counter-balanced across all participants to ensure that the pictures were presented equally often in the first and second half of the picture order.

Using calibrated Telephonic TDH-49 headphones, participants received a binaural startle probe during 28 of the 32 pictures (7 of the 8 pictures per valence category were startled), as well as during four intertrial-intervals (ITI). This probe consisted of a prerecorded 50-ms burst of 95 dB white noise with instantaneous rise time, which was controlled by the Inquisit software. A Bruel & Kjaer 2235 Sound level meter (Bruel & Kjaer, Naerum, Denmark) was used to calibrate the white noise bursts. The startle probe was presented at 2, 3, or 4 s after picture onset or during the ITI. Pictures were probed equally often across participants and picture orders.

Procedure

Participants came to the laboratory on 2 days separated by less than 1 week. On the first day, participants signed the University-approved Informed Consent

[4]IAPS pictures (female standardized valence rating, female standardized arousal rating) were as follows: Pleasant – 2040 (8.74, 4.97), 2057 (8.39, 4.73), 2150 (8.31, 5.29), 2310 (7.37, 4.34), 4470 (6.75, 6.03), 4500 (6.90, 5.08), 4510 (7.00, 6.05), 4531 (6.96, 5.79); Neutral- 2190 (4.90, 2.50), 2200 (4.95, 4.03), 2221 (4.33, 3.05), 2440 (4.54, 2.82), 7000 (5.06, 2.15), 7004 (5.14, 1.94), 7006 (5.09, 2.58), 7175 (4.95, 1.87); Unpleasant – 2691 (2.30, 6.01), 3110 (1.47, 6.98), 3150 (1.98, 6.94), 3400 (2.06, 7.12), 3530 (1.51, 6.80), 3550 (1.98, 6.14), 6312 (2.08, 6.83), 6350 (1.44, 7.52).

and completed the SPAS (Hart et al., 1989) and the EDI-2 (Garner, 1991). Participants were instructed to change into their bathing suit for the purpose of measurement and pictures, with the assurance that the only person who would view their pictures would be the female experimenter. The participant wore the bathing suit of her choice (i.e., one-piece or two-piece) and eight pictures were taken at 45° increments from a distance of 3.0 m with a digital camera against a blue backdrop.

Body weight was measured using an electronic scale (Tanita, Inc., Tokyo, Japan). Participants wore medical "scrubs" or minimal street clothes without shoes. Height was determined using a stadiometer. Body composition was determined by DXA (Hologic 4500A, Bedford, MA). This instrument determines whole body fat, lean and mineral mass using low dose X-ray attenuation. DXA scans were acquired and analyzed by the same investigator per manufacturer guidelines. Waist, hip, arm, and thigh circumferences were assessed in triplicate using a retractable measuring tape (Gulick II, Country Technology Inc.) by the same investigator.

On the second day, participants were seated in a comfortable chair and prepared for physiological measurement, at which point they were informed that the sensors placed on the face would measure electrical activity. Impedances for all electrodes were below 10 kΩ. Finally, headphones were placed on the participant and the lights were dimmed. The experimenter went through three practice trials with the participant, with specific instructions to view each picture for the entire time it was on the screen in front of them. Participants were told they would occasionally hear brief noises over the headphones that they should ignore. During the experimental process, pictures were shown for 6-s each with a randomly determined ITI lasting from 6 to 12 s. Following each picture participants made ratings along the dimensions of pleasure (happy to unhappy), arousal (excited to calm), and dominance (in control to controlled) using the SAM. Upon completion of the SAM ratings for the final picture, sensors were removed, the participant was briefed as to the purpose of the study, and her body composition information was discussed.

Statistical Analyses

SPSS 11.1 was used for all statistical analyses. Participants' responses to the four picture categories (i.e., pleasant, neutral, unpleasant, and self) were analyzed separately for each measure using a repeated measures MANOVA with the Wilks' Lambda statistic. Significant findings were explored using Bonferroni corrected t tests. The alpha level was set at $p \leq .05$ for all analyses prior to Bonferroni correction.

