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Role of attention, memory, and covariation-detection processes in clinically significant eating-disorder symptoms

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ABSTRACT

Cognitive theorists implicate a role for cognitive processing of shape- and weight-related information in the maintenance and potential etiology of eating disorders. The present study examines the role of women's processing of information regarding other women's body size and affect in eating disorder symptoms among young women. 253 female undergraduates completed attention, memory, and covariation-detection tasks that presented full-body photographs of young women, as well as an eating-disorder measure. High-Symptom women, relative to Medium- and Low-Symptom women, showed greater relative attention to body size than affect, better memory for body size and worse memory for affect, and enhanced sensitivity to the manipulated covariation between body size and affect. All participants perceived an illusory correlation between body size and affect. These findings suggest that cognitive theories may be extended usefully by considering processing of other-relevant and affective information, as well as the role of covariation-detection processes in eating disorders.

1. Introduction

Eating disorders are serious behavioral-health problems characterized by a diverse array of symptoms, including binge eating, regular use of compensatory measures to avoid weight gain, an overemphasis on the relevance of body shape and weight to self-evaluation, and dangerously low weight (American Psychiatric Association, 2006). Researchers have made remarkable advances in the development of effective treatments for eating disorders in the last two decades, with manualized cognitive-behavioral approaches emerging as the best-established treatments for both bulimia and binge eating disorder (Wilson, Grilo, & Vitousek, 2007). Large numbers of patients continue to struggle with clinically significant symptoms after receiving these best-practice treatments, however, and potential secondary treatments (e.g., medication, interpersonal therapy) have not proven helpful to partial- and non-responders (e.g., (Agras et al., 1995; Mitchell et al., 2002)). Thus, basic research on the cognitive and behavioral processes that maintain eating-disorder symptoms may point the field in new directions and ultimately may enhance the effectiveness of our treatment strategies.

Researchers increasingly have focused on the role of cognitive factors, such as distorted processing of shape- and weight-related information, in the etiology and maintenance of eating-disorder symptoms and in the development of cognitive-behavioral treatments for these symptoms (e.g., (Ainsworth, Waller, & Kennedy, 2002; Cooper, 2003, 2005; Cooper, Wells, & Todd, 2004; Fairburn, Cooper & Shafran, 2003; Lee & Shafran, 2004; Mizes & Christiano, 1995; Williamson, Muller, Reas, & Thaw, 1999)). For example, Vitousek and colleagues proposed that increased attention to and memory for shape-, weight-, and eating-related information play a central role in the development and maintenance of eating-disorder symptoms (e.g., (Vitousek, 1996; Vitousek & Ewald, 1993; Vitousek & Hollon, 1990)). Lee and Shafran (2004), in a recent review of the information-processing literature, reported that researchers have relied primarily on the emotional Stroop paradigm to examine attentional processes, although the dot-probe paradigm also has been used occasionally for this purpose (see, for example (Shafran, Lee, Cooper, Palmer, & Fairburn, 2007)). Only a handful of recall and recognition–memory studies have examined memory processes. Overall, the literature suggests that clinical samples in particular may show attentional biases toward and enhanced memory for weight-, shape-, and eating-related stimuli, consistent with information-processing models of eating disorders, although it is unclear whether such biases preceed, follow, or simply co-occur with disordered eating. Nonetheless, further investigation in this area would benefit from greater attention to the advances in contemporary cognitive science, as cognitive scientists (e.g., (Ashby, 1992; Nosofsky, 1992)) have developed a much wider

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array of theoretical models, measurement paradigms, and analytical techniques for the investigation of cognitive processing than currently are being employed by eating disorders researchers.

Additionally, Lee and Shafran (2004) noted that the overwhelming majority of the studies on cognitive theories of eating disorders have relied on word stimuli. Because shape-, weight-, and eating-related information frequently is represented visually, however, a greater reliance on photo stimuli would be expected to enhance the ecological validity of the findings. Thus, we have initiated a program of research which uses well-established and theoretically rich cognitive-science approaches to evaluate whether women reporting clinically significant eating-disorder symptoms, when compared with non-symptomatic women, exhibit differential processing of shape- and weight-related information presented in photo stimulus sets.

Previously, we examined the link between self-reported eating-disorder symptoms and attention to other women's body-size and facial-affect information among undergraduate women who were classified as High- or Low-Symptom on the basis of their responses to the Bulimia Inventory-Revised (Viken, Treat, Nosofsky, McFall, & Palmeri, 2002). We developed a photo stimulus set of young women who varied systematically along two dimensions: facial affect (sad to happy) and body size (light to heavy). The use of photo stimuli in the current work also allows us to investigate the relevance of processing of other women's characteristics. This is a surprisingly understudied area of research within the cognitive-processing literature on eating disorders, given the hypothesized importance of social-comparison processes in the development and maintenance of eating-disorder symptoms (e.g., (Beebe, Holmbeck, Schober, & Lane, 1996; Cash, 2002; Corning, Krumm, & Smitham, 2006; Janelle, Hausenblas, Fallon, & Gardner, 2003; Rosen, 1997; Thompson, Coovert, & Stormer, 1999)).

Because affective perception and memory are central to effective social interactions and emotion regulation, we chose facial affect as the second dimension for our photo stimulus set. Moreover, many women with eating disorders report both heightened interpersonal stress and a keen sense of social ineffectiveness, display marked deficits in interpersonal problem solving and emotion regulation, and indicate that negative mood and social interactions are a common trigger for eating-disordered behaviors (e.g., (Johnson, Schlundt, Barclay, Carr-Nangle, & Engler, 1995; Lingswiler, Crowther, & Stephens, 2006; McFall, Eason, Edmondson, & Treat, 1999; McManus & Waller, 1995; Smyth et al., 2007)).

In our initial study, participants completed similarity-ratings and prototype-classification tasks with these photo stimuli, which allowed us to quantify individual-specific attention to and utilization of body-size and affect information (Viken et al., 2002). Results were consistent with our hypotheses: When compared to Low-Symptom women, High-Symptom women showed greater attention to and utilization of body-size information, as well as less attention to and utilization of affect information. Enhanced processing of body-size information is fully consistent with the predictions of cognitive models of eating disorders. The symptom-linked differences in affective processing suggest that it is possible that eating-disorder symptoms are maintained not only by enhanced processing of shape- and weight-related information, but also by impoverished processing of affective information, however. These findings also highlight the importance of considering other-relevant processing, in addition to self-relevant processing, as suggested by social-comparison theories of eating disorders.

More recently, we evaluated whether undergraduate women who reported clinically significant eating-disorder symptoms were more likely to perceive an illusory correlation (i.e., a non-zero association when no association is present) between other women's affect and body-size information (Viken, Treat, Bloom, & McFall, 2005). Research has demonstrated that young women struggling with eating disorders endorse strong beliefs and expectations about the links between body size and a variety of indicators of happiness, such as others' acceptance, approval, and interest (e.g., (Annus, Smith, Fischer, Hendricks, & Williams, 2007; Cooper, Cohen-Tovée, Todd, Wells, & Tovée, 1997; Cooper, Todd, & Wells, 1998; Hohlstein, Smith, & Atlas, 1998)). Two research teams also have shown that expectations about the positive link between thinness and global self-improvement predict the onset and further development of eating-disorder symptoms among adolescent girls (Smith, Simmons, Flory, Annus, & Hill, 2007; Stice & Whitenton, 2002). This body of work suggests that symptomatic women indeed might erroneously perceive a negative correlation between other women's weight and happiness, even in the absence of such a relationship.

