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The effects of angry and happy expressions on recognition memory for unfamiliar faces in delusion-prone individuals

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Abstract

Numerous studies suggest a cognitive bias for threat-related material in delusional ideation. However, few studies have examined this bias using a memory task. We investigated the influence of delusion-proneness on identity and expression memory for angry and happy faces. Participants high and low in delusion-proneness were presented with happy and angry faces and were later asked to recognise the same faces displaying a neutral expression. They also had to remember what the initial expressions of the faces had been. Remember/know/guess judgments were asked for both identity and expression memory. Results showed that delusion-prone participants better recognised the identity of angry faces compared to non-delusional participants. Also, this difference between the two groups was mainly due to a greater number of remember responses in delusion-prone participants. These findings extend previous studies by showing that delusions are associated with a memory bias for threat-related stimuli.

Keywords: Delusions; Facial expressions; Memory; States of awareness; Self-threat

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1. Introduction

There is growing evidence of biased processing of threat-related information in people with delusions. For example, a number of studies have observed an attentional bias for threat-related material in delusional ideation. Some of the first studies reporting this bias employed the emotional Stroop task to investigate processing of words referring to delusional themes rather than colour words as is used in the original procedure. For instance, Bentall and Kaney (1989) found that schizophrenic patients with persecutory delusions, compared with depressed and normal controls, were slower in naming the ink-colour of threat-related words, versus meaningless strings of O's, neutral words, or words signifying negative affect (depressive and anxiety words). Fear, Sharp, and Healy (1996) also included the emotional Stroop task and compared patients with delusional disorder (DD) with normal controls. Results revealed that DD patients had significantly longer reaction times for threat words compared to normal controls. Findings of increased latency in these two studies suggest that words of a threatening nature are particularly salient for delusion-prone individuals.

Attentional processing biases in delusions have also been examined in studies utilizing the visual scanpath paradigm, which involves measuring participants' direction and duration of gaze whilst viewing a stimulus. Studies show that when delusion-prone individuals view a stimulus consisting of photographs of neutral, threatening, or ambiguous social scenes, they spend more time viewing photographs depicting direct and hidden threat, compared to "happy" and "potentially threatening" scenes (Freeman, Garety, & Phillips, 2000). In another study, Green, Williams, and Davidson (2001) compared groups of delusion-prone and non-delusion-prone individuals on a visual scanpath including the presentation of happy, sad, neutral, fearful, and angry emotional expressions. Upon presentation, participants were asked to decide how the person in the photograph was feeling. Both reaction times and affect recognition accuracy were recorded. They found that delusion-prone participants and non-delusion-prone participants did not differ in terms of their mean number of correctly identified facial expressions. Although no differences were found between the two groups in terms of mean reaction times across the entire series of stimuli, delusion-prone individuals, compared to non-prone individuals, displayed significantly longer reaction times for the task of naming the angry face in particular. No differences were revealed between these groups in the speed of processing of the other facial expressions. More recently, Green, Williams, and Davidson (2003) also asked delusion-prone and non-delusion-prone participants to view photographs of faces displaying anger, fear, happy, sad, and neutral expressions while visual scanpaths were recorded. Following this, facial stimuli (identical in size and presented in the same order as for the scanning procedure) were presented and participants were asked to choose a word most suited to describing the emotion displayed on each face from a set of seven emotion labels (i.e. happy, sad, anger, fear, disgust, surprise, neutral). The results revealed that the two groups did not differ significantly in terms of the mean affect recognition accuracy. However, delusion-prone participants exhibited "extended" scanning (characterised by longer distances between fixations) for expressions of anger, fear, and happiness. The authors suggest that this reflects the fact that delusion-prone individuals may search for threat in an extended range of facial expressions (i.e. in anger, fear, and happiness).