RESULTS

SAM Ratings

Pleasure

The multivariate analysis indicated that pleasant pictures elicited the highest pleasure ratings and unpleasant pictures elicited the lowest pleasure ratings with neutral and self-pictures falling between the two extremes, $F(3, 29) = 62.9$, $p < .001$, $\eta^2 = .87$. Follow-up analyses indicated that all categories were significantly different from one another in the stated direction, with the exception of neutral and self-pictures, $ts(1, 31) \geq 6.4$, $p < .001$ (see Table II).

Arousal

The multivariate analysis revealed that unpleasant pictures elicited the highest arousal ratings and neutral pictures elicited the lowest arousal ratings, with pleasant and self-pictures eliciting relatively moderate ratings of arousal, $F(3, 29) = 26.4$, $p < .001$, $\eta^2 = .73$. Post hoc analyses indicated that all picture categories were significantly different from one another, $ts(1, 31) \geq 4.8$, $p < .001$, with the exception of pleasant and self-pictures (see Table II).

Dominance

The multivariate analysis indicated that pleasant and neutral pictures were rated highest in dominance, followed by unpleasant and self-pictures, respectively, $F(3, 29) = 36.7$, $p < .001$, $\eta^2 = .80$. Follow-up analyses indicated that all picture categories were significantly different from one another, $ts(1, 31) \geq 2.9$, $p \leq .008$, with the exception of pleasant and neutral pictures (see Table II).

Table II. Mean (Standard Deviation) Self-Report Ratings Along a 0 to 20-Point Scale for the Dimensions of Valence, Arousal, and Dominance to the Four Picture Categories

	Picture category			
SAM measure	Pleasant	Neutral	Unpleasant	Self
Pleasure	14.2^{a} (2.2)	10.4^{b} (1.3)	3.1^{c} (2.7)	10.2^{b} (1.6)
Arousal	10.9^{a} (2.6)	7.3^{b} (2.3)	15.1^{c} (3.9)	9.9^{a} (2.6)
Dominance	12.1^{a} (2.3)	11.7^{a} (2.3)	4.8^{b} (3.0)	10.5^{c} (2.6)

Note. Values that share a common superscript are not significantly different at the $p \leq .05$.

Startle Reflex

The omnibus startle analysis indicated that self-pictures elicited the smallest blink magnitude and unpleasant pictures elicited the largest magnitude, with responses to pleasant and neutral pictures falling between the two extremes, $F(3, 28) = 13.5$, $p < .001$, $\eta^2 = .59$. Post hoc analyses revealed that responses to all picture categories were significantly different from one another, $ts(1, 30) \geq 2.8$, $p \leq .008$, with the exception of pleasant and neutral pictures, which did not differ (see Fig. 1).