Viken et al. (2005) asked 186 undergraduate women to rate 75 photographs of women along multiple dimensions, including weight and affect. After completing the rating task, participants then judged the magnitude of the association between the women's weight and affect across the full set of photographs. Even though the correlation between participants' body-size and affect ratings was zero, participants on average perceived a small but reliable negative association between the two dimensions. That is, participants tended to perceive erroneously that large body size was associated with negative affect. Moreover, women who reported clinically significant eating-disorder symptoms perceived a significantly stronger illusory correlation than the less symptomatic participants. Such an illusory correlation could serve to confirm and exacerbate the shape- and weight-related concerns of symptomatic women, much as analogous illusory correlations between feared stimuli and negative outcomes have been proposed to maintain anxiety disorders (e.g., (Garner, Mogg, & Bradley, 2006; Hermann, Ofer, & Flor, 2004; Tomarken, Mineka, & Cook, 1989; Tomarken, Sutton, & Mineka, 1995)).

The present work aimed to extend our understanding of the role of attention, memory, and covariation-detection processes in disordered eating. First, we examined whether High-Symptom women, relative to both Medium- and Low-Symptom women, show relatively greater attention to other women's body-size than affect information. Such a finding would replicate and extend the findings reported in Viken et al. (2002), which juxtaposed only High- and Low-Symptom women. Second, we evaluated whether High-Symptom women exhibit worse memory for affective information and enhanced memory for body-size information. According to formal mathematical models of cognitive processing, attention provides critical input to other higher-order processes, such as memory, decision-making, and learning (see (Nosofsky, 1992)). Thus, impoverished encoding of affect should result in reduced memory for affect, and enhanced attention to body size should be associated with greater memory for body size, presuming that such information also was stored and retrieved adequately. A memory deficit for affective information would be of particular interest, given the constraints this might place on interpersonal effectiveness, a challenging arena for many women struggling with eating disorders.

Finally, we evaluated (a) whether High-Symptom participants show an enhanced illusory correlation for body-size and affect information when the covariation between the attributes varies across multiple randomly ordered trials; and (b) whether sensitivity to differing correlations covaries with eating-disorder symptoms. To address these questions, a novel covariation-detection task (CDT) was introduced, in which participants viewed a rapidly presented series of 16 photos and then judged the covariation of the affect and body size of the women depicted in the photos (see (Crump, Hannah, Allan, & Hord, 2007), for a related paradigm). The covariation of the two attributes varied randomly between −1.0

and +1.0 across trials, rather than remaining fixed at a single value, typically 0.0 in most studies. Multilevel regression analyses then were used to obtain individual-specific estimates of any illusory correlation between affect and body size (i.e., the predicted correlation when the true correlation is zero), as well as the sensitivity to the manipulated correlation across trials (i.e., the slope of the regression line linking true and judged correlations). Thus, the CDT characterizes the entire function linking the manipulated variability in covariation with judgments of covariation, whereas illusory-correlation paradigms typically evaluate only a single point on the function, most commonly when the true correlation is 0.0.

Conclusions about the average magnitude of an illusory correlation, as well as moderation of the magnitude of the illusory correlation by group status, may differ when evaluated in an experimental context in which each participant views and evaluates several varying associations. Numerous researchers have pointed out that it is unclear to what extent illusory-correlation findings reflect the influence of prior expectations about the covariation versus insensitivity to the covariation information presented during an experiment (e.g., (Alloy & Tabachnik, 1984; Garner et al., 2006; Hermann et al., 2004)). In the present context, the findings reported by Viken et al. (2005) might reflect group differences in prior expectations about the covariation between weight and happiness, group differences in sensitivity to the presented information, or both. Unlike prior illusory-correlation paradigms, the CDT allowed us to obtain separate and simultaneous estimates of the effects of illusory correlation and sensitivity on participants' covariation judgments.

Fig. 1 depicts potential regression lines that correspond to four different accounts of the relative influence of illusory correlation and sensitivity on covariation judgments. The True Correlation ranges on the X-axis from -1 (expectation-consistent association between body size and affect, such that lighter women are happier and heavier women are less happy) to $+1$ (expectation-inconsistent association, such that heavier women are happier and lighter women are less happy). If participant judgments are determined wholly by illusory perception of a negative relationship between weight and happiness, then correlation ratings should be the same regardless of the magnitude of the presented correlation on the CDT. Under this circumstance, the slope of the regression line would be approximately zero, and the intercept would be negative, as illustrated by Line A. If, instead, both illusory correlation and discriminative ability influence participants' covariation judgments, then the intercept still would be negative, but the slope of the regression line would be positive, as depicted by Line B. Line C would be anticipated if covariation judgments are determined entirely by moderate sensitivity to the manipulated correlations. Finally, Line D displays the expected regression line if a participant is insensitive to the variability in the presented correlations and displays no biases in perceptions of the correlations. Thus, exposure to and judgment of an array of correlations in the CDT allowed us to estimate separately the magnitude of two theoretically interesting contributors to covariation judgments (see (Allan, Siegel, & Tangen, 2005; Perales, Catena, Shanks, & González, 2005), for related, but independently developed, conceptualizations of contingency judgments).

In the current study, we used the CDT to evaluate whether participants in all three symptom groups showed a significant illusory correlation in the stereotypically consistent direction, such that thinner women are happier and heavier women are less happy, even though no such relationship existed on the trial in which the correlation is 0.0. Relative to less symptomatic women, High-Symptom participants were expected to display a more pronounced illusory correlation, given their markedly stronger endorsement of a constellation of beliefs and expectancies indicating that weight is related to happiness (e.g., (Annus et al., 2007; Cooper et al., 1997, 1998; Hohlstein et al., 1998)), as well as the findings reported by Viken et al. (2005).

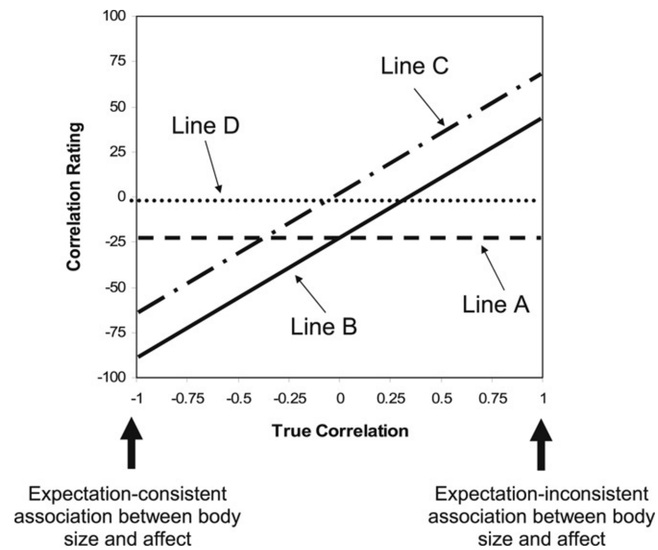

Fig. 1. Schematic illustration of four outcomes of theoretical interest on covariation detection task. Lines A and B are consistent with the presence of an illusory correlation in the expectation-consistent directions, whereas Lines C and D suggest that an illusory correlation is absent. Lines B and C indicate substantial sensitivity to the manipulated correlation, whereas Lines A and D indicate a lack of discriminative ability. See text for more details.

We also anticipated that participants in all three symptom groups would show substantial sensitivity to the manipulated covariation between body size and affect. In our weight-preoccupied society, young women will be particularly likely to encounter social environments in which negative correlations between weight and affect are present. Thus, young women should display greater sensitivity to manipulated correlations that are drawn from the stereotypically consistent region of the correlation dimension, in which thinner women are happier and heavier women are less happy. In other words, stereotypically consistent prior expectations not only should enhance the magnitude of the illusory correlation, but also could produce a nonlinear relationship between the true and judged correlations. Finally, we evaluated whether sensitivity to the manipulated correlation between the two attributes was associated with clinically significant eating-disorder symptoms. Given the novelty of the sensitivity construct and its indicator, this analysis was exploratory in nature. In all analyses, we also examined whether variability in depressive symptoms accounted for any observed group differences, given the comorbidity of depression and eating disorders (e.g., (Godart et al., 2007; O'Brien & Vincent, 2003)).

