Personality and Individual Differences 75 (2015) 201–204

Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

High trait anxiety increases inferential false memories for negative (but not positive) emotional events

Enrico Toffalini *, Chiara Mirandola, Tatiana Coli, Cesare Cornoldi

Department of General Psychology, University of Padova, Italy

ARTICLE INFO

Article history:
Received 13 August 2014
Received in revised form 23 October 2014
Accepted 13 November 2014

Keywords:
False memories
Anxiety
Anxious trait
Emotional events

ABSTRACT

Emotional disorders have been related with attentional and memory biases, especially for emotional material. Recent research has shown that depression, dysphoria and high internalizing traits are related with an increase of false memories for negative events. However, it is not clear whether anxiety alone may imply the same effect and whether it applies to all emotional events or only negative ones. The present study examined these questions by using a paradigm based on pictorial scripted material to analyze inferential memory errors for negative, positive and neutral everyday events in high-anxious vs. control young adults. Results showed an increase in negative (but not positive) inferential false memories in high-anxious individuals, even after controlling for depression level. On the contrary, negative material reduced false memories in control participants, further supporting previous research. It is concluded that high trait anxiety enhances elaboration of negative emotional material, which eventually leads to misremember causal antecedents of negative events as previously experienced while they were only inferred.

1. Introduction

Our memory is influenced by many emotional aspects, including transient emotional states, long-lasting conditions such as depression and anxiety, and the emotional valence of to-be-remembered events. These aspects may affect memory accuracy as well as memory distortions. The present paper is focused on how a high anxious trait affects the production of inferential false memories for emotional events.

It is well known that anxiety entails an attentional bias towards negative material, especially when it is threat-relevant (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & Van Ijzendoorn, 2007; Mogg & Bradley, 2005), that is anxious persons detect and encode threatening stimuli more easily and more quickly than neutral stimuli. Such attentional bias has been hypothesized to be the cause of a corresponding memory bias (Mitte, 2008). Indeed, anxiety has been shown to enhance implicit (e.g., Amir, Foa, & Coles, 2000) and explicit memory for threat-relevant information (Mitte, 2008; Saunders, 2013).

Studying the relations between anxiety and cognitive biases is important because it allows a better understanding of the processes that promote and maintain anxiety disorders (Eysenck, 2004). If threatening information is easily available to memory, this may trigger a vicious circle between anxiety and a consideration of the world as threatening. Interestingly, these memory biases were found in anxious individuals both at the clinical and at the sub-clinical level (Mitte, 2008), suggesting that some changes in processing and remembering material precede clinical status and may constitute one precursor.

Despite evidence regarding attentional and memory biases in anxiety, whether memory biases for emotional material can be found also on memory distortions is still unknown. On this respect, it may be hypothesized that anxious individuals do not only have enhanced memory for negative-threatening information, but also higher tendency to incorporate associated non-presented information into their memories (which may be self-generated from increased elaboration of negative material).

Increased false memories for negative material have been recently found in individuals with depression (e.g., Howe & Malone, 2011; Joormann, Teachman, & Gotlib, 2009). However, it is unclear whether the same effect may hold true also for anxiety. To our knowledge only one study investigated emotional false memories in anxious individuals, but failed to find the expected result (Wenzel, Jostad, Brendle, Ferraro, & Lystad, 2004). However, Wenzel and colleagues focused only on phobic individuals, and used words describing their phobic objects as the critical items for false memory test, thus possibly giving rise to avoidance effects.

A recent study found that people with strong internalizing traits incurred more inferential false memories for negative (but not

* Corresponding author at: Department of General Psychology, University of Padova, Via Venezia 8, 35131 Padova, Italy. Tel.: +39 049 827 6635; fax: +39 049 827 6600.
E-mail address: enrico.toffalini@studenti.unipd.it (E. Toffalini).

http://dx.doi.org/10.1016/j.paid.2014.11.029
0191-8869/

neutral) events, compared to controls (Toffalini, Mirandola, Drabik, Melinder, & Cornoldi, 2014). However, that study had some limitations. First, there was no positive content in the to-be-remembered material, making it difficult to know whether the effect of the internalizing traits was specific to negative or could apply to all emotional material. Second, as in other studies on this issue (e.g., Joormann et al., 2009) no distinction was made between the depressive and anxious traits. This was due to the naturally high co-occurrence of depression and anxiety, which is well documented in both clinical (Mineka, Watson, & Clark, 1998) and sub-clinical samples (Mitte, 2008).

The present study investigated the occurrence of false memories associated with emotional (positive and negative with high arousal) vs. neutral events in a sample of young adults with high anxious trait (but not high depressive trait) compared to a control sample. For this purpose, we used an adapted version of a paradigm (Mirandola, Toffalini, Grassano, Cornoldi, & Melinder, 2014) based on the presentation of pictorial scripted material that allows for the investigation of inference based memory errors: gap-filling and causal errors (see Hannigan & Reinitz, 2001). Gap-filling errors do not imply a subjective re-interpretation of the event as they represent the likelihood of accepting non presented – but consistent with the script – information. For example, in a script of a girl competing in a running race, falsely recognizing the scene of the girl tying her shoe laces, while the scene of the girl doing stretching was actually presented. On the contrary, causal errors occur when participants incorporate the not presented antecedent of a viewed action outcome into their memory; for example falsely recognizing the scene of the girl springing from the starting grid (i.e., the antecedent) while only the scene of the girl exultant after winning the competition (i.e., the outcome) was actually presented. Furthermore, emotionality of material varied by presenting different outcomes (i.e., negative or neutral) at the end of each pictorial script. In the present version of the paradigm we included also positive material.

