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Identifying Attentional Bias and Emotional Response After Appearance-Related Stimuli Exposure

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Abstract

The effect of media images has been regarded as a significant variable in the construction or in the activation of body images. Individuals who have a negative body image use avoidance coping strategies to minimize damage to their body image. We identified attentional biases and negative emotional responses following exposure to body stimuli. Female university students were divided into two groups based on their use of avoidance coping strategies (high-level group: high avoidance [HA]; low-group: low avoidance [LA]), and were assigned to two different conditions (exposure to thin body pictures, ET, and exposure to oversized body pictures, EO). Results showed that the HA group paid more attention to slim bodies and reported more negative emotions than the LA group, and that the EO had more negative effects than the ET. We suggest that HAs may attend more to slim bodies as a way of avoiding overweight bodies, influenced by social pressure, and in the search for a compensation of a positive emotional balance. However, attentional bias toward slim bodies can cause an upward comparison process, leading to increased body dissatisfaction, which is the main factor in the development of eating disorders (EDs). Therefore, altering avoidance coping strategies should be considered for people at risk of EDs.

Introduction

INDIVIDUALS ARE EXPOSED daily to pictures of female bodies on the Internet, television, in magazines, and in advertisements. The effect of the media has been regarded as a significant variable in the construction or in the activation of body image.[1] Body image signifies an individual's perception of his or her physical appearance.[2] A negative body image is an important diagnostic criterion for eating disorders (EDs). Individuals with EDs generally perceive themselves as fat and unattractive, and they detest their bodies. This cognitive-emotion distortion is a characteristic of body image disturbance.[3]

According to the integrated cognitive-behavioral theory of EDs,[4] exposure to body-related stimuli constructs and develops body self-schema, and it then activates cognitive bias. This activation elicits negative emotion when interacting with self-schema related to body size/shape, which reactivates cognitive bias. The more frequently this circulation occurs, the stronger the association becomes. As a result, this mechanism may generate or maintain EDs.

According to Ferrer-Garcia and Gutierrez-Maldonado's review,[5] previous studies of body image disturbance using virtual reality found that participants with ED showed more negative emotional responses, such as increased anxiety and depressed mood, after exposure to food-related stimuli and to situations in which the body is observed by others, such as the swimming pool. These results demonstrated that exposure to body-related stimuli induces emotional response.

Attentional bias is one of the cognitive biases suggested in individuals with EDs, who may differentially attend to stimuli presenting weight/shape. Attentional bias plays an important role in etiology and/or in the maintenance of psychopathology.[6] According to the cognitive model of EDs,[7] individuals with EDs selectively attend to appearance-related cues. Identifying these attentional biases has been important because of their influence on the development or maintenance of EDs. Many studies have demonstrated the attentional bias present in EDs utilizing different measures. Previous studies using the modified Stroop color-naming tasks have found that individuals with EDs spent significantly more time naming colors of body shape-related words than neutral words.[8,9] This implies that individuals with EDs allocate greater attention to body shape-related stimuli. Studies using dot-probe tasks also have found evidence of attentional bias toward body shape-related stimuli in individuals with EDs and body disturbance.[10]

Attentional bias toward body-related stimuli can cause negative emotion, and an individual experiences this negative emotion as aversive, thus, it must be avoided.[4] In fact, when presented with an uncomfortable situation related to body image, a person with a negative body image may

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perceive the situation as stressful. As a result, such individuals establish coping strategies in an effort to control the stress associated with negative body image exposure.[11] Cash et al.[11] developed a Body Image Coping Strategies Inventory (BICSI) to assess the individual's coping mechanisms toward threatening body images. This scale consists of three subfactors: appearance fixing, positive rational acceptance, and avoidance. The avoidance factor measures efforts to escape from or block stressful body images. It has been demonstrated that this factor is highly correlated with negative body image assessing scales, and is a significant predictor of EDs.[11,12]

According to Kurosaki et al.,[13] healthy women showed significant activation of the amygdala when performing a fat-image task, but not in a thin-image task. This result suggests that women considered fat body stimuli to be a physiologically threatening stimulus, causing fear of gaining weight. From this, it can be suggested that individuals with a high avoidance [HA] tendency would activate their body-self schema when exposed to fat bodies more than for other body types. Further, they would pay more attention to slim bodies as a means of avoiding fear of fatness, and would also have more negative emotions after exposure to body-related images.