2. Method

2.1. Participants

Two hundred fifty-three unselected undergraduate females completed a *Stimulus Preview*, a *Prototype-Classification Task*, a *Recognition-Memory Task*, a *Covariation-Detection Task*, and a *Symptom Assessment*. As the overwhelming majority of eating-disorder patients are young women, college women compose a high-risk population for researchers seeking to understand the factors that cause and maintain problematic eating patterns.

2.2. Stimulus set

Viken et al. (2002) developed the initial stimulus set for this line of research. Undergraduate females were photographed in similar clothing (i.e., white short-sleeved t-shirt, black stretch pants, and white socks) and against a constant background (a grey cloth). Body size varied naturally, whereas facial affect varied systematically through experimenter manipulation; each model was instructed to display a range of facial expressions, from very sad to very happy. A sample of undergraduate women rated these photos on two 10-point scales: body size (underweight to overweight), and affect (unhappy to happy). Warping software was used to modify the body size of the females depicted in the photo stimulus set. Women's morphed heads were replaced with their original heads after morphing, so that their affect did not change. After completion of the stimulus development phase of this project, new normative data were collected for the final stimulus set from 186 undergraduate females. Participants rated each photo along several dimensions, including body size and affect, on a ten-point scale. Our research team carefully examined all of these potential images and removed those that were not realistic from further consideration. We used only non-warped stimuli as prototypes, to decrease the likelihood that participants would encode stimuli as warped or not. To ensure that whether a stimulus had been warped was unrelated to old/new status in the memory task, ten of the warped stimuli were "old" (i.e., viewed during the stimulus preview and classification tasks), and nine of the warped stimuli were "new" (i.e., viewed only during the memory task).

Photographs of 28 different women were selected on the basis of the normative data for use in the present study. Seven women were selected to represent each of the four regions of the two-dimensional stimulus space (e.g., normatively happy and heavy, happy and light, etc.). A second photo of each woman depicted her with either altered body size or altered affect, for use in the memory task. 16 unique women were selected for inclusion on each trial of the CDT. For the 56 photos of 28 women that composed the final stimulus set, the average affect rating was 2.98 ($SD = .48$) for women classified as sad, and 7.56 ($SD = .53$) for those classified as happy. The average body-size ratings for the women classified as light and heavy, respectively, were 3.71 ($SD = .70$) and 6.49 ($SD = .79$). The absence of a relationship between affect and body size was critical to our inferences about the existence of an illusory correlation. We addressed this issue in two ways. Most importantly, we documented the absence of a relationship between affect and body-size ratings among the women presented on the CDT trial in which $\phi = 0.0$. The body-size ratings of the 8 happier and 8 sadder women on this trial did not differ significantly, $t(14) = .75$ ns, and the affect ratings of the 8 heavier and 8 lighter women also did not differ reliably, $t(14) = .22$ ns. More broadly, we confirmed that affect and body-size ratings were uncorrelated for the stimuli used in the present study, $r(54) = -.091$ ns.

2.3. Experimental tasks

2.3.1. Stimulus preview

Participants viewed a single photo of each of 28 different women for three seconds apiece on a computer screen. Participants were asked to study each photograph, so that they became familiar with them prior to making later ratings of the photographs. Photos were presented in a different random order for each participant.

2.3.2. Prototype-classification task

Participants first viewed two prototypical women – a "Type D woman" and a "Type K woman" – who showed very different values along both body-size and affect dimensions, according to normative ratings. After studying these two prototypes for 10 s, the participant then classified each of the remaining 24 photo stimuli as an example of a Type D woman or a Type K woman. As the prototypes varied markedly along both body-size and affect dimensions, participants could use either or both dimensions as the basis for their classifications. Participants then repeated the task with two new prototypes, which were labeled a Type V and a Type N woman. The two sets of prototypes (for tasks "A" and B") are depicted in Fig. 2. In Task A, one prototype was normatively happy and heavy (body size and affect average ratings were 8.10 and 7.27 on a 10-point scale), whereas the other was normatively sad and light (ratings were 3.45 and 4.51). In Task B, one prototype was normatively sad and heavy (ratings were 2.57 and 6.40), and the other was normatively happy and light (ratings were 8.47 and 3.75).

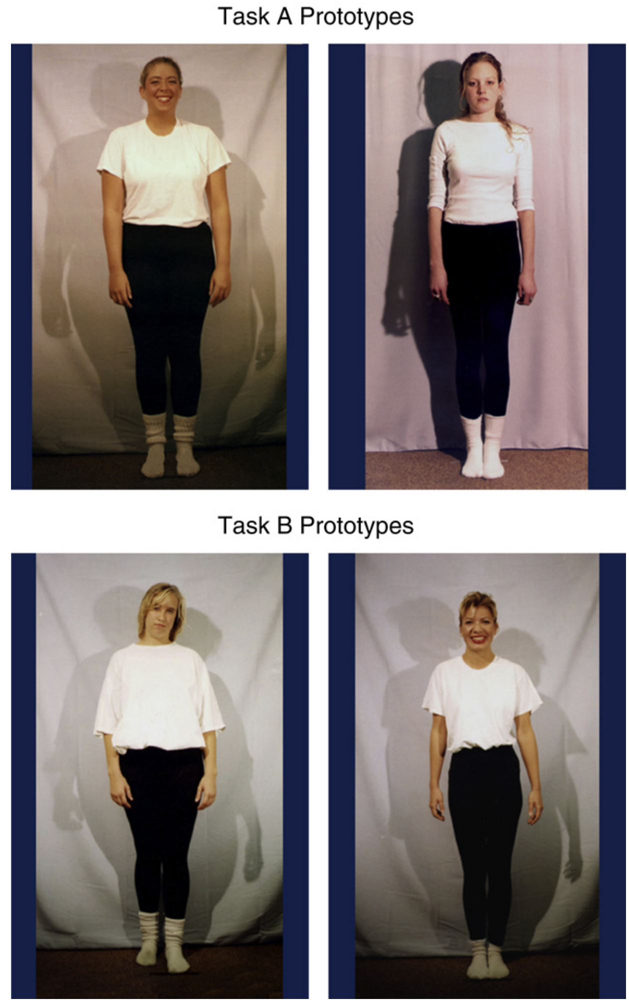

Fig. 2. Prototypes for Prototype Classification Tasks.

2.3.3. Recognition-memory task

Participants viewed 56 photos; half were identical to those seen in previous tasks. The remaining 28 photos depicted previously viewed women, but the woman's affect differed for 14 stimuli and the woman's body size differed for 14 stimuli (e.g., a previously happy woman appeared sad; a previously light woman appeared heavy). Participants were told that either "the look on her face" or "the shape of her body" might have been altered in each photo. The participant viewed all 56 photos one at a time and indicated whether she had seen this exact photo previously (i.e., whether the stimulus was "old" or "new") and how certain she was. On each trial, the participant made a rating of "definitely yes", "probably yes", "maybe yes", "maybe no", "probably no", or "definitely no". At the conclusion of the memory task, participants were asked to evaluate the adequacy of their memory for body-size and their memory for affect. They used two 4-point scales to indicate whether they "couldn't tell at all", "could tell some of the time", "could tell most of the time", or "could tell almost all of the time" when either the shape of the woman's body or the look on her face had changed.