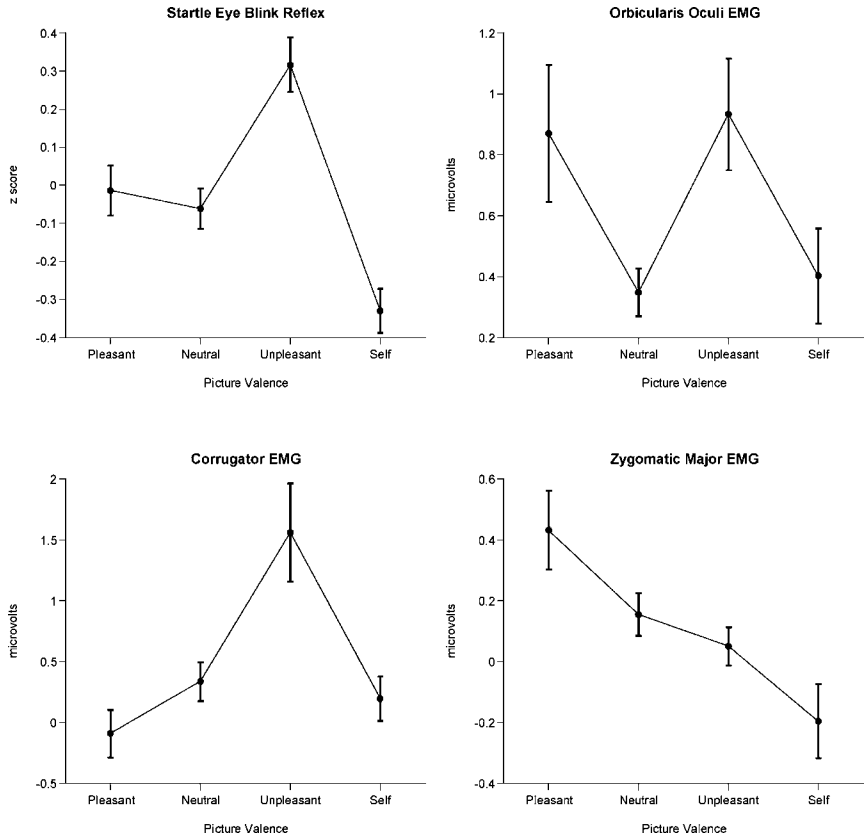

Fig. 1. Grand averaged data for the startle eye-blink reflex (upper left corner), orbicularis oculi EMG (upper right corner), corrugator EMG (bottom left corner), and zygomatic EMG (bottom right corner) to the four picture categories (pleasant, neutral, unpleasant, and self). Note that startle blink responses to self-pictures were inhibited relative to all other picture categories. Baseline oculi EMG was reduced for self-pictures compared to pleasant and unpleasant pictures. Corrugator EMG indicated that self-pictures elicited less activation than unpleasant pictures. Zygomatic EMG indicated that self-pictures elicited less activation than pleasant pictures and marginally less activation than neutral pictures.

Corrugator EMG

Corrugator analyses indicated that unpleasant pictures prompted the largest responses and pleasant pictures prompted the smallest responses, with neutral and self-pictures revealing relatively moderate activation, $F(3, 27) = 7.0$, $p < .001$, $\eta^2 = .44$. Follow-up analyses indicated that all categories were significantly different from one another, ts$(1, 29) \geq 3.0$, $p \leq .005$, with two exceptions: self-pictures were not significantly different from either pleasant or neutral picture categories (see Fig. 1).

Zygomatic EMG

Zygomatic analyses revealed that pleasant pictures prompted the largest activation, followed by neutral, unpleasant, and self-pictures, respectively, $F(3, 25) = 4.5$, $p = .01$, $\eta^2 = .35$. Post hoc tests indicated that pleasant pictures elicited greater zygomatic activation than unpleasant and self-pictures, ts$(1, 27) \geq 3.5$, $p \leq .002$, and were marginally greater than neutral pictures after Bonferroni correction, $t(1, 27) = 2.8$, $p = .01$. Follow-up tests also indicated that self-pictures prompted marginally less activation than neutral pictures after Bonferroni correction, $t(1, 27) = 2.7$, $p = .01$, and were no different than unpleasant pictures (see Fig. 1).

Orbicularis Oculi EMG

Orbicularis oculi analyses indicated that participants exhibited increased activation to pleasant and unpleasant pictures relative to neutral and self-pictures, $F(3, 28) = 5.1$, $p < .01$, $\eta^2 = .35$. Post hoc analyses indicated that unpleasant pictures prompted greater orbicularis oculi activation than neutral and self-pictures, ts$(1, 30) \geq 3.1$, $p \leq .004$. Pleasant pictures also elicited greater activation than neutral, $t(1, 30) = 2.3$, $p = .03$, and self-pictures, $t(1, 30) = 1.9$, $p = .06$, but to a marginal or nonsignificant extent after Bonferroni correction. Lastly, participants' responses to pleasant and unpleasant pictures did not differ from one another, nor did their responses to neutral and self-pictures.

DISCUSSION

Framed by the biphasic theory of emotion (Lang, 1985; Lang et al., 1997), the purpose of this study was to extend previous research on affective responses to pictorial stimuli by including reactions to pictures of oneself. Within the spectrum of affective picture viewing, participants' responses to pictures of themselves appear to be consistent with low arousing pleasant stimuli when both psychophysiological

and self-report data are considered, confirming, in part, our *a priori* prediction. That is, responses to pictures of oneself were similar to participants' responses to other arousing pleasant and neutral stimuli, with the noted exception of the zygomatic EMG response.