As the most direct method of identifying attentional bias, eye-movement (EM) monitoring has been used in similar studies, particularly ingaze duration.[14,15] Jansen et al.[3] demonstrated that women with ED symptoms gazed for a longer time at body parts, which were rated as beautiful of others, than did normal controls. Hewig et al.[16] also found that individuals with a high level of drive for attaining thinness showed an attentional bias toward body regions associated with changes in weight using an eye-tracking system. Kwak and Lee[17] identified attentional bias toward attractive bodies when studying EMs in a HA coping strategy group.

In the present study, we aimed to identify cognitive biases and emotional responses resulting from exposure to body stimuli, considering the individuals' level of avoidant coping strategies. Prior to the EM task, we divided subjects into two different conditions (exposure to thin body pictures, ET, and exposure to oversized body pictures, EO), so as to identify the type of bodies that have a negative effect. We predicted that the EO condition would lead to more negative effects. As expected, the EO condition induces more negative emotion and attentional bias toward slim body stimuli than the ET condition because the overweight stimuli are considered to evoke feelings of social pressure regarding weight gain. We therefore hypothesized that the HA group would show more attentional bias and negative emotion than the low avoidance (LA) group, with a more intense effect of EO than ET.

Materials and Methods

Participants

Prior to the experiment, 170 women from C University completed the Korean version of BICSI (K-BICSI). The HA- and LA groups were selected from the top and bottom quartiles, respectively, of the distribution of scores on the K-BICSI. Sixty-seven women (mean age: 21.24 years, $SD = 1.42$) were selected for the experiment (HA: 35; LA: 32). Participants in each group were randomly assigned to two different conditions.

Apparatus

Exposure stimuli. To control the exposure pictures, 21 female students rated 60 female pictures (30 pictures were thin and 30 were oversized). Online clothes shop and runway models were selected for the ET images, whereas online oversized clothes shop models were selected as EO images. To avoid any extraneous effects, faces were covered with a gray circle. Stimuli were rated on a seven-point scale for the overall body shape (1: extremely thin; 7: extremely fat) and a seven-point affect scale (1: negative; 7: positive). The average body shape score for the ET images was 1.96 ($SD = 0.59$), and for the EO, it was 5.70 ($SD = 0.45$). The emotion score for ET images was 3.77 ($SD = 0.69$), and for EO, it was 3.32 ($SD = 0.77$). 12 pictures in each category, which were more than two standard deviations (SDs) from the mean shape and affect scores, were excluded.

Eye-tracking images. Adobe Photoshop was used to construct images of three types of a female body. The software enabled images of females, who were clothed in bikinis, to be manipulated so as to appear skinny, slim, or overweight. Six sets of three images (Fig. 1) were used. Thirty-five students rated each image on a seven-point overall body shape scale (1: extremely thin; 7: extremely fat) and affect scale (1: negative; 7: positive). The average body shape score for skinny was 1.85 ($SD = 0.54$), slim was 3.39 ($SD = 0.71$), and overweight was 5.84 ($SD = 0.54$). The emotion score for skinny was 3.42 ($SD = 1.12$), slim was 5.00 ($SD = 0.90$), and fat was

FIG. 1. Three kinds of eye-tracking stimuli (from left to right: skinny, slim, and overweight).

2.74 ($SD = 0.77$). Women reported a more positive affect when looking at slim images, whereas skinny and overweight images were rated as eliciting a negative affect. For additional analysis, the average score of the 35 whole raters on the K-BICSI was 22.5. The images were 12.50 cm wide and 20.50 cm high on screen.

Eye-tracking device. The exposure stimuli were presented on a 17″ LCD-TFT monitor. Participants' EMs were recorded using a computerized eye-tracking system (View-Point PC-60 EyeFrame Scene Camera; Arrington Research, Inc.). The images were presented on a 19″ LCD-TFT monitor.

Measures

The Korean version of the BICSI[12]. The K-BICSI was used to assess how subjects coped with body-image threatening or challenging states. The Koreang version of this tool has been validated; it consists of three factors: appearance fixing, avoidance, and positive rational acceptance. Each of the 26 items was measured using a four-point scale. They addressed ways of assessing and coping with body-image threatening or challenging situations. In this study, only the avoidance factor was considered. Chronbach's alpha for this factor was 0.720.

Positive and Negative Affect Schedule[18]. The Positive and Negative Affect Schedule (PANAS) consisted of 10 positive affect items and 10 negative affect items alongside an appropriate scale for assessing the current affect. This experiment used a version of PANAS translated into Korean. Participants were asked to rate items on a scale from 1 to 5 (1: not at all; 5: extremely) based on the strength of emotion experienced. Chronbach's alpha for the positive and negative scales, when assessed for pre-exposure stimuli, was 0.879 and 0.879, and postexposure was 0.915 and 0.915. In the statistical analysis, the total score for the negative scale was subtracted from that for the positive scale. A higher score indicated a positive affect and a lower score indicated a negative affect.