2.3.4. Covariation-detection task

On each trial of this task, participants viewed 16 photos of unique women that were presented for 500 ms apiece. Participants then made a covariation judgment about the association between the body size and affect of the women on a 200-point scale, in which "100 = heavier women were always happy; lighter women were always sad", "0 = both heavier and lighter women were happy half the time and sad half the time", and "−100 = heavier women were always sad; lighter women were always happy". Appropriate labels were provided for each 25-point increment in the scale.

Nine trials were presented to each participant in a random order. Across the nine trials, the true correlation between the dichotomous values of the attributes (i.e., phi) ranged from −1.0 to +1.0 in .25 increments. On the trial that displayed a perfect negative association between body size and affect, for example, all viewed women were either happy and thin or sad and heavy. On the trial depicting no association between the two attributes, one quarter of the women were happy and thin, one quarter were happy and heavy, one quarter were sad and thin, and one quarter were sad and heavy. The model-predicted correlation rating when the true discrete correlation is zero thus reflects an illusory correlation that is not present in the presented stimuli.

2.3.5. Symptom assessment

Participants completed the Eating Disorders Examination questionnaire (EDE-Q; (Fairburn & Beglin, 1994)), a 36-item self-report version of the Eating Disorders Examination interview (EDE; (Fairburn & Cooper, 1993)). The EDE-Q shows good internal consistency and test–retest reliability (e.g., (Luce & Crowther, 1999; Mond, Hay, Rodgers, Owen, & Beumont, 2004a; Peterson et al., 2007)). The EDE-Q and EDE have shown high correlations regarding the core attitudinal aspects of eating-disorder symptoms in community samples (Fairburn & Beglin, 1994; Mond, Hay, Rodgers, Owen, & Beumont, 2004b), and the global score on the EDE-Q frequently is used as a measure of the overall severity of eating-disorder symptoms. Participants also completed the Beck Depression Inventory-II (BDI-II; (Beck, Steer, & Brown, 1996)), which shows excellent psychometric properties (e.g., (Beck et al., 1996; Dozois, Dobson, & Ahnberg, 1998)).

2.4. Procedure

Participants completed the tasks described above in the order in which they are presented. Participants were run individually by a female experimenter. Participants were uninformed about the focus of the study on eating patterns until after completing the cognitive task, when they completed a second consent form for the *Symptom Assessment*. The *Covariation-Detection Task* was added to the procedure after 23 participants already had completed the study, so the sample size for analyses of this task is 230.

3. Results

3.1. Participant groupings

Participants were classified as High-, Medium-, or Low-Symptom on the basis of their global scores on the EDE-Q. High-Symptom participants ($n = 20$) displayed a global score exceeding 4.0 (on a scale from 0.0 to 6.0). Fairburn and Cooper (1993) recommended using a cutoff score of 4.0 when determining whether responses to attitudinal items met diagnostic criteria for an eating disorder, such as importance of shape and weight to self-evaluation and fear of weight gain. Relevant normative data also attest to the validity of this cutoff. Mond, Hay, Rodgers, and Owen (2006) reported that a global score of 4.0 was at the 95th percentile for a large community sample ($n = 5255$) of young Australian adult women. Similarly, Luce, Crowther, and Pole (2008) reported that a global score of 4.0 was at the 94.4th percentile for a large sample ($n = 723$) of undergraduate women in the United States. Thus, we used a cutoff value of 4.0 to indicate the presence of clinically significant symptoms. Low-Symptom participants ($n = 70$) showed a Global score ≤ 1 on the EDE-Q. The remaining participants were classified as Medium-Symptom ($n = 163$).

3.2. Classification data analyses

The following logistic function was fit to each participant's dichotomous classification judgments for each of the two classification tasks, using the logistic-regression procedure in SPSS,

$$p(\text{Type } K \text{ or } N \text{ Woman}) = \frac{1}{1 + \exp(-[(a_k^* AFF) + (b_k^* BS) + c])}, \quad (1)$$

where $k = 1$ or 2, depending on whether the first or second classification task was being modeled, and *AFF* and *BS* refer to standardized normative scale values for the stimuli along affect and body-size dimensions. Note that the stimulus coordinates for the prototypes do not enter into the equation above. Because the prototypes for both tasks were in opposite corners of the psychological space, however, a_k and b_k indicated the extent to which a participant's dichotomous responses were related to the affect- and body-size values of the classified stimuli. The absolute value of the ratio of a_k to b_k in the equation above indicated a participant's relative attention to affect versus body size. As b_k approached zero, values of this ratio became extreme. Thus, the arctangent of the ratio was taken. The final measure of each participant's attention to affect, relative to body size, was the average of these transformed ratios for the two tasks. Values for this measure ranged from 0.00 rad (or 0 degrees), when the participant relied exclusively on body size in making her classification judgments, to 1.57 rad (or 90 degrees), when the participant attended only to affect when classifying the stimuli.

It would be inappropriate to reify the absolute magnitude of this relative-attention index, as it could vary as a function of prototype locations, among other things. We also sample only two prototype pairs from the universe of possibilities in the current tasks. Fortunately, our interest in the present work is not in the absolute magnitude of this index, but rather in individual differences in relative attention to the two stimulus dimensions when prototype locations are the same for all participants (i.e., when all participants view the same prototypes in the two tasks). Thus, we need assume only that the rank ordering of participants' relative-attention indices would be similar across multiple classification tasks that employed different prototypes that varied markedly along both body-size and affect dimensions. This assumption is upheld in the present work, as a strong correlation between the relative-attention indices for the two versions of the classification task was observed, $r(252) = .65$, $p < .001$.

Fig. 3 presents the average relative attention to affect versus body size for High-, Medium-, and Low-Symptom participants. A significant Group effect emerged, $F(2250) = 4.228$, $p < .05$, $\eta_p^2 = .033$. Planned contrasts indicated that High-Symptom participants showed significantly lower relative-attention scores than Medium- and Low-Symptom participants, both $ps < .025$

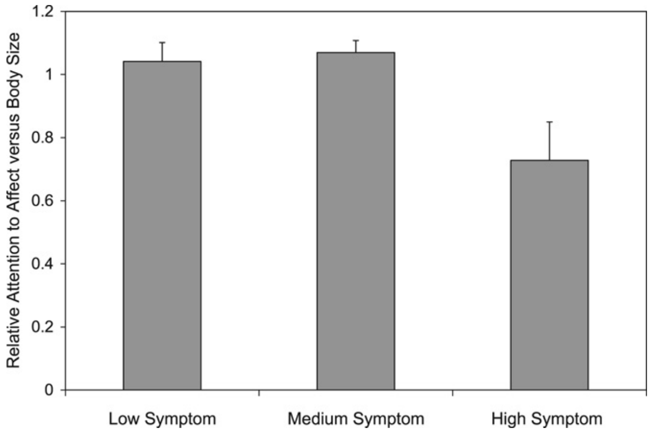

Fig. 3. Relative attention to affect versus body size among High-, Medium-, and Low-Symptom participants on Prototype Classification Task. The relative attention scale ranges from a minimum of 0.0 to a maximum of 1.57. Error bars represent one standard error above and below the mean.