Specifically, valence ratings indicated that self-pictures were rated less pleasurable than pleasant pictures, more pleasurable than unpleasant pictures, and were no different from neutral scenes. Self-pictures were also rated less arousing than unpleasant pictures, more arousing than neutral pictures, and were no different from ratings of pleasant pictures. Dominance ratings indicated that participants reported less control for self-pictures compared to pleasant and neutral pictures, and more control than unpleasant pictures. Accordingly, compared to the other picture categories, participants rated themselves as moderately pleasant, arousing, and dominant, thus providing a basis on which to better understand the psychophysiological findings.

With regard to the psychophysiological data, the smallest startle blink reflex was observed for self-pictures, with pleasant, neutral, and unpleasant pictures replicating previous picture-viewing research with female participants (Bradley, Codispoti, Sabatinelli, & Lang, 2001). However, significant differences were not observed between pleasant and neutral pictures, which were likely the result of the moderately arousing pictures selected for the pleasant category (Bradley, Codispoti, Cuthbert, et al., 2001; Cuthbert et al., 1996). Thus, replicating Cuthbert et al. (1996), moderately arousing pleasant pictures did not exhibit greater startle inhibition than neutral pictures.

Previous startle research has indicated that inhibition of startle magnitude is associated with more pleasant emotional reactions (Lang et al., 1990). As such, one viable explanation for the observed blink inhibition to self-pictures is that participants responded with the greatest amount of pleasure to pictures of themselves. Despite the fact that participants rated pictures of themselves more similar to neutral contents than to pleasant contents, previous research has indicated some dissociation between the self-report and expressive physiological response systems (Bradley, Codispoti, Cuthbert, et al., 2001). Accordingly, the observed blink inhibition to self-pictures may reflect an overall pleasant emotional state in this population.

Alternatively, when the startle data are considered with subjective ratings and facial EMG, participants' overall responses to images of themselves are characteristic of a more neutral or low arousing affective response. Subjective ratings indicate participants had a healthy body image, given the low to moderate scores on the EDI-2 and the SPAS, as well as the positive valence rating for the SAM. Additionally, moderate arousal ratings coupled with the small startle response to pictures of oneself may reflect attentional inhibition. Cuthbert et al. (1996) found that the typical "affect-startle effect" was elicited only for those pictures deemed high in arousal. For pictures that were rated moderate in arousal, there were no significant differences between pleasant and unpleasant pictures, which showed

overall inhibition (Cuthbert et al., 1996). In the current study, the decreased startle blink reflex to self-pictures may be a result of increased attentional processing of the foreground stimulus (i.e., the picture); thus, more attentional resources may be allocated to the picture, leaving fewer resources to attend to the startle probe. Blumenthal, Chapman, and Muse (1995) found that startle responses are reduced when one is being observed, suggesting that when attentional resources are allocated toward the self, there is a withdrawal of attention from the environment.

Participants' increased attentional focus toward pictures of themselves may also be reflected in the lack of facial EMG activation to this picture category. Specifically, corrugator EMG responses to pictures of oneself were not significantly different from neutral pictures and replicated previous research, with the largest activity observed for unpleasant pictures, and smallest activity for pleasant pictures (Bradley, Codispoti, Cuthbert, et al., 2001; Lang et al., 1993). Zygomatic EMG responses yielded the smallest activation for self-pictures. Although one may expect increased zygomatic activity if participants rated self-pictures as pleasant, the lack of zygomatic activation observed herein may also reflect greater attentional allocation to this picture category, such that the increased attention to the picture may override affective responding, as measured via this muscle. Responses for pleasant, neutral, and unpleasant pictures also replicated previous research, with pleasant pictures eliciting the greatest zygomatic EMG activity, followed by neutral and unpleasant pictures, respectively (Bradley, Codispoti, Cuthbert, et al., 2001; Lang et al., 1993). Orbicularis oculi activity in response to pictures of oneself was not significantly different from that of neutral pictures and was smaller than that observed for pleasant and unpleasant pictures. Across facial EMG measures, responses to pictures of oneself did not differ from those for neutral pictures, with the exception of zygomatic EMG responses, which were reduced. Again, supporting an attentional explanation, the decreased activation for facial EMG responses, together with the inhibition observed for the startle blink response, may indicate increased attentional engagement to self-pictures relative to the other picture contents, and further suggests a pleasant affective set given the subjective pleasure ratings.

