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Covariation bias in women with a negative body evaluation: How is it expressed and can it be diminished?

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ABSTRACT

Background and objectives: Women with a negative body evaluation display *covariation bias*: They overestimate the relation between their own body and negative social feedback. This study aimed to develop a more fine-grained understanding of this covariation bias and to determine whether it could be diminished.
Methods: Seventy women completed a computer task wherein three categories of stimuli – pictures of their own body, a control woman's body, and a neutral object – were followed by (nonverbal) negative social feedback or nothing. Participants' estimates of the relation between each stimulus category and negative social feedback were assessed throughout the task.
Results: Before starting the task, women with a more negative state body evaluation *expected* their body to be followed by more negative social feedback (demonstrating *a priori* covariation bias). During the task, when the relation between stimulus category and negative social feedback was random, women with a more negative trait and state body evaluation perceived at the present moment (*online* covariation bias) and retrospectively (*a posteriori* covariation bias) that their body was followed by more negative social feedback. When contingencies were manipulated so that women's own body was rarely followed by negative social feedback, covariation bias was temporarily diminished; this coincided with improvements in state body evaluation.
Limitations: The task did not incorporate neutral or positive social feedback and focused only on undergraduate women.
Conclusions: Covariation bias exists *preexperimentally* and occurs when situational information is ambiguous. It is possible to (temporarily) diminish covariation bias. This might be a technique for improving body evaluation.

1. Introduction

Individuals with a negative body evaluation (i.e., dissatisfaction with one's body) demonstrate distortions in cognitive processing (Cash, 2011), such as dichotomous thinking (e.g., in terms of fat vs. thin) and magnification of perceived flaws in appearance (Jakatdar, Cash, & Engle, 2006). These distortions in cognitive processing are related to greater psychological investment in one's appearance, preoccupation with being or becoming overweight, and pathological eating attitudes and behaviours (Jakatdar et al., 2006). Furthermore, distortions in cognitive processing reinforce and maintain negative body evaluation (Williamson, White, York-Crowe, & Stewart, 2004). For these reasons, investigating distortions in cognitive processing is important for understanding the aetiology and maintenance of negative body evaluation and how to alleviate it. The present study focuses, in particular, on covariation bias.

Covariation bias (often called *illusory correlation*) is a distortion in cognitive processing whereby an individual overestimates the contingency between a particular stimulus and an aversive outcome – even when the contingency is absent or is correlated in the opposite direction (Chapman & Chapman, 1967). Covariation bias has frequently been studied in individuals with an anxiety disorder or high levels of anxiety symptomatology. For example, in the classic covariation bias paradigm (Tomarken, Mineka, & Cook, 1989), individuals are presented with pictures belonging to three

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categories of stimuli: (a) spiders (fear-relevant), (b) snakes (fear-relevant), and (c) mushrooms or flowers (neutral). Across a series of trials, the pictures are followed by an electric shock (the aversive outcome), a tone (the nonaversive outcome), or nothing. Importantly, the contingencies between each stimulus category and each type of outcome are random. At the end of the task, participants estimate the percentage of trials of each stimulus category that were followed by each type of outcome. The key finding is that individuals who are highly fearful of spiders markedly overestimate the contingency between pictures of spiders and the electric shock, whereas their other estimates are quite accurate (Tomarken et al., 1989; see also De Jong & Merckelbach, 1993; De Jong, Merckelbach, & Arntz, 1995). This may reflect an underlying assumption that spiders are dangerous (Tomarken et al., 1989).

Alleva, Lange, Jansen, and Martijn (2014) demonstrated that negative body evaluation is associated with covariation bias as well. In their study, 65 women completed a computer task wherein pictures of their own body, a control woman's body, and a neutral object, were followed by nonverbal social feedback (i.e., facial crowds with equal numbers of negative, positive, and neutral faces). Their findings showed that women with a more negative body evaluation estimated higher levels of negative social feedback (the aversive outcome) for their own body (the stimulus), but not for the other stimuli (i.e., the control woman's body and the neutral object). In addition to reinforcing and maintaining body image distress in itself, such a covariation bias could cause women to inadvertently *elicit* negative social feedback from others (e.g., by avoiding eye contact), thereby further reinforcing negative body evaluation (Alleva et al., 2014; Tantleff-Dunn & Lindner, 2011).