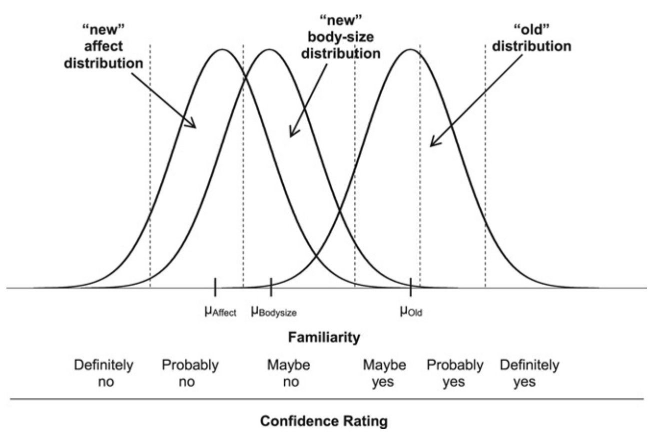

Fig. 4. Signal-detection theory model of performance on Recognition Memory Task. See text for details.

(i.e., $\alpha/2$). Thus, both Medium- and Low-Symptom participants attended relatively more to affect than to body size, in comparison to High-Symptom participants. In an additional analysis, participants' total BDI score (after a natural-log transformation eliminated severe right skew) did not account for significant variability in relative-attention scores, and inclusion of BDI in the model did not alter the magnitude of the Group effect. Thus, variability in depressive symptoms was not associated with relative attention to body-size versus affect information and did not account for the observed relationship between problematic eating patterns and relative attention scores.

3.3. Recognition memory data analyses

Signal-detection theory (SDT) methods (Macmillan & Creelman, 2005) commonly are used to quantify participant memory — in this case, participants' abilities to detect the "old" signal in the presence of either "new-affect" or "new-body-size" noise. In the present case, we fit an SDT model to the observed frequencies of each participant's 6-point confidence ratings for "old", "new-affect", and "new-body-size" stimuli ($n = 28$, 14, 14 respectively, for the three stimulus classes). The SDT model for recognition memory in this case, illustrated in Fig. 4, assumes that the stimuli are arrayed along a dimension ranging from low to high perceived familiarity. The stimuli are members of either the "old", the "new-affect", or the "new-body-size" distributions, which are unobserved (latent) and assumed to be normal in form.

Presumably, exemplars from the "old" distribution provoke a greater sense of familiarity on average, so this distribution is placed to the right of the other distributions in the figure. The "new-affect" distribution is placed to the left of the "new-body-size" distribution to reflect our expectation that memory will be greater for affect than for body-size information, given the far greater perceived salience of affect than body-size for this stimulus set in past research (Viken et al., 2002). Five decision boundaries, which are represented by dashed lines in the figure, partition the familiarity dimension into the six confidence-rating categories. On a given trial, a stimulus is assumed to evoke a particular value along the familiarity dimension and then is classified into the confidence-rating category associated with that value of familiarity. For example, presentation of a previously viewed woman with a startlingly different facial expression might provoke an extremely low feeling of familiarity that does not clear even the lowest boundary between "definitely no" and "probably no". Hence, the participant would respond "definitely no".

The SDT model was fit separately to each participant's frequency data. We fit the model only to the first response that participants made to each woman, given the potential dependence of the two responses to the same woman (i.e., the "old" and "new" versions of each woman).[1] Maximum-likelihood methods were used to estimate the means and standard deviations of the new-affect and new-body-size distributions; the mean and SD of the old distribution were fixed at 0.0 and 1.0, respectively. The locations of the five boundaries separating the confidence regions also were estimated. Given these parameter estimates, the standardized distance between the mean of the "old" distribution and the mean of one of the "new" distributions indicates the strength of a participant's memory for either affect or body-size information. This d'-like index (Macmillan & Creelman, 2005) is computed as follows:

$$d_a = \frac{\mu_{old} - \mu_{new}}{\sqrt{\frac{\sigma_{old}^2 + \sigma_{new}^2}{2}}}. \tag{2}$$

This measure differs from the classic d' measure only by allowing the variances of the old and new distributions to differ, and its values can be interpreted similarly.

Fig. 5 depicts the average memory (i.e., the average d_a values) for affect and body-size information for High-, Medium-, and Low-Symptom participants. These d_a values were submitted to a two-factor Group by Attribute (body size vs affect) ANOVA. Two sensitivity estimates (i.e., $<$ 1% of the data) were outliers, so we used a robust estimator in the General Estimating Equations procedure in SPSS to conduct the analysis. An Attribute effect indicated that memory for affect was superior to memory for body size, Wald $\chi_{(1)} = 9.477, p < .01$. The Group by Attribute interaction was significant, Wald $\chi_{(2)} = 19.364, p < .001$. Group effects were present for both affect, Wald $\chi_{(2)} = 8.691, p < .05$, and for body-size, Wald $\chi_{(2)} = 10.831, p < .01$. Follow-up comparisons indicated that High-Symptom participants showed significantly worse memory for affect than Medium-Symptom participants, Wald $\chi_{(1)} = 8.688, p < .01, d = .58$, as well as Low-Symptom participants, Wald $\chi_{(1)} = 4.764, p < .05$, $d = .55$. High-Symptom participants also displayed significantly better memory for body size than Low-Symptom participants, Wald $\chi_{(1)} = 9.651, p < .01, d = .73$. Memory for body size did

[1] We appreciate an anonymous reviewer's helpful suggestion that we model only the first response to each woman, in order to minimize the influence of response dependencies on our findings. Analysis of the full set of frequency data resulted in near-identical group differences in affect memory but no group difference in body-size memory.

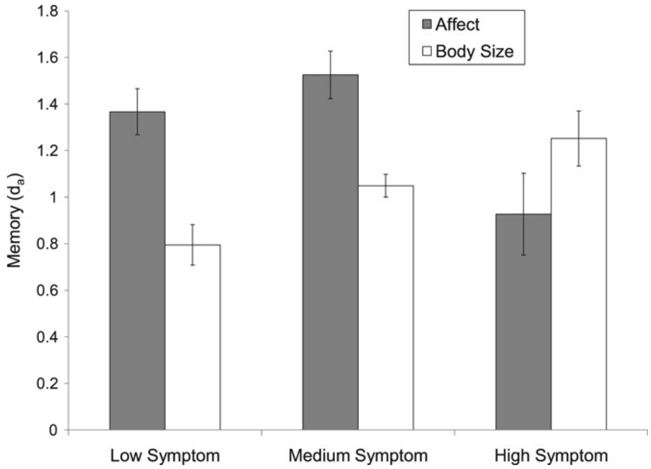

Fig. 5. Memory for affect and body size among High-, Medium-, and Low-Symptom participants. Error bars represent one standard error above and below the mean.

not differ reliably for High- and Medium-Symptom participants, Wald $\chi_{(1)} = 2.501, p > .10, d = .37$. Memory for body size across the three symptom groups was well-described by a linear trend, however, Wald $\chi_{(1)} = 10.577, p < .01$. Neither a main effect of BDI score nor an interaction between BDI score and attribute was present in an additional analysis, and including BDI in the model did not alter the magnitude of the Group by Attribute interaction (i.e., depressive symptoms did not account for the link between eating-disorder symptoms and memory for affect or body size).

Estimates of the five boundaries that defined participants' confidence regions also were evaluated in a two-factor Group by Boundary ANOVA. Seven threshold estimates (i.e., <1% of the data) were outliers, so we again used a robust estimator in the General Estimating Equations procedure in SPSS to conduct the analysis. Neither Group nor Group by Boundary effects were observed, and the inclusion of BDI in the model did not alter the pattern of findings.

Group differences in participants' evaluations of their memory for body-size and affect were evaluated using Kruskal–Wallis tests, given the ordinal nature of the response scale. Group differences in evaluations emerged only for affect, $\chi^2_{(2)} = 10.10, p < .01$. Post-hoc Mann–Whitney comparisons revealed that High-Symptom participants perceived their memory for affect to be worse than did the Medium- and Low-Symptom participants, *Us* = 997.00, 480.50, *ps* < .025, the Bonferroni-corrected alpha level.