Implications and Future Research Directions

In addition to characterizing the basic emotional state associated with viewing images of oneself, implications of the present findings may contribute to the understanding of emotional correlates of body image and self-perceptions. Previous research has included work on body size estimation, reported body dissatisfaction, and correlates of eating disorders. However, Thompson, Penner, and Altabe (1990) suggest that certain deficits in the techniques used to estimate body size exist in the literature. Methodological concerns include instructions given to participants. That is, participants' estimates may be increased if they are asked to make ratings

based on how they feel as opposed to how they rationally view their body (i.e., how do you feel you look versus how do you think you look), illustrating the variance between cognitive and affective responses (Huon & Brown, 1986). The present study utilized a novel approach that attempts to minimize such methodological concerns by assessing underlying psychophysiological responses of the participant while viewing her pictorial image.

It should also be noted that results described herein might not extend to pathological populations, such as those individuals with social anxiety or Body Dysmorphic Disorder (BDD) where more intense scrutiny of self-pictures may occur. Those individuals with extreme body image concerns may respond to pictures of themselves with highly arousing negative emotions and potentiation of the startle reflex, based on studies of individuals who suffer from fear and anxiety disorders (e.g., Cuthbert et al., 2003; Hamm, Cuthbert, Globisch, & Vaitl, 1997; Merckelbach, de Jong, Leeuw, & Van den Hout, 1995). For example, Panayiotou and Vrana (1998) examined the effect of self-focused attention on the startle reflex in socially anxious individuals, and found that during self-focused conditions, larger startle responses were exhibited among the participants. They attributed this to an increase in arousal due to an enhanced demand for processing, citing that without sensory engagement, positively and negatively valenced arousal increases startle response (Panayiotou & Vrana, 1998). Accordingly, Lang et al. (1990) have suggested the startle response may be used to help diagnose anxiety-disorder patients and evaluate fear responses prior to and following therapy. As such, the present study is not only an important first step toward understanding how a normal, healthy sample of young females view themselves, but also may be viewed as a basis from which to compare the differential responses posited for pathological samples.

Additionally, probes in other sensory modalities or at varying times may help disentangle the complex nature of attention and emotion. For example, Bradley, Cuthbert, and Lang (1993) were able to assess the interaction of attention and emotion using pictures as a prepulse stimulus, based on the premise that inhibitory effects of a prepulse stimulus on the startle reflex is attributed to attention. Specifically, results showed greater inhibition of the startle response during initial processing of pleasant and unpleasant pictures when compared to neutral pictures (Bradley et al., 1993). Thus, if participants in the current study showed inhibition to the startle probe during initial processing of their pictures, this may be an indication of the increased attentional allocation to images of themselves.

Limitations

Despite the relationships demonstrated between responses to self-pictures and the other three valence categories, certain limitations should be noted. The pictures selected for the pleasant category were relatively low in arousal, resulting

in similar startle responses between pleasant and neutral pictures. Despite this, the inhibition of the startle blink response to self-pictures clearly demonstrates a need for further investigation to determine the nature of this effect. Additionally, pictures of recognizable or significant others were not presented, which would have allowed for additional comparison to better determine the origin of the observed psychophysiological effects. Although the pictures shown in this study contained pictures of other people, this may not have been sufficient for the comparison against the pictures of participants in their bathing suits. Nonetheless, affective responses to pictures of oneself were similar to those in previous reports that used pictures of ideal models (Hausenblas et al., 2002; Hausenblas et al., 2004). Furthermore, given the focus of study, it is possible that those who volunteered to take part and have their pictures taken are different from those who would not agree to do so. In the current study, none of the participants refused to take part upon learning that they would have their pictures taken, which may be an indication that the study sample had a healthy body image. Future studies, however, must take the fear of being photographed into consideration when the goal is to study those individuals with poorer body image.