Body mass index. To assess weight, participants were asked to report their height and weight. These were calculated into the body mass index (BMI; body weight divided by the square of body height).

Procedure

Participants initially signed a consent form, reported their current affect, and then were seated at a desk in front of a computer monitor. In the exposure phase, they were instructed to look at the monitor attentively to obtain a good score on a memory test after exposure (fake test). Subjects in both groups were randomly assigned to the ET or the EO condition. The exposure stimuli presentation took 108 seconds. Immediately after the exposure stimuli presentation, participants reported their affect. Three questions from the memory test followed, after which participants moved to another chair. They wore an eye-tracking device with the camera positioned below their right eye. The distance between the monitor and the eye-tracker was 65 cm. The eye-tracking equipment was calibrated for each participant by presenting 16 squares on the screen; the participants were required to look at each square in turn while the position of their gaze was recorded.

In the EM task, each trial started with a central cross fixation for 1000 ms, which was replaced by a set of images shown side by side for 4000 ms, followed by a 1000 ms blank screen. Three practice trials and 18 critical trials were conducted (the total presentation time of the critical trial was 108 seconds). Pairs of images (skinny–slim, slim–overweight, and skinny–overweight) were presented side by side simultaneously with the location of images counterbalanced. Before starting each trial, the following instructions were displayed: "From now on, the trial is underway. A pair of pictures will appear for 4 seconds after the '+' sign. Do not talk or move your head during the experiment." After the eye-tracking task, participants filled out questionnaires and were thanked for their efforts; they were given a small amount of money. These procedures took about 30 minutes in total.

Data analysis

The data were examined using the View Point data analysis program (Arrington Research, Inc.). The direction of gaze, measured in degrees, was recorded 30 times per second. The total time spent looking at each stimulus was recorded, and was considered indicative of attentional bias. For statistical analysis, SPSS 13.0 for Windows was used. An independent t-test was conducted to compare age, avoidance scores, and BMI. A 2 (group: HA, LA) × 3 (gaze duration toward skinny, slim, and overweight body) repeated-measured ANOVA was used for analysis of the between-subject variable and within-subject variables in each exposure phase. For the analysis of emotional change, a 2 (group: HA, LA) × 2 (PANAS, on pre-exposure and postexposure time points) repeated-measured ANOVA was performed.

Results

Sample characteristics

The mean age and BMI were not significantly different between the two groups; however, the avoidance score from the K-BICSI was significantly different between the HA and the LA groups [$t(66) = 19.10$, $p < 0.01$; see Table 1]. Twelve participants were excluded from the EM data analysis: two had moved their heads during recording, eight showed a leftward bias, and two showed a response more than two SDs from the mean score. The total number of participants in the final analysis was 55. For the emotion data analysis, seven participants were excluded because their means were also more than two SDs from the mean score; therefore, the total number of participants was 60.

EM results

Gaze duration. In the ET condition, analysis indicated significant effects of group and picture type [$F(1, 25) = 5.977$, $p < 0.05$; $F(2, 50) = 4.817$, $p < 0.05$], yet, there was no significant interaction of group × picture type [$F(2, 50) = 2.035$, n.s.]. Both groups gazed longer at the slim than the fat stimuli, and the HA group gazed longer at the skinny and slim stimuli than the overweight stimuli. In the EO condition, analysis revealed a significant effect of picture type and group × picture type [$F(2, 52) = 7.275$, $p < 0.01$; $F(2, 52) = 4.191$, $p < 0.05$], yet, there was no significant effect of group [$F(1, 26) = 0.183$, n.s.]. Specifically, the HA group gazed longer at the skinny and slim stimuli than the LA group, and less at overweight bodies. In

Table 1. Mean (±Standard Deviation) Sample Characteristics, Ems, and Emotional Changes in Participants

	HA		*LA*		
	ET	*EO*	*ET*	*EO*	t
Age	21.09 (1.26)		21.41 (1.56)		−0.93
AVO	18.37 (1.66)		11.69 (1.12)		19.10**
BMI	20.57 (1.89)		19.80 (2.19)		1.55
Gaze duration (seconds)					
Skinny	1.81 (0.44)	1.60 (0.33)	1.49 (0.27)	1.54 (0.26)	
Slim	1.78 (0.24)	1.92 (0.25)	1.73 (0.31)	1.73 (0.16)	
Overweight	1.38 (0.42)	1.39 (0.29)	1.48 (0.29)	1.67 (0.23)	
Affect					
Pre-exposure	7.87 (11.73)	7.43 (8.70)	12.06 (7.01)	10.87 (9.31)	
Postexposure	7.00 (11.71)	4.07 (7.30)	9.63 (8.89)	13.47 (8.67)	