3.4. Covariation detection task data analysis

Hierarchical linear modeling (HLM) was used to analyze the CDT data for 230 participants (19 High-Symptom, 146 Medium-Symptom, and 65 Low-Symptom). The level-one equation specified a quadratic association between the true correlation, which ranged from −1.0 to +1.0, and each participant's ratings of the correlation on each trial, which ranged from −100 to +100, as well as a random-effect error term, r:

$$\text{Correlation rating} = \beta_0 + \beta_1(\text{True correlation}) + \beta_2(\text{True correlation})^2 + r. \tag{3}$$

The first two level-two equations treated the level-one intercept and linear slope coefficients, β_0 and β_1, as random effects, necessitating the inclusion of a random-effect error term, u:

$$\beta_0 = \gamma_{00} + u_0, \tag{4}$$

$$\beta_1 = \gamma_{10} + u_1. \tag{5}$$

The third level-two equation treated β_2, the level-one acceleration coefficient, as a fixed effect, as preliminary analyses indicated there was limited variability in its estimate across participants:

$$\beta_2 = \gamma_{20}. \tag{6}$$

This Unconditional Model was fit to the data to facilitate evaluation of (a) the nature of the function relating the true and judged correlations (i.e., linear vs quadratic); and (b) the extent to which the function parameters varied substantially across participants, which is a necessary precondition for including predictors of such variability in future models.

The intercept estimate (γ_{00}) was −5.33 and differed significantly from zero, $t(229) = -5.604, p < .001$, indicating that the average judged correlation predicted by the model was negative when the true correlation was zero. In other words, an illusory correlation in the stereotypically consistent direction was observed. The linear slope estimate (γ_{10}) was 48.51 and also differed significantly from zero, $t(229) = 35.07, p < .001$, indicating that participants exhibited significant sensitivity to the manipulated correlation across trials. The acceleration parameter estimate (γ_{20}), which indicates the rate of change in participant sensitivity across the range of true correlations, was −11.42 and differed significantly from zero, $t(229) = -6.71, p < .001$. The negative value of the parameter estimate indicates that the slope of the average regression line decelerated as the true correlation increased; in other words, participants' sensitivity to the manipulated correlation decreased as the true correlation ranged from stereotypically consistent to stereotypically inconsistent. Both intercept and slope estimates exhibited significant variability across participants, $\chi^2_{(229)} = 282.90, 408.48$, both *ps* < .01, indicating the utility of examining predictors of variation in these parameters. Even though the acceleration estimates did not differ significantly across participants in preliminary analyses, we retained this parameter in the model as a fixed effect that influenced participant judgments in a uniform fashion.

Next, group status was included as a predictor of the random intercept and slope parameters in a Conditional Model at level two; group status was coded "−1" for Low-Symptom, "0" for Medium-Symptom, and "1" for High-Symptom, to facilitate evaluation of a linear trend:

$$\beta_0 = \gamma_{00} + \gamma_{01}(\text{Group status}) + u_0, \tag{7}$$

$$\beta_1 = \gamma_{10} + \gamma_{11}(\text{Group status}) + u_1, \tag{8}$$

$$\beta_2 = \gamma_{20}. \tag{9}$$

The level-one equation remained the same as in the Unconditional Model. Inclusion of group status in the model allowed us to examine whether High-Symptom women showed a stronger illusory correlation than less symptomatic participants (i.e., a more negative intercept), as well as differential sensitivity to the manipulated correlation between body size and affect (i.e., a steeper or shallower slope).

The intercept parameter estimate ($\gamma_{00} = -5.06$) continued to differ significantly from zero $t(228) = -5.03, p < .001$, indicating that an illusory correlation was present. Both the linear slope and the acceleration parameters (γ_{10} and γ_{20}) remained significant, with the linear slope equal to 49.68, $t(228) = 34.47$, $p < .001$, and the acceleration equal to −11.42, $t(2065) = -6.71$, $p < .001$. Group status was unrelated to the intercept ($\gamma_{01} = 1.36$), $t(228) = 1.024$ ns, indicating that the magnitude of the illusory correlation did not vary as a function of symptom status. Symptom group predicted linear slope values, however, $\gamma_{11} = 5.86, t(228) = 2.47, p < .05$, indicating that more symptomatic participants displayed greater sensitivity to the varying correlation than less symptomatic participants. Group status accounted for approximately 3.5% of the variability in the linear slopes across participants. Both the intercept and linear slope continued to vary significantly across participants, $\chi^2_{(228)} = 282.36, 399.24$, both *ps* < .01. In additional models, participants' total BDI score (after transformation to eliminate severe right skew) did not account for

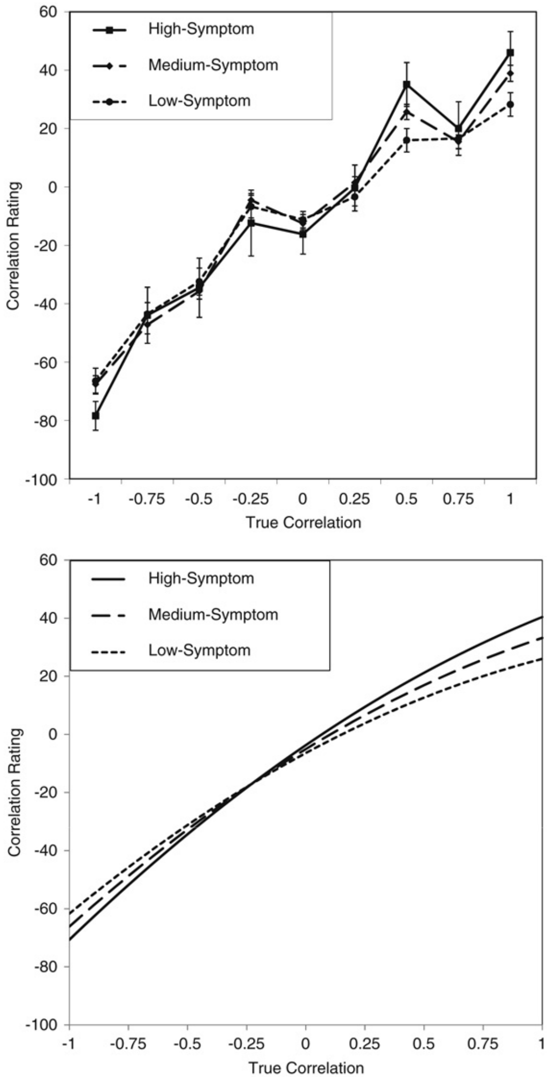

Fig. 6. Observed and modelled performance on covariation detection task among High-, Medium-, and Low-Symptom participants.

significant variability in either the intercept or the slope estimates, and inclusion of BDI in the model did not alter the observed relationships between other variables. Thus, depressive symptoms were unrelated to illusory-correlation magnitude and sensitivity, and the observed relationship between group status and sensitivity could not be accounted for by variation in depression.

Fig. 6 depicts the group-status moderation of the relationship between the true and judged correlations. Note that the function is quadratic, rather than linear, and decelerates as the true correlation changes in the stereotypically inconsistent direction. The linear slope is related to symptom status, indicating that sensitivity to the manipulated covariation between body size and affect increases with symptom group status. The predicted correlation rating when the true correlation is zero is less than zero, but the value varies little across groups, indicating that an illusory-correlation effect in the stereotypically consistent direction is present but not group-specific in magnitude.