The first aim of the present study is to develop a more fine-grained understanding of the covariation bias for the relation between women's own body and negative social feedback. Covariation bias can be expressed in three ways (Mayer, Muris, Freher, Stout, & Polak, 2012; Pauli, Montoya, & Martz, 1996; Pauli, Montoya, & Martz, 2001). *A priori covariation bias* refers to an individual's expectancy of a relation between a stimulus and an outcome, *before* the stimulus-outcome pairings have occurred or been presented (e.g., “When I arrive at the party, everyone will look at me and think I am unattractive;” Mayer et al., 2012). On the other hand, *online covariation bias* refers to an individual's *current* perception of a relation between a stimulus and an outcome (e.g., “Right now, everyone is looking at me and thinking I am unattractive;” Pauli et al., 2001). Lastly, *a posteriori covariation bias* refers to an individual's perception of a relation between a stimulus and an outcome *after* the stimulus-outcome pairings have occurred or been presented (e.g., “At the party last night, everyone looked at me and thought I was unattractive;” Tomarken et al., 1989). The covariation bias demonstrated by Alleva et al. (2014) was in fact an *a posteriori* covariation bias, as participants' covariation estimates were assessed at the end of the computer task.

Prior experimental research has shown that although both high and low fear individuals – that is, individuals with high and low scores on a measure of the pathology under investigation (e.g., spider phobia, panic disorder) – may demonstrate an *a priori* covariation bias for the relation between fear-relevant stimuli and an aversive outcome (e.g., Amin & Lovibond, 1997), only high fear individuals demonstrate an *a posteriori* covariation bias as well (e.g., Amin & Lovibond, 1997; Pauli et al., 1996, 2001; Tomarken et al., 1989). These findings suggest that covariation bias exists *preexperimentally*, and is not merely formed during an experiment due to differential ‘online’ processing of stimuli (Amin & Lovibond, 1997; De Jong, Merckelbach, & Arntz, 1990; McNally & Heatherton, 1993). In addition, these findings suggest that high fear individuals are resistant to “disconfirming situational information” (i.e., the fact that there is absolutely no relation between the stimulus and the aversive outcome; Pauli et al., 1996), whereas low fear individuals do adjust their preexperimental estimates according to disconfirming situational information (Pauli et al., 1996). This would also explain why high fear individuals, but not low fear individuals, have been shown to display an online covariation bias as well (e.g., Pauli et al., 1996, 2001). In the present study, we expected that women with a more negative body evaluation would demonstrate *a priori*, online, and *a posteriori* covariation biases.

The second aim of this study was to investigate if the covariation bias for the relation between women's own body and negative social feedback could be diminished. Pauli et al. (2001) showed that a covariation bias for fear-relevant stimuli (pictures of emergency situations) and an aversive outcome (electric shocks) could be abolished by manipulating the contingency between different types of stimuli and the aversive outcome. To do so, in a computer task, pictures of emergency situations were followed by shocks on a minority (17%) of trials, whereas fear-irrelevant stimuli were followed by shocks on a majority (83%) of trials. This manipulation successfully diminished the covariation bias found in high fear participants in a prior block of the experiment. Interestingly, the covariation bias did not return in a subsequent block where contingencies returned to random.

To our knowledge, Pauli et al.'s (2001) study is the only study to have reported a technique for diminishing covariation bias. Therefore, in the current study, we adapted Pauli et al.'s approach to try to diminish the covariation bias for the relation between women's own body and negative social feedback. That is, we created a computer task that was modelled as closely as possible to Pauli et al.'s computer task, but with stimuli (e.g., pictures of women's own body) and an aversive outcome (negative social feedback instead of an electric shock) that were specific for the covariation bias under investigation. In addition, to explore whether any changes in the covariation bias coincide with changes in body evaluation, we assessed women's state body evaluation throughout the computer task. We expected that the covariation bias in women with a more negative body evaluation would be diminished by the computer task, and that this change would persist when contingencies returned to random.

2. Material and methods

2.1. Participants

Seventy-eight women participated in this study. Six participants were excluded from the dataset because they were aware of the study aim, one participant was excluded because her body mass index (BMI) indicated that she was obese (BMI = 34.26), and one participant was excluded because her BMI indicated that she was severely underweight (BMI = 15.57; BMI was calculated based on participants' self-reported weight and height). The final dataset comprised 70 women between 18 and 29 years (M_{age} = 22.30, SD = 2.66), with a BMI between 17.31 and 28.71 (M_{BMI} = 21.87, SD = 2.60). The majority of the participants were university students (80.0%).

2.2. Materials

2.2.1. Computer task

At the start of the computer task, participants were told that it was their job to determine the relation between three categories of pictures – their own body, another woman's body (i.e., the control woman's body), and a lamp (i.e., the neutral object) – and two outcomes: “negative portrait photos” (i.e., the negative social