Thus, overall, there is substantial evidence indicating that delusional ideation is associated with an attentional bias for threat-related information. By contrast, only two studies have examined memory for threatening information in patients with persecutory delusions. Kaney, Wolfenden, Dewey, and Bentall (1992) asked participants to listen to stories that differed in terms of threatening content. Results revealed that when participants were asked to recall as many propositions from the stories as possible, persecutory deluded individuals recalled more of the threatening propositions from the stories than the normal control group. In another study, Bentall, Kaney, and Bowen-Jones (1995) asked schizophrenic patients with persecutory delusions, depressed patients and normal controls to recall items from a list of threat-related, depression-related and neutral words. Results revealed that the deluded participants displayed better memory for threat- and depression-related words than the normal controls and demonstrated a significant tendency to repeat threat-related words during recall. These findings thus suggest that persecutory delusions are not only associated with an attentional bias for threatening information but also with biased memory for material associated with personal threat. However, one major shortcoming of the above-mentioned studies is that memory biases were assessed exclusively with verbal material. Whether delusions are associated with a memory bias for threatening information that is more closely related to cues actually encountered during social encounters (e.g. facial information) has not been investigated yet. In addition, the memory bias reported in previous studies has been interpreted as reflecting the consequence of deeper encoding of threatening material in long-term memory (e.g. Green & Phillips, 2004). However, to the best of our knowledge, this proposition has not been examined directly.

In this study, we wished to examine memory bias for threat-related material in delusion-prone individuals by using a previously validated memory task that includes the presentation of happy and angry faces (D'Argembeau & Van der Linden, 2004; D'Argembeau, Van der Linden, Comblain, & Etienne, 2003; D'Argembeau, Van der Linden, Etienne, & Comblain, 2003). Faces were used as they are highly significant social stimuli that not only help us recognize familiar people, but which also communicate important social information such as the intentions of the people around us (Haxby, Hoffman, & Gobbini, 2002). Furthermore, it may prove fruitful to distinguish between identity and expression memory as invariant aspects of face structure that underlie the recognition of individuals (identity recognition) and changeable aspects, such as eye gaze, expression, and lip movement are typically processed independently (Bruce & Young, 1986; Haxby et al., 2002). Accordingly, in the task we used, participants were presented with faces displaying a happy or an angry expression during the study phase. They then had to recognise the same faces displaying a neutral expression among new neutral faces. When a face was claimed to be recognised, participants also had to remember what the initial expression of the faces had been. Sates of awareness associated with memory were also assessed for both identity and expression memory. Indeed, recent research has revealed the importance of examining qualitative aspects of memory (see Gardiner & Richardson-Klavehn, 2000; Wheeler, Stuss, & Tulving, 1997). In many cases, recognition of a face is accompanied by a recollection of something that occurred or something that one experienced (what one thought or felt) when this face was seen previously. In other cases, a face can be recognised because it evokes strong feelings of familiarity but nothing about its prior occurrence can be remembered. Accordingly, we included an investigation of these qualitative aspects of memory with the remember/know/guess procedure

(Gardiner & Richardson-Klavehn, 2000), which enabled us to examine both identity and expression memory in a more precise manner. Using this procedure in previous studies, we have found that normal participants better recognised happy than angry faces, and that this effect was mainly due to differences in remember responses (D'Argembeau & Van der Linden, 2004; D'Argembeau, Van der Linden, Comblain et al., 2003; D'Argembeau, Van der Linden, Etienne et al., 2003). We interpreted these findings by arguing that most people tend to focus on and better elaborate positive rather negative stimuli. In the present study, we wished to examine whether this tendency would be reversed in delusion-prone individuals, making them recognise angry (threat-related) faces more often with remember responses than happy faces.

In general, a better understanding of (long-term) memory biases for threatening information in delusional ideation would help clarify processes that are involved in both the development and the maintenance of delusions. That is, a memory bias for threatening information in delusion-prone individuals could play a role in the instigation and/or strengthening of the belief that the (social) world is somehow personally threatening.

2. Method

2.1. Participants

A sample of 376 undergraduate students was screened using the French version of the 21-item version (Peters & Garety, 1996) of the Peters et al. Delusions Inventory (PDI; Peters, Joseph, & Garety, 1999). The PDI-21 is a self-report instrument that was designed to measure delusional ideation in the normal population. For each question (e.g. "Do you ever feel as if you are under the control of some force or power other than yourself?"), the participant is asked to respond if the belief is endorsed or if the belief is not endorsed based on a four-point scale as follows: "never", "sometimes", "often", or "all the time". Participants were explicitly asked *not* to report experiences when under the influence of alcohol or narcotic substances and were asked to report experiences within the last 5 years. An exclusion criterion for all participants was that they were not clinically referred or had not received a psychiatric or neurological diagnosis in the past 5 years. The internal consistency, concurrent validity and criterion validity of the PDI-21 have been previously established (Peters & Garety, 1996). In addition, recent studies have shown that the French version utilised in the present study measures delusion-proneness adequately in the normal population (Verdoux, Maurice-Tison et al., 1998; Verdoux, van Os et al., 1998). In the present study, those scoring in the upper and lower quartiles on the PDI-21 were contacted by telephone and invited to participate in the study. A total of 24 delusion-prone and 18 non-delusion-prone participants agreed to participate. These participants also completed the Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996) and the State Trait Anxiety Inventory-Trait version (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) in order to assess degrees of depression and anxiety, respectively.