4. Discussion

This study evaluated the extent to which attention, memory, and correlation–detection processes differ among college-aged women who report struggling with clinically significant eating-disorder symptoms, relative to their peers. We examined processing of shape- and weight-related information, as cognitive theories identify this as the primary "threat-relevant" information for the eating-disordered population. We also investigated processing of affective information, however, as deficits in such processing might lie upstream from the well-established difficulties that eating-disorder patients have managing challenging interpersonal situations and regulating their affect. We chose to evaluate participants' processing of the body-size and affective information of other women, rather than themselves, in part because this afforded greater standardization of stimulus materials, and in part because social-comparison processes are assumed to be central to the development and maintenance of eating disorders. Finally, we presented body-size and affective information using photographs, rather than words, to enhance the ecological validity of our findings.

4.1. Attention and memory processes

As expected, in the classification task, High-Symptom participants attended more than both Medium- and Low-Symptom participants to body-size information, relative to facial-affect information. This finding replicates and extends the work of Viken et al. (2002), who demonstrated this difference in relative attention between High- and Low-Symptom women. Thus, we anticipated that affective information necessarily would be relatively less accessible than body-size information to these other processes among High-Symptom women. In keeping with these expectations, both Low- and Medium-Symptom women showed significantly better memory for affect than body-size, Wald $\chi_{(1)} = 29.767, 19.232$, $p < .001$, $d = .73, .50$. In contrast, High-Symptom women showed a non-significant trend toward better memory for body-size than affect information, Wald $\chi_{(1)} = 3.248$, $p < .10$, $d = -.49$.

The attention index derived from the prototype-classification task used in the present study necessarily must be interpreted in relative terms, because it characterizes relative attention to affect and body size, rather than absolute attention to affect and body size. The recognition–memory task employed in the present study provides independent estimates of memory for affect and body-size information, however, allowing us to evaluate whether group differences in relative memory are attributable to differing memory for affect, body size, or both. As Viken et al. (2002) previously had demonstrated that High-Symptom women showed both greater attention to body size and less attention to affect, relative to Low-Symptom women, we anticipated that High-Symptom women would show enhanced memory for body size and reduced memory for affect. As expected, High-Symptom women showed markedly worse memory for affective information (Cohen's $d = .55$ and $.58$ for comparisons with Low- and Medium-Symptom participants, respectively), presumably secondary to their impoverished encoding of such information. High-Symptom woman also showed significantly better memory for body-size information than Low-Symptom women (Cohen's $d = .73$), and memory for body size increased linearly across the three symptom groups. This finding, in conjunction with the results of Viken et al. (2002), suggests that women who report clinically significant eating-disorder symptoms display enhanced encoding, storage, and retrieval of body-size information, relative to less-symptomatic women. To our knowledge, this is the first demonstration of symptomatic women's enhanced explicit memory for shape- and weight-related information, as represented in a more ecologically valid fashion in pictures, rather than in words or sentences. Interestingly, participants' self-reported evaluations of their performance on the memory task indicated that High-Symptom women were aware that their recollection of affect had been poor, in comparison to

Low-Symptom women. Future research should evaluate whether High-Symptom women's memory for affect, as well as their evaluation of their memory for affect, improves when task instructions direct participants' attention to both body-size and affect information during the stimulus preview and attention tasks.

Preoccupation with shape- and weight-related information is central to all cognitive theories of eating disorders (e.g., (Ainsworth et al., 2002; Cooper, 2003, 2005; Fairburn et al., 2003; Lee & Shafran, 2004; Vitousek & Hollon, 1990)), although performance-based examinations of cognitive processing of such information regarding others are quite rare. The present findings indicate that even other women's shape- and weight-related information is quite salient to and well-remembered by High-Symptom women, relative to other women's affective information, consistent with the expectations of social-comparison theorists (e.g., (Ainsworth et al., 2002; Beebe et al., 1996; Cash, 2002; Corning et al., 2006; Janelle et al., 2003; Rosen, 1997; Thompson et al., 1999)). Thus, existing cognitive theories might be extended fruitfully by incorporating a more explicit role for other-relevant, as well as self-relevant, processing of body-size information (or, alternatively, by treating some types of other-relevant information as self-relevant for symptomatic women). As processing others' characteristics is but a first step in social comparison, a potentially fruitful avenue for future research might examine whether symptomatic women rely relatively more on other women's body-size than affect information when making comparative judgments about the self (e.g., when evaluating which of a variety of women are more similar to their "real" and "ideal" selves).

Greater consideration of the role of affective processing in cognitive theories of eating disorders also appears warranted, as impoverished attention to and memory for another's affect might account in part for the commonly observed social incompetence and affect-regulation difficulties in this population. Future research should evaluate the hypothesized links between affective processing, eating-disorder symptoms, and social competence. It also will be important to evaluate relative attention to body-size, affect, and a third dimension (e.g., attractiveness) in future work, so that we can rule out the possibility that the processing deficits observed for affect would be observed for any dimension that co-occurs with body size (i.e., that the effects are not specific to affective information).

Finally, we should begin to investigate the utility of category-learning paradigms for the enhancement of attention to and memory for affective information. Goldstone and colleagues have examined the extent to which category learning influences participants' normative perceptual representations of simple, artificial stimuli (Goldstone, 1994; Goldstone, Lippa, & Shiffrin, 2001; Goldstone & Steyvers, 2001). Researchers have yet to evaluate the generalizability of their basic findings to individual differences in learning about more complex, socially relevant information, however, or to consider the applicability of this basic research to amelioration of cognitive-processing deficits in psychopathology.

4.2. Correlation-detection processes

The Covariation Detection Task (CDT) proved useful for the assessment of sensitivities and biases in participants' perception of the covariation between other women's body-size and affect information. In the final model, participants in the three symptom groups showed biased but uniform perception of a zero correlation (i.e., they saw a more negative relationship between body size and happiness than was present in the stimuli) and exhibited significant sensitivity to the manipulated correlation across trials, particularly when the correlation was in the stereotypically consistent direction. Sensitivity also correlated positively with eating-disorder status, such that High-Symptom participants showed the strongest performance and Low-Symptom participants the weakest.

The presence of an overall illusory correlation is consistent with prior work (Viken et al., 2005) demonstrating that young women erroneously perceive a correlation consistent with their pre-existing beliefs about the links between weight and happiness, even when such a correlation is not present. Contrary to prior findings, however, the magnitude of the perceived illusory correlation did not vary across symptom groups. The absence of a symptom-linked illusory correlation was surprising, given the far greater extent to which women who struggle with eating disorders anticipate that weight is related to positive outcomes (e.g., (Annus et al., 2007; Cooper et al., 1998; Hohlstein et al., 1998)), as well as the prior demonstration of a symptom-linked illusory correlation (Viken et al., 2005). The present assessment of illusory correlation differed from that reported in Viken et al. (2005) in at least two significant ways: first, by presenting multiple trials on which the correlation between the attributes varied strikingly, whereas only the single correlation of 0.0 was presented in Viken et al. 's assessment; and second, by alerting participants prior to viewing the stimuli that they later would be asked to make a covariation judgment. Either or both differences could account for the discrepancy in findings.