Conclusion

This study examined the underlying emotional reactions of a sample of healthy, college age females viewing images of themselves. Results indicate that participants' responses to images of themselves may be characterized by a low arousing affective set across both psychophysiological and self-report measures. Future research should investigate pathological samples as well as various populations, such as different races and age cohorts to better characterize affective reactions related to self-perceptions. A focus on males may also yield unique results given that they react differently than females to the same emotion-eliciting pictures (Bradley, Codispoti, Sabatinelli, et al., 2001), and given the different sociocultural factors that shape males' viewpoints on the acceptable male image.

REFERENCES

Ben-Tovim, D. I., & Walker, M. K. (1990). Effect of a mirror on body-size estimation. *Perceptual and Motor Skills*, *71,* 1151–1154.

Blumenthal, T. D., Chapman, J. G., & Muse, K. B. (1995). Effects of social anxiety, attention, and extroversion on the acoustic startle eye-blink response. *Personality and Individual Differences*, *19,* 797–809.

Bradley, M. M., Codispoti, M., Cuthbert, B. N., & Lang, P. J. (2001). Emotion and motivation I: Defensive and appetitive reactions in picture processing. *Emotion*, *1,* 276–298.

Bradley, M. M., Codispoti, M., Sabatinelli, D., & Lang, P. J. (2001). Emotion and motivation II: Sex differences in picture processing. *Emotion*, *1,* 300–319.

Bradley, M. M., Cuthbert, B. N., & Lang, P. J. (1993). Pictures as prepulse: Attention and emotion in startle modification. *Psychophysiology*, *30,* 541–545.

Cash, T. F., & Pruzinsky, T. (Eds.). (2002). *Body image: A handbook of theory, research, and clinical practice*. New York: Guilford Press.

Center for the Study of Emotion and Attention [CSEA-NIMH]. (1999). *The international affective picture system* [photographic slides]. Gainesville, FL: The Center for Research in Psychophysiology, University of Florida.

Cuthbert, B. N., Bradley, M. M., & Lang, P. J. (1996). Probing picture perception: Activation and emotion. *Psychophysiology*, *33,* 103–111.

Cuthbert, B. N., Lang, P. J., Strauss, C., Drobes, D., Patrick, C. J., & Bradley, M. M. (2003). The psychophysiology of anxiety disorder: Fear memory imagery. *Psychophysiology*, *40,* 407–422.

Dimberg, U., & Karlsson, B. (1997). Facial reactions to different emotionally relevant stimuli. *Scandinavian Journal of Psychology*, *38,* 297–303.

Dimberg, U., Thunberg, M., & Elmehed, K. (2000). Unconscious facial reactions to emotional facial expressions. *Psychological Science*, *11,* 86–89.

Fisher, S. (1986). *Development and structure of the body image: Volume 1*. Hillsdale, NJ: Erlbaum.

Fridlund, A. J., & Cacioppo, J. T. (1986). Guidelines for human electromyographic research. *Psychophysiology*, *23,* 567–589.

Gardner, R. M., Gallegos, V., Martinez, R., & Espinoza, T. (1989). Mirror feedback and judgments of body size. *Journal of Psychosomatic Research*, *33,* 603–607.

Gardner, R. M., & Morrell, J. A. (1991). Body-size judgment and eye movements associated with looking at body regions in obese and normal weight subjects. *Perceptual and Motor Skills*, *73,* 675–682.

Garner, D. M. (1991). *The eating disorder inventory-2 manual*. Odessa, FL: Psychological Assessment Resources.

Hamm, A. O., Cuthbert, B. N., Globisch, J., & Vaitl, D. (1997). Fear and the startle reflex: Blink modulation and autonomic response patterns in animal and mutilation fearful subjects. *Psychophysiology*, *34,* 97–107.

