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The effects of a novel hostile interpretation bias modification paradigm on hostile interpretations, mood, and aggressive behavior



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ABSTRACT

Background and objectives: Cognitive theories of aggression propose that biased information processing is causally related to aggression. To test these ideas, the current study investigated the effects of a novel cognitive bias modification paradigm (CBM-I) designed to target interpretations associated with aggressive behavior.

Methods: Participants aged 18–33 years old were randomly assigned to either a single session of positive training ($n = 40$) aimed at increasing prosocial interpretations or negative training ($n = 40$) aimed at increasing hostile interpretations.

Results: The results revealed that the positive training resulted in an increase in prosocial interpretations while the negative training seemed to have no effect on interpretations. Importantly, in the positive condition, a positive change in interpretations was related to lower anger and verbal aggression scores after the training. In this condition, participants also reported an increase in happiness. In the negative training no such effects were found. However, the better participants performed on the negative training, the more their interpretations were changed in a negative direction and the more aggression they showed on the behavioral aggression task.

Limitations: Participants were healthy university students. Therefore, results should be confirmed within a clinical population.

Conclusions: These findings provide support for the idea that this novel CBM-I paradigm can be used to modify interpretations, and suggests that these interpretations are related to mood and aggressive behavior.

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Research into the social cognitive aspects of aggressive behavior has shown that aggressive individuals frequently display cognitive biases in the processing of environmental stimuli (Quiggle, Garber, Panak, & Dodge, 1992). According to the social information processing (SIP) model (Crick & Dodge, 1994), an individual's social behavior is a function of six steps: (1) encoding of social cues; (2) interpretation of those cues; (3) setting goals; (4) formulating responses; (5) evaluating different responses until an acceptable response is generated; and (6) response enactment. Adequate processing of social information during these steps will lead to adaptive behaviors, while biased processing may result in

maladaptive behaviors, including aggression.

In line with this model, reactive aggression has been found to be associated with biases in encoding and interpreting social cues (e.g., Dodge, 2006). With respect to the interpretation of social cues, a meta-analytic review found that more hostile attributions are strongly related to more aggressive behavior (Orobio de Castro, Veerman, Koops, Joop, & Monshouwer, 2002). For example, Crick and Dodge (1996) showed in a sample of aggressive and non-aggressive children aged nine to 12 that reactive aggressive children more often attributed hostile intent to peers than non-aggressive children and that these hostile attributions motivated aggressive behavior. Such findings inspired the development of a number of interventions aimed at preventing or reducing aggressive behavior by manipulating social information processing.

One way to manipulate social information processing is by employing cognitive bias modification (CBM). This paper focuses on

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the effects of manipulating interpretation bias (CBM-I) on aggression. Such CBM-I procedures are designed to modify interpretations of the intentions of others, by exposing participants multiple times to ambiguous social situations and training them to interpret these situations either in a negative (i.e., hostile) or positive (i.e., prosocial) way using feedback. For example, Vassilopoulos, Brouzos, and Andreou (2014) trained a sample of 10–12-year-old children using a three-session attribution training program, and found that hostile attributions regarding ambiguous social situations decreased while positive attributions increased.

Studies in adult samples have also suggested that hostile interpretations can be modified using CBM procedures (Hawkins & Cougle, 2013; Penton-Voak et al., 2013). For example, Hawkins and Cougle (2013) randomly assigned a number of undergraduate students to a positive training, a negative training, or a control condition. The positive training led to an increase in positive interpretation bias whereas the negative training led to an increase in negative interpretation bias. Importantly, participants in the positive training also reported less angry responses in reaction to an insult than participants from the other conditions.

Although the results of these first studies on the effects of CBM-I on aggression are promising, there is a dire need for studies replicating and extending these initial promising results.

The current study aimed to replicate the finding that interpretational styles can be altered and that this impacts aggression, using a new CBM-I paradigm that includes visually rather than verbally presented ambiguous social situations. In real-life situations, visual nonverbal behaviors (e.g., facial and physical expressions) hold important social information about the internal state (including intentions) of the other person (Cadesky, Mota, & Schachar, 2000). Indeed, research has shown that aggressive children inaccurately interpret cues of benign and prosocial intention as hostile (Dodge, Murphy, & Buchsbaum, 1984). This suggests that including visual ambiguous social scenes, rather than written stories (i.e., vignettes), might boost the effects of the training procedure. Based on previous studies (e.g., Hawkins & Cougle, 2013; Penton-Voak et al., 2013), we expected that training individuals to interpret ambiguous situations as non-hostile would lead to a reduction in aggressive behavior whereas training them to interpret such situations as hostile would increase aggressive behavior. Given that previous findings show that manipulating interpretation bias can also impact mood (e.g., Lothmann, Holmes, Chan, & Lau, 2011), we also included measures of mood before and after the training.