Future work should investigate the extent to which either exposure to or judgment of multiple correlations influences the magnitude of illusory correlations. Because illusory-correlation assessments in clinical psychology typically do not entail the administration of multiple trials with varying correlations to a single participant, it would be informative to examine whether symptomatic women perceive an illusory correlation when a single but moderate association in the stereotypically consistent direction is presented. If correlation ratings are driven entirely by prior expectancies, then average group ratings should remain unchanged in the presence of a moderate negative correlation. Different averaged ratings could be consistent with group differences in either expectancies or discriminative ability, and a single trial would not be sufficient to tease apart these explanations. More generally, an assessment approach in which each group of participants is exposed to a different correlation would allow investigations of research questions about clinically relevant sensitivities and biases in covariation detection while retaining the appealing feature of Viken et al. 's assessment — namely, that participants were unaware when they initially viewed the stimuli that they later would be asked to make a retrospective covariation evaluation. This aspect of Viken et al. 's design presumably maps better onto social-learning processes in the real world, in which people are not instructed to attend to the co-occurrence of aspects of the social environment (although they may be motivated to do so without instruction). Thus, future research should evaluate whether the magnitude of symptom-linked illusory correlations varies as a function of participant awareness of the upcoming covariation judgments during initial stimulus encoding. The convergence of the performance-based measure of expectancy obtained from the CDT with self-report measures of expectations and beliefs also merits investigation.

Participants also exhibited substantial sensitivity to the manipulated correlation. The slope of the average regression line predicting the correlation rating from the presented correlation was 49.68, with a value of 0.0 indicating no sensitivity and a value of 100.0 indicating perfect sensitivity. The relationship between the true and judged correlations was non-linear, with a decelerating slope, indicating that participants better discriminated correlations that were consistent with the widely held belief in our society that thinner women are happier and heavier women are less happy. For example, the model-estimated average correlation rating of a perfect negative (belief-consistent) correlation was −65.26, whereas the analogous rating of a perfect positive (belief-inconsistent) correlation was +31.76. Thus, even when half of the depicted women on a trial were happy and heavy, and the other half were sad and light, the average participant reported only a minimal positive association between body size and affect. This normative finding may reflect the differential prevalence of or exposure to social learning environments in which negative, zero, and positive correlations occur, such that young women in our society are more likely to have experience with and to develop expertise in detecting negative correlations between women's body-size and affect information. If so, then using the CDT as a training tool, in which participants receive trial-by-trial feedback on their judgments, may prove useful for enhancing young women's ability to detect belief-inconsistent associations between body-size and affect, as well as to distinguish between the magnitude of these correlations. Theoretically, such training eventually might contribute to the modification of normative beliefs about the extent to which body size is linked to happiness, via differential learning in real-world social environments (i.e., participants may be better positioned to detect belief-inconsistent information in their social environments).

In exploratory analyses, High-Symptom participants displayed greater sensitivity to the covariation between body-size and affect; the slopes of the average regression lines for High-, Medium, and Low-Symptom participants were 55.54, 49.68, and 43.82, respectively. High-Symptom women's greater sensitivity could reflect symptom-linked differences in either or both of two influences on the magnitude of this coefficient. First, the standardized relationship (i.e., the correlation) between the true and judged correlations might be stronger among High-Symptom women, such that the rank ordering of their judged correlations converges better with the rank ordering of the true correlations. Second, the variation in High-Symptom women's judgments about the true correlations might map better onto the variation in the true correlations, thus enhancing accuracy by minimizing the discrepancy between the true and judged correlations. Because the unstandardized regression coefficient in the multilevel analyses taps both subprocesses, it can be illuminating to juxtapose findings from analyses of participants' raw and standardized correlation judgments, as the latter analysis eliminates individual differences in the magnitude of participants' variability in judgments.

Thus, we fit the conditional model detailed in the results section to a standardized version of participants' ratings, in which each rating was divided by the standard deviation of the participant's ratings. The normative findings were fully consistent with those described previously, as expected: participants displayed a significant illusory correlation in the stereotypically consistent direction, $\gamma_{00} = -0.11$, $t(228) = -4.99$, $p < .001$; moderate "standardized sensitivity" to the manipulated correlations, $\gamma_{10} = 1.07$, $t(228) = 49.16$, $p < .001$; and a significant deceleration in their perceived correlations, $\gamma_{20} = -0.26$, $t(2065) = -6.46$, $p < .001$. Group status was unrelated to "standardized sensitivity", however, $\gamma_{11} = 0.04$, $t(228) = 1.11$ ns. This pattern of results suggests that High-, Medium-, and Low-Symptom women's judgments of the ordering of the manipulated correlations converged to a similar degree with the ordering of the true correlations. High-Symptom women, however, appeared to make better use of the full range of information that was present in the true correlations when making their (unstandardized) ratings. This implies that High-Symptom women judged the absolute magnitude of the true correlations more accurately, whereas the remaining women displayed a greater discrepancy between the true correlations and their ratings (i.e., their responses resembled a regression to the mean effect).

Ironically, such enhanced accuracy would be expected to work against High-Symptom participants, to the extent that society presents them with far more social environments with negative associations. Research indicates that exposure to television and magazines that promote a thin ideal is associated with eating-disorder symptoms among young women (e.g., (Botta, 2003; Harrison & Cantor, 1997; Stice, Schupak-Neuberg, Shaw, & Stein, 1994; Tiggemann, 2003)). The directionality of this relationship over a long time scale as of yet is unclear (Aubrey, 2006): symptomatic young women may expose themselves selectively to thin-ideal media, consumption of thin-ideal media may promote eating-disorder symptoms in this population, both processes may be operating in a reciprocal fashion, or a more complex model may account for the observed association. Nonetheless, the existing data indicate that symptomatic women view more thin-ideal mass media than non-symptomatic women, thus affording the former greater opportunity to cement their perception of a negative association between body size and various indicators of success or happiness. Thus, both society-based and symptom-linked greater exposure to social environments presenting negative associations may provide an evidence-based rationale for eating-disorder symptoms. Fortuitously, however, symptomatic women also may be better positioned than their peers to capitalize on greater exposure to environments depicting positive associations. Future research should evaluate whether training to enhance detection of positive correlations, in conjunction with increased exposure to social environments in which such correlations are present, proves beneficial in tempering the strength of High-Symptom women's beliefs — a presumed causal and maintaining factor in eating-disordered behavior and a common target in empirically supported treatments for eating disorders.

Overall, the CDT appears to provide a unique and useful window on the operation of social-perceptual processes, which presumably influence beliefs, judgments, behavior, etc. Relative to existing illusory-correlation paradigms, the CDT affords separate and simultaneous assessments of two independent characteristics of the function relating the presented and judged correlations, either of which might serve as a causal or maintaining factor in various clinical phenomena. Bias, or illusory correlation, is the model-estimated correlation rating when the presented correlation is zero. As numerous researchers have argued (e.g., (Tomarken et al., 1989, 1995)) a clinically linked illusory correlation may provide erroneous confirmation of patient concerns about the covariation between aversive stimuli and feared outcomes. Sensitivity is the model-estimated slope relating the true and judged correlations. Because existing illusory-correlation paradigms typically present only a single true correlation to participants, this parameter has not been estimated previously, although it is possible that clinical phenomena could be associated with either worse or superior covariation-detection skills. Thus, future research should examine the utility of the CDT for examination of covariation-detection questions within other areas of psychopathology.

5. Conclusions

The present research has demonstrated that college-aged women who struggle with clinically significant symptoms of eating disorders, in comparison to their peers, show altered processing of other women's body-size and affective information. In particular, High-Symptom women showed greater relative attention to body size than to affect, worse memory for affect, better memory for body size, and superior sensitivity to the covariation between body size and affect. Although depressive symptoms commonly co-occur with eating-disorder symptoms, the observed group differences were specific to variation in eating difficulties. Future work should examine whether these processing patterns are more marked in clinical samples, are present prior to the onset of an eating disorder, and are amenable to modification via experimental training methods. Existing cognitive theories prioritize attention to and memory for one's own shape- and weight-related information in the maintenance and potential etiology of eating disorders, but they may be extended usefully by incorporating processing of other-relevant information in addition to self-relevant information, by addressing the role of covariation-detection processes for eating disorders, and by considering the relevance of processing of affective information, in addition to body-size information.

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