Participants' characteristics for each group are presented in Table 1. Similar sex-distributions are found in the two groups, $\chi^2(1, N = 42) = .89$, $p = .35$. Independent t tests indicated that the two groups did not differ significantly in terms of age. However, the two groups differed significantly in terms of their scores on the PDI-21. The two groups did not differ in terms of their scores on the STAI, but differed to a moderate extent in terms of their scores on the BDI-II.

Table 1
Participants' characteristics for delusion-prone and non-delusion-prone groups

	Delusion-prone	Non-delusion-prone	*t*
Age	20.13 (3.9)	20.28 (2.7)	−.14
Sex (F/M)	17/7	15/3	—
PDI-21 total score	18.71 (3.4)	6.89 (1.0)	14.36**
BDI	14.88 (7.6)	9.5 (8.4)	2.18*
STAI	49.29 (4.6)	49.0 (3.1)	.23

*$p < .05$.
**$p < .001$.

2.2. Materials

Black and white pictures of 24 different faces (12 males and 12 females), each displaying a neutral, a happy, and an angry expression were used. These pictures were selected from four different databases (Beaupré, Cheung, & Hess, 2000; Bégin, Kirouac, & Doré, 1984; Ekman & Friesen, 1976; Martinez & Benavente, 1998). Stimuli with unusual features (e.g. beards, glasses) were not used. All the photos were retouched with Adobe Photoshop software to standardize their frame, size, background colour, and (whenever possible) luminosity and contrast.

Two sets (A and B) of 12 faces (6 male and 6 female) were made. Whenever possible, faces in sets A and B were matched for physical similarity (e.g. hair size and colour, complexion). Six happy faces (three male, three female) and six angry faces were presented during the study phase. The use of sets A and B as studied or non-studied items was counterbalanced across participants. Also, within each set, each face was seen with a happy expression by half the participants and with an angry expression by the other half. This made it possible to look for the effect of face expression unconfounded with differences in the memorability of particular people's faces. Stimuli were placed in a pseudorandom but fixed order in such a manner that no more than two faces with the same expression occurred in succession. To counterbalance for order effects, the photos were presented in one order for half the participants and in the reverse order for the other half. Two test lists were constructed using the 24 neutral faces. Stimuli were placed in a pseudorandom but fixed order so that no more than three "old" or "new" faces, and no more than two "old" faces that had the same expression at study should occur in succession. The second list presented the photos in reverse order.

2.3. Procedure

Participants were tested individually several weeks after completing the screening PDI-21. Each face was shown to the participants for 5 s on a computer screen approximately 60 cm in front of them. They were asked to look carefully at the faces in order to be able to recognise them later. No mention was made of the emotional expressions of the faces. After a 5-min retention interval, participants were presented with the recognition test. They were told that they would be shown a series of faces some of which represented people they had been shown initially, though the expression of the faces had changed (all the faces were neutral). When each face appeared they had to decide whether they had seen

it before. Furthermore, they had to report whether their recognition was of the remember (R), the know (K) or the guess (G) variety. The instructions we used to explain the R, K, and G responses were adapted from those used by Gardiner and colleagues (see Gardiner & Richardson-Klavehn, 2000). Briefly, participants were told that an R response should be given to any face which, at the time it was recognised, brought back to mind something they had consciously experienced (e.g. an association, a thought, a feeling, etc.) at the time it was presented. In contrast, they were asked to make a K response if the face felt familiar but they were unable to recollect details of its prior exposure. Finally, they were asked to make a G response if they were unsure whether or not the face had been presented in the study phase.