We made a series of predictions. First, if participants with high trait anxiety elaborated negative events more deeply and included in their extended memory representation also related negative elements, they would produce a higher number of inferential false memories associated with negative events compared to non-anxious participants. Second, the effect was expected to be more evident for the 'causal' errors than for gap-filling errors. Indeed, causal errors are false memories of events that are directly and logically related to the emotionally charged outcomes, and thus they are expected to be more sensitive to valence manipulations (Toffalini et al., 2014). On the contrary, gap-filling errors are false memories for secondary events that make up the rest of the episode, but that are more peripheral with regard to the emotional outcome. We also predicted that either no effect, or even the opposite effect, would be found for emotionally positive material, as anxiety entails different processing for negative/threatening material, and not for all emotional material.

2. Method

2.1. Participants

Sixty-eight students, aged between 17 and 24, from a high school in central Italy ($N = 48$) and from University of Padova, ($N = 20$) were selected through a screening based on a standardized Personality Questionnaire for late adolescents and young adults (Q-Pad). The Q-Pad (Questionario per la valutazione della psicopatologia in adolescenza – Questionnaire for the assessment of psychopathology in adolescence; Sica, Chiri, Favilli, & Marchetti, 2011) is a nine-factor, 81-item questionnaire which assesses a series of psychopatological traits that are typical of adolescent malaise. (For the purpose of the present study, only the depression (8 items) and the anxiety (10 items) scales were included in the screening.) Responses are given on a 4-point Likert scale ranging between 1 (false, not describing my situation at all) and 4 (true, absolutely describing my situation). The questionnaire has been standardized on a sample of 1454 adolescents ranging between 14 and 19 years of age. Cronbach's alpha indicated good reliability for both the anxiety ($\alpha = .87$) and the depression ($\alpha = .85$) scale in the screening sample of the present study.

The "anxious group" included participants ($n = 34$, Mean age = 19.34, $SD = 2.00$, 22 females) who had their scores at the anxiety scale of the Q-Pad equal to or above the 80th percentile (based on the normative data provided for the questionnaire), while at the same time had their scores at the depression scale not above the 60th percentile. The control group included participants ($n = 34$, Mean age = 19.39, $SD = 1.99$, 17 females) whose scores at both the anxiety and depression scales of the Q-Pad were not above the 60th percentile. The forty-eight participants from the group of high school students also completed the Italian version of the trait anxiety scale of the State-Trait Anxiety Inventory (STAI-Y; Spielberger, Pedrabissi, & Santinello, 1996). We could therefore confirm the validity of the measure collected with the Q-Pad Questionnaire. Indeed, anxious and control participants significantly differed in their mean scores at the STAI-Y, $t(46) = 4.42$, $p < .001$, Cohen's $d = 1.28$; the mean STAI-Y score was 53.33 ($SD = 9.92$) in the anxious participants, and 42.21 ($SD = 8.41$) in the control participants. The 20 undergraduate students were added to the high school students to enlarge the sample. They were administered the same memory paradigm as well as all the Q-Pad, although they were not asked to complete some measures (e.g., the STAI-Y) because they were involved in a large research project which investigated other variables and, thus, the experimental session could not be lengthened.

Informed consent from all participants was collected before the experiment. For participants under 18 years of age, parental permission was collected.

2.2. Materials

The set of stimuli was an adaptation of the material used by Toffalini et al. (2014), adapted in order to include not only negative, but also positive episodes. Nine scripted episodes were created, each consisting of a series of 14 color pictures depicting an everyday event (e.g., waking up in the morning, dating/meeting a friend, etc.). Eleven pictures for each episode were used as targets and the remaining 3 as distractors in the recognition phase. Other 7 photographs were created for each episode to depict the cause-effect pattern and to vary the valence of the outcome. The cause-effect pattern of each script consisted of a single picture depicting a causal antecedent followed by three different and mutually exclusive outcomes (i.e., the "consequences"): one positive, one negative and one neutral outcome. Each outcome was depicted by a sequence of two pictures. Emotionality was counterbalanced across participants such that each of the three outcomes was presented to one third of the participants. Each participant saw three episodes for each of the three emotional conditions (for a total of nine episodes). The entire sequence of nine episodes was presented without interruptions. Five script-inconsistent photographs were shown at the very beginning of the presentation, and other five at the very end, in order to avoid primacy and recency effects. Characters and settings were different in each episode to help differentiating between the episodes.

Stimuli for the recognition phase consisted of a series of 45 old and 45 new photographs in a randomized order. For each episode, 4 old and 4 new photographs were included, and 1 of the 4 new