1. Method

1.1. Participants

Forty male and forty female students from Erasmus University Rotterdam (42 Caucasians, 12 Asian, 6 Middle Eastern, 4 Hispanic, 1 African, and 15 others), aged between 18 and 33 ($M = 21.67$, $SD = 3.17$) participated in exchange for course credits.

1.2. CBM-I training

The training task consisted of 52 trials that were presented using E-prime software. For each trial, participants viewed a different image of a hypothetical social situation in which one person harmed another. These images were used to assess and manipulate interpretation bias. The training task was completed within a single session and consisted of three phases: baseline, training, and test. The baseline and test phases consisted of six trials during which interpretation bias was assessed. The training phase consisted of forty trials during which interpretations were manipulated. Participants were randomly assigned to the positive or the negative

training condition.

Phase 1 (baseline) and 3 (test): On each trial participants were presented on the computer screen with a single sentence scenario that described a negative situation. For example, “His arm bumped hard into him!” Participants were then presented with an image of a social situation in which a mishap occurred which was ambiguous with respect to the intent of the harm-doer (see Fig. 1). After 200 ms, two rectangles appeared on the image, one around the face of the harm-doer and the other around the focus of the incident (e.g., the place where the “victim” is hit by the arm). Participants were first asked to click on the rectangle surrounding the place in the picture that best indicated whether or not the mishap occurred on purpose. We included this assessment to get an idea of what kind of information in the scene would be deemed most important by participants for disambiguating the situation. A discussion of these exploratory data are beyond the scope of the current manuscript. Thereafter, the question “Why did this happen?” along with two possible interpretations, one hostile and one benign, appeared on the screen. For example, the picture presented in Fig. 1 was accompanied by the following two interpretations: (a) This happened on purpose because he doesn't want him to pass (hostile interpretation); (b) This happened by accident because he didn't see him (non-hostile interpretation). Participants were asked to rate for each interpretation how likely they considered it to be true, by marking a 100 point visual analogue scale that was anchored with the labels “No, definitely not” on the left and “Yes, definitely” on the right ends.

Phase 2 (training): On each trial participants were presented with an image of a social situation in which a mishap occurred, which was ambiguous with respect to the intent of the harm-doer. The images were always preceded by a short description of the situation. All scenarios were one sentence long, and described the negative outcome. For example, the image presented in Fig. 2 was preceded by the description: “His drawing is all ruined!” The image was presented on the screen until the spacebar was pressed, after which the question “Why did this happen?” appeared on the screen. After clicking the mouse to continue, a hostile and one non-hostile interpretation appeared simultaneously on the screen, randomly positioned one above the other. Participants were asked to click on the interpretation they considered to be most likely. In the positive training condition, the non-hostile interpretations were reinforced as “correct” while, in the negative training, the hostile interpretations were “correct”. For example, the situation depicted in Fig. 2 was accompanied by the following two interpretations: (a) “This happened on purpose because he dislikes him”; (b) “This happened by accident because he bumped against him” Following a “correct” response, the word “CORRECT” was presented at the top of the screen in green font, the color of the font of the selected interpretation and the line around it changed from navy blue to green, and the other interpretation disappeared to avoid confusion regarding the feedback. Following an “incorrect” response, the word “INCORRECT” was presented at the top of the screen in red font, the color of the font of the selected interpretation and the line around it changed from navy blue to red, and the other interpretation then disappeared from the screen. Feedback remained on the screen for 2000 ms, after which the next trial began.

1.3. Stimulus materials

A set of 52 pictures were used to assess and train interpretation bias. Each image depicted a situation in which one person harmed another. For the baseline and test phases we used images from the study of Wilkowski, Robinson, Gordon, and Troop-Gordon (2007; see Fig. 1). For the training phase, we used images from the study of

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