**$p < 0.01$.

HA, high avoidance group; LA, low avoidance group; AVO, avoidance factor score of the Korean Version of the Body Image Coping Strategies Inventory; BMI, the body mass index; ET, exposure to the thin body condition; EO, exposure to the oversized body condition.

an additional analysis, it was identified that the HA group gazed longer at slim bodies rather than overweight bodies in both conditions [Fig. 2 (a-1), (a-2)].

Self-reported scale results

Affect. In the ET condition, analysis revealed no significant effects of group and time point [$F(1, 29) = 0.963$, n.s.; $F(1, 29) = 2.712$, n.s., respectively] and no significant effect of group × time point [$F(1, 29) = 0.613$, n.s.]. In the EO condition, analysis showed significant effects of group [$F(1, 27) = 4.896$, $p < 0.05$] and group × time point [$F(1, 27) = 5.309$, $p < 0.05$] interaction; however, there was no significant effect of time point [$F(1, 56) = 0.086$, n.s.]. The HA group reported more negative affect postexposure to EO than pre-exposure, compared with the LA group [Fig. 2 (b-1), (b-2)].

Discussion

In the present study, we identified how attentional bias and emotional response occur as the result of exposure to thin and oversized body stimuli based on the subjects' avoidance coping level. In the ET condition, there was no difference between the two groups in that both gazed significantly longer at slim bodies than fat bodies, and further, both groups did not show any emotional changes. In the EO condition, however, the HA group gazed significantly longer at skinny and slim bodies than overweight bodies compared with the

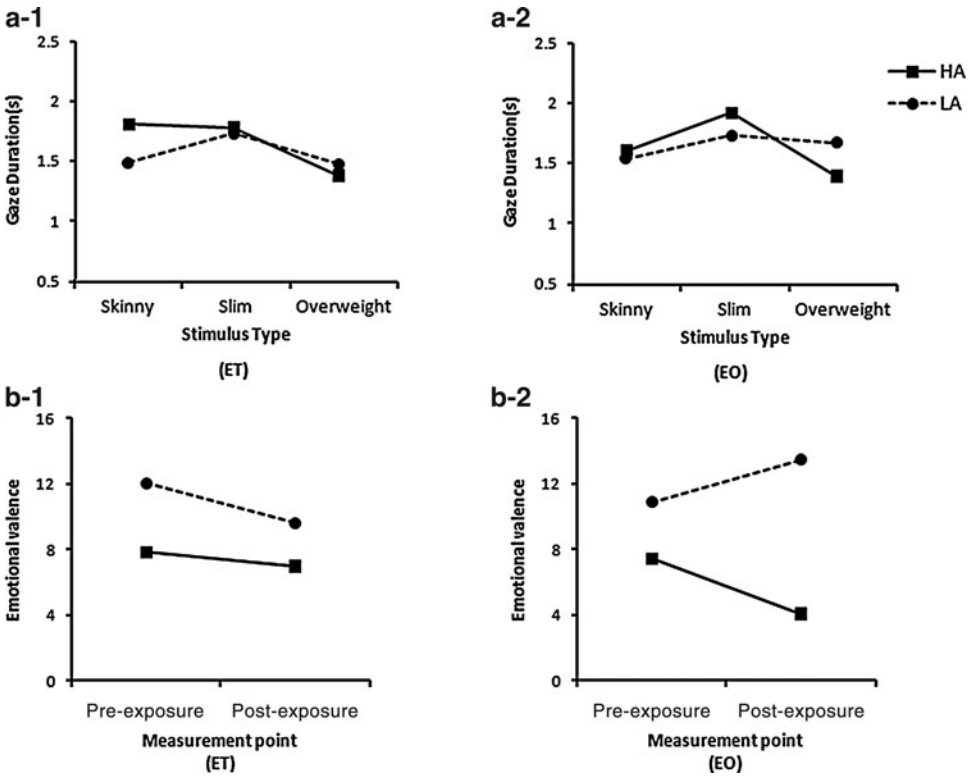

FIG. 2. Mean gaze durations and emotional change **(a-1)** is the mean gaze durations on various stimuli during exposure to the thin body condition (ET), and **(a-2)** is during exposure to the oversized body condition (EO). **(b-1)** is the mean emotional change according to the measurement points, pre-exposure and postexposure, in exposure to the thin body condition (ET), and **(b-2)** is in exposure to the oversized body condition (EO). HA, high avoidance group; LA, low avoidance group).