Participants were also asked to remember the initial expression of the faces they claimed to recognise. They were told that some of the faces they had seen in the study phase had a happy expression and other faces an angry expression. When they classified a face as old, they were asked to decide whether this face had had a happy or angry expression when they saw it in the study phase, and they also had to classify their responses according to the R/K/G paradigm. They were asked to make an R response if they could consciously recall seeing the expression of the face, if they could remember what the expression looked like. They were asked to make a K response if they believed that the face had a particular expression but they could not consciously recollect what the expression looked like. They were asked to make a G response if they had no idea of the expression and they had guessed. Participants were asked to repeat the instructions concerning the R/K/G classification for identity and for emotional expression of the faces and also to explain the rationale for some of their responses to ensure that they had understood the classification correctly. All the responses were made orally and each face remained on the screen until participants indicated their responses. Participants completed the BDI-II and the STAI at the end of the session.

3. Results

3.1. Identity recognition

We examined differences in overall identity recognition performance by analysing the proportion of hits as a function of delusion proneness and expression of the faces (happy vs. angry). We also examined the relation between these two factors and states of awareness associated with recognition of the faces by decomposing overall recognition data into R, K, and G responses. Table 2 shows the mean proportions of R, K, and G responses for identity recognition as a function of delusion proneness and expression type.

Separate 2 (delusion proneness) X 2 (expression type) analyses of variance (ANOVAs) were performed on total proportion of hits, and on R, K, and G responses. For proportion of hits, the main effects of delusion proneness and expression type were not significant, Fs<1. However, there was a significant interaction between these two factors, $F(1,40) = 8.66$, $p<.01$. Planned comparisons indicated that the proportion of hits for angry faces was higher in delusion-prone compared to non-delusion-prone participants, $F(1,40) = 10.09$, $p<.005$, whereas there were no differences between the two groups of participants for happy faces, $F(1,40) = 1.11$, $p = .30$. Furthermore, delusion-prone participants recognised more angry than happy faces, $F(1,40) = 6.67$, $p<.05$, whereas it

Table 2
Mean proportions (and standard deviations) of R, K, and G responses for identity recognition as a function of delusion proneness and expression type

Response	Delusion-prone			Non-delusion-prone		
	Happy	Angry	False alarms	Happy	Angry	False alarms
R	.41 (.16)	.51 (.25)	.05 (.09)	.47 (.20)	.37 (.21)	.06 (.08)
K	.22 (.17)	.26 (.21)	.28 (.19)	.22 (.17)	.25 (.23)	.23 (.19)
G	.02 (.06)	.00 (.00)	.02 (.06)	.02 (.05)	.00 (.00)	.00 (.00)
Total	.65 (.19)	.77 (.15)	.35 (.22)	.71 (.21)	.62 (.16)	.29 (.19)

tended to be the reverse for non-delusion-prone participants although the difference failed to reach statistical significance, $F(1,40) = 2.75$, $p = .10$.

These differences between the two groups of participants were mainly due to R responses. Indeed, the delusion proneness by expression type interaction was significant for R responses, $F(1,40) = 6.98$, $p < .05$, but not for K responses, $F < 1$. The proportion of R responses for angry faces was marginally higher for delusion-prone compared to non-delusion-prone participants, $F(1,40) = 3.54$, $p = .067$. In contrast, the two groups of participants did not differ in proportion of R responses for happy faces, $F(1,40) = 1.30$, $p = .26$. Furthermore, delusion-prone participants tended to report more R responses for angry compared to happy faces, $F(1,40) = 3.88$, $p = .056$, whereas this tendency was reversed in non-delusion-prone participants, $F(1,40) = 3.20$, $p = .081$. Finally, for both R and K responses, the main effects of expression type and delusion proneness were not significant, all $ps > .16$. G responses could not be analysed because no participant produced a G response for angry faces.

3.2. Memory for emotional expressions

Memory for emotional expressions was assessed by determining the probability that a participant correctly recalled expression conditionalised upon correct identity recognition. For each participant, proportions of correct and incorrect responses for expression memory were calculated separately for each type of expression (happy vs. angry). This was made by dividing the number of correct or incorrect R, K, and G responses for each type of expression by the number of correct identity recognition (hits) for that type of expression. Table 3 shows mean proportions of R, K, and G responses for expression memory as a function of delusion proneness and expression type.