Hart, E. A., Leary, M. R., & Rejeski, W. J. (1989). The measurement of social physique anxiety. *Journal of Sport and Exercise Psychology*, *11,* 94–104.

Hausenblas, H. A., Janelle, C. M., Ellis Gardner, R., & Focht, B. C. (2004). Viewing physique slides: Affective responses of high and low drive for thinness women. *Journal of Social and Clinical Psychology*, *23,* 45–60.

Hausenblas, H. A., Janelle, C. M., Ellis Gardner, R., & Hagan, A. L. (2002). Effects of exposure to physique slides on the emotional responses of men and women. *Sex Roles*, *47,* 569–575.

Huon, G. F., & Brown, L. B. (1986). Body images in anorexia nervosa and bulimia nervosa. *International Journal of Eating Disorders*, *5,* 421–439.

Lang, P. J. (1980). Behavioral treatment and bio-behavioral assessment: Computer applications. In J. B. Sidowski, J. H. Johnson, & T. A. Williams (Eds.), *Technology in mental health care delivery systems* (pp. 119–137). Norwood, NJ: Ablex.

Lang, P. J. (1985). The cognitive psychophysiology of emotion: Fear and anxiety. In A. Hussain Tuma & J. Maser (Eds.), *Anxiety and the anxiety disorders* (pp. 131–170). Hillsdale, NJ: Erlbaum.

Lang, P. J. (2000). Emotion and motivation: Attention, perception, and action. *Journal of Sport and Exercise Psychology*, *22,* S122–S140.

Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (1990). Emotion, attention, and the startle reflex. *Psychological Review*, *97,* 377–395.

Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (1997). Motivated attention: Affect, activation, and action. In P. J. Lang, R. F. Simons, & M. T. Balaban (Eds.), *Attention and orienting: Sensory and motivational processes* (pp. 97–135). Hillsdale, NJ: Erlbaum.

Lang, P. J., Greenwald, M. K., Bradley, M. M., & Hamm, A. O. (1993). Looking at pictures: Affective, facial, visceral, and behavioral reactions. *Psychophysiology*, *30,* 001–017

Lanzetta, J. T., Biernat, J. M., & Kleck, R. E. (1982). Self-focused attention, facial behavior, autonomic arousal and the experience of emotion. *Motivation and Emotion*, *6,* 49–63.

Lox, C., Martin, K., & Petruzzello, S. (2003). *The psychology of exercise: Integrating theory and practice* (pp 299–325). Scottsdale, AZ: Holcomb Hathaway.

Marsh, H. W. (1999). Cognitive discrepancy models: Actual, ideal, potential, and future self-perspectives of body image. *Social Cognition*, *17,* 46–75.

Merckelbach, H., de Jong, P. J., Leeuw, I., & Van den Hout, M. A. (1995). Startle responses of spider phobics to masked stimuli: A pilot study. *International Journal of Neuroscience*, *81,* 169–175.

Overduin, J., Jansen, A., & Eilkes, H. (1997). Cue reactivity to food- and body-related stimuli in restrained and unrestrained eaters. *Addictive Behaviors*, *22,* 395–404.

Panayiotou, G., & Vrana, S. R. (1998). Effect of self-focused attention on the startle reflex, heart rate, and memory performance among socially anxious and nonanxious individuals. *Psychophysiology*, *35,* 328–336.

Sanders, N. M., & Heiss, C. J. (1998). Eating attitudes and body image of Asian and Caucasian college women. *Eating Disorders: The Journal of Treatment and Prevention*, *6,* 15–27.

Scheier, M. F., & Carver, C. S. (1977). Self-focused attention and the experience of emotion: Attraction, repulsion, elation, and depression. *Journal of Personality and Social Psychology*, *35,* 625–636.

Silvia, P. J. (2002). Self-awareness and emotional intensity. *Cognition and Emotion*, *16,* 195–216.

Thompson, J. K., Penner, L. A., & Altabe, M. N. (1990). Procedures, problems, and progress in the assessment of body images. In T. F. Cash & T. Pruzinsky (Eds.),*Body images: Development, deviance, and change* (pp. 21–48). New York: Guilford Press.