LA group, and showed negative emotional change after exposure. More specifically, exposure to oversized bodies had more overall negative effect on the HA group than the effect on the exposure to thin bodies.

These results could be explained by Kurosaki et al.,[13] which showed how women activated the amygdala when performing an overweight-image task, indicating that women considered the overweight body stimuli to be physiologically threatening. Similarly, in the present study, the HA group may have given more attention to slim bodies to avoid feeling psychological pressure related to the weight derived from the overweight body stimuli; negative emotional change was noted after exposure to an oversized body. Therefore, these results suggest that exposure to oversized female body pictures could have negative effects, such as on mood and cognitive bias, particularly for women in the HA group. Another possible explanation is that exposure to overweight bodies had only a non-specific negative effect on mood. Therefore, participants may seek compensation through attentional bias toward images with positive emotional balance, which was the slim body stimuli, particularly for people who use avoidance strategies.

Without reference to the effects of the exposure phase, further analysis showed that the HA group gazed significantly longer at slim bodies than overweight bodies. This result is consistent with the previous results, such that HA individuals pay more attention to socially desirable bodies than less desirable ones, compared with LA individuals,[17] and that ED subjects gazed longer at the beautiful body parts of others than less attractive parts, compared with the control group.[3] The social comparison theory[19] indicates that women tend to evaluate themselves through comparison with others who are more attractive.[20,21] This upward comparison generally leads to negative effects, such as negative mood and increased body dissatisfaction, which is an important factor in the development of EDs.[22] Therefore, the result relating to attentional bias suggests that HA individuals show similar cognitive bias to those with EDs, and that their attentional bias toward slim bodies could be a risk factor for developing EDs.

The present study has some implications in that we extended the findings of previous studies of body image disturbance by providing more information about attentional bias and emotional response through the results gathered via exposure to thin and oversized bodies. When identifying attentional bias, previous studies[3,16,17] presented female body pictures without considering the former exposure to body stimuli. However, we investigated the effect of the previous exposure to body pictures; the comparison between thin and oversized female body images was a component of this study.

Despite these contributions to the current literature, this study has some limitations. First, the sample size was small. In some groups, the participant numbers were less than 15, which may not be high enough to assure the validity of the results. In future study, researchers should consider repeating the current experiment with larger samples. Second, a manipulation check was not conducted. According to the integrated cognitive-behavioral theory of EDs,[4] exposure to body-related stimuli activates body self-schema and then induces cognitive bias and negative emotion. However, in this study, we cannot be certain that participants' body-self schema was activated by a pre-exposure to body pictures, which is what we propose made them attend to slim bodies. In future studies, researchers should consider measuring the activation of body self-schema by exposure to body-related stimuli. Finally, participants were all healthy college students. Although avoidance coping strategy usage has been identified as a significant predictor of EDs, we recruited participants using only their avoidance coping level. In further studies, researchers should consider other characteristics of participants, such as their drive for thinness or eating behaviors.

In summary, due to media promotion of thinness, most women appear to hold a belief that thinness is positive and that men prefer thinner women.[23] As a result, fatness is considered as aversive and may be fearful for women. In this study, women who had a high level of avoidance coping strategy usage felt negative emotion when exposed to oversized bodies, and at the same time, showed attentional bias toward slim body images. These characteristics are similar cognitive mechanisms to those proposed by the cognitive-behavioral theory of EDs. That is, an attentional bias elicits negative emotion, and that negative emotion also develops a negative self-schema for body size/shape and thus, creates cognitive bias.[4] If this cycle frequently occurs, the mechanism could facilitate the development of EDs. The relationship between cognition and emotion and coping strategies with regard to body image has largely been an unexplored area in the treatment of EDs. Findings from this study suggest that it may be necessary to closely examine coping strategies related to body image together when conducting treatment and prevention of EDs. Also, for further study, it may be necessary to utilize other more immersive forms of presentation of body related-stimuli, such as virtual reality. Using virtual reality will allow simulating a real-live situation related to body image disturbance[5] and facilitate the emotional involvement of participants.[24] In future studies, the use of a combination of virtual reality and eye-tracking system in individuals with body image disturbance should be considered.

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Author Disclosure Statement

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