For total correct responses, there was a significant main effect of expression type, $F(1,40) = 4.84$, $p < .05$, indicating that expression memory was overall better for happy than angry expressions. There were no main effect of delusion proneness, $F(1,40) = 1.03$, $p = .32$, but the delusion proneness by expression type interaction approached statistical significance, $F(1,40) = 3.28$, $p = .077$. Contrary to what we expected, this was due to the fact that total proportion of correct responses for happy expressions was higher for delusion-prone compared to non-delusion-prone participants, $F(1,40) = 4.39$, $p < .05$, whereas this was not the case for angry expressions, $F < 1$. However, this difference between the two groups of participants was mainly due to K rather than R responses. Indeed, delusion-prone participants reported more K responses than non-delusion-prone

Table 3
Mean proportions (and standard deviations) of R, K, and G responses for expression memory as a function of delusion proneness and expression type

Response	Delusion-prone				Non-delusion-prone			
	Hits		Errors		Hits		Errors	
	Happy	Angry	Happy	Angry	Happy	Angry	Happy	Angry
R	.28 (.18)	.25 (.18)	.01 (.05)	.06 (.10)	.36 (.27)	.26 (.23)	.03 (.10)	.03 (.09)
K	.36 (.23)	.27 (.21)	.11 (.19)	.13 (.15)	.21 (.18)	.30 (.25)	.17 (.24)	.09 (.18)
G	.20 (.22)	.13 (.22)	.04 (.11)	.16 (.15)	.13 (.16)	.13 (.23)	.10 (.17)	.19 (.24)
Total	.84 (.21)	.65 (.19)	.16 (.21)	.35 (.19)	.70 (.21)	.69 (.28)	.30 (.21)	.31 (.28)

participants for happy expressions, $F(1,40) = 5.06$, $p < .05$, whereas the two groups did not differ concerning R responses, $F(1,40) = 1.32$, $p = .26$. Finally, there were no main effects or interaction for G responses, all $ps > .35$. We did not perform statistical analyses on the proportions of incorrect responses because of the small cell sizes.

4. Discussion

The purpose of the present study was to examine whether delusion-prone individuals show a memory bias for angry faces compared to happy faces. We found that the identity of angry faces was better recognized by delusion-prone participants than by non-delusion-prone participants whereas the two groups did not differ concerning recognition of happy faces. Furthermore, the difference between the two groups for angry faces was mainly due to R responses (i.e. higher in delusion-prone participants) rather than to K or G responses. Contrary to identity memory, expression memory for happy faces was better in delusion-prone participants than in non-delusion-prone participants, whereas the two groups did not differ concerning memory for angry expressions. However, the difference between the two groups concerning memory for happy expressions was mainly due to K rather than R responses.

These findings extend previous studies that have used verbal material (Bentall et al., 1995; Kaney et al., 1992) by showing that the memory bias associated with delusional ideation also occurs for more ecological social stimuli such as faces. In addition, and more importantly, the results from the present study suggest that memory biases in delusional ideation may be a consequence of deeper encoding of threatening stimuli. Indeed, the difference in identity memory for angry faces between delusion- and non-delusion-prone participants was mainly due to R responses being more frequent for delusion-prone participants. It has been shown that R responses are affected by the degree of elaboration and attention during encoding (see Gardiner & Richardson-Klavehn, 2000 for review). For instance, Gardiner (1988) observed that semantic elaboration of words (as opposed to phonological processing) increased R responses while leaving the proportion of K responses unaffected. Furthermore, Gardiner and Parkin (1990) found that, when attentional resources are engaged in a concurrent task during word encoding, the R component of recognition memory decreased while K responses remained unaffected. Similar findings were reported with face stimuli (Parkin, Gardiner, & Rosser, 1995). Thus,

the present findings suggest that delusion-prone participants paid more attention to and better elaborated faces with angry expression as compared to non-delusion-prone participants, thereby enhancing the probability that they subsequently recollected the identity of these faces.

Another interesting finding from the present study was the observed dissociation between identity and expression memory (i.e. an effect of delusion-proneness on identity memory, but not on expression memory, for angry faces). This dissociation is in line with a large body of evidence that has shown that face recognition and expression recognition are two relatively independent systems. That is, both behavioural studies and neuroimaging studies have shown that the invariant aspects of faces that underlie the recognition of individuals, and changeable aspects which are used as social communication cues (including eye gaze, expression and lip movement), appear to be processed relatively independently and seem to be related to different regions of the brain (e.g. Haxby et al., 2002). It remains to be explained, however, why we found an effect of delusion-proneness on recognition of the identity of faces that had been previously seen with an angry expression but no effect on memory for angry expressions themselves. An explanation may be that expressions representing self-threatening information (e.g. angry expressions) are detected very rapidly in deluded individuals (see Green & Phillips, 2004) and then that attention is shifted towards invariant aspects of face structure that underlie the recognition of individuals. Indeed, being able to recognise the source of the self-threat, i.e. the person displaying the angry expression, is important in order to deal with future interactions with that person. The results concerning expression memory (i.e. that delusion-prone participants reported more K responses compared to non-prone participants for expression memory of happy faces) are puzzling. Nonetheless, a speculative interpretation might be that emotional expressions are more salient in delusion-prone individuals, which should normally result in better memory for both angry and happy expressions. However, as mentioned above, delusion-prone individuals might rapidly shift towards an elaboration of the identity of angry faces, resulting in less focus on specific facial features conveying angry expressions thus reducing the strength of the memory association between the identity and the expression. The fact that the better performance in delusion-prone participants for happy expressions only concerns K responses indicates that this difference in expression memory results from relatively automatic memory processes. Further research should be conducted in order to explore more directly the temporal dynamics of emotional face processing in delusion-prone individuals and their relationship with identity and expression memory.

In this study, delusion-prone and non-delusion-prone groups differed in terms of their scores on the BDI. This is consistent with previous studies that have found a higher prevalence of depressive symptoms in delusion-prone individuals (Ohayon & Schatzberg, 2002; Verdoux et al., 1999). However, this raises the possibility that the between-group differences in identity and expression memory could be due to individual differences in depressive symptoms rather than delusional ideation. Some studies used statistical procedures such as analysis of covariance (ANCOVA) in an attempt to "control for" these preexisting group differences in BDI scores. However, it has been argued that this use of ANCOVA is inappropriate because an assumption of ANCOVA is that the covariate is independent of group membership, which happens with random assignment to groups, but not with naturally occurring groups (see Miller & Chapman, 2001, for further discussion of this issue). In this study, memory for the identity of angry faces and for the expression of

happy faces (i.e., the memory measures that significantly differed between the two groups of participants) was unrelated to BDI scores (all $rs < .18$, $ps > .25$), whereas PDI-21 scores correlated with identity memory for angry faces ($r = .48$, $p < .001$, for total proportions of hits, and $r = .28$, $p = .07$, for R responses) and with K responses for expression memory of happy faces ($r = .33$, $p = .03$), suggesting that the memory biases manifested by delusion-prone participants resulted from delusional ideation rather than depressive symptoms.

More generally, findings from the present study are in accordance with recent cognitive models of delusions presuming a cognitive bias to threat-related stimuli in delusion-prone individuals (Blackwood, Howard, Bentall, & Murray, 2001; Freeman, Garety, Kuipers, Fowler, & Bebbington, 2002; Green & Phillips, 2004). For instance, Green and Phillips (2004) have recently suggested that heightened perception of certain negative emotions (such as anger) may be relevant to the genesis of persecutory delusions. Much research suggests that healthy individuals detect faces depicting emotional expressions of anger more rapidly than faces depicting other (non-threatening) expressions (e.g. Öhman, Lundqvist, & Esteves, 2001). Indeed, taken from an evolutionary perspective, such an accurate and rapid detection of social threat is essential for species survival (Öhman, & Wiens, 2003). According to Green and Phillips (2004), delusional ideation reflects an exaggeration of this (normal) cognitive bias. Furthermore, they suggest that the direction of threat-bias in delusional ideation may vary across early and late stages of information processing—a so-called "vigilance-avoidance" style of processing threat. That is, an initial phase involves "vigilance" towards threat (i.e. an early orienting bias for threat-related material), followed by an active "avoidance" of threat during later, controlled stages (i.e. in order to reduce the high levels of anxiety brought upon by the initial perceived threat). Results from the present study are in line with a presumed increased vigilance for threat-related stimuli in delusional ideation in early phases, but they also suggest that this vigilance stage may be followed by a later, controlled stage, involving an *elaboration* of some aspects of the threat-related material (in the present case, information pertaining to identity recognition) and not necessarily (or exclusively) a subsequent active *avoidance* of all threat-related information.

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