Running head:

Delusional ideation, dissociative experiences and false recall

Original title:

The influence of delusional ideation and dissociative experiences on the resistance to false memories in normal healthy participants.

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ABSTRACT

The influence of individual differences in a measure of delusional ideation (Peters et al. Delusional Inventory; Peters et al., 1999) or dissociative experiences (Dissociative Experiences Scale; Bernstein & Putnam, 1986) on the production of false memories was examined. Using a modified DRM procedure, outcomes that were consistent with the activation/monitoring account of DRM false memories (e.g., Roediger et al., 2001) were observed. In addition, it was found that scores on both scales were associated with increased rates of false recall of the non-presented lure and with a poorer performance on a measure that assessed unsuccessful source monitoring. However, neither score was associated with veridical memory. These results contribute to better understand the influence of individual differences on the resistance to false memories.

Key words: false memory, delusional ideation, dissociative experiences, normal participants.

INTRODUCTION

A common form of memory distortion arises when individuals erroneously attribute the source of an item's familiarity (e.g., confusing something imagined with a perception). According to the source monitoring framework (Johnson, Hashtroudi & Lindsay, 1993), source attributions are dependent on several factors: the quality of the encoded information, the type and the amount of information that can be retrieved, and the decision processes used to evaluate the retrieved information. More precisely, our memories differ in terms of the distribution of characteristics such as perceptual (visual, auditory, etc.) and contextual (spatial and temporal) details, affective reactions, associated thoughts and cognitive operations. These averaged differences in qualitative characteristics can then be used as diagnostic indications to properly attribute the origin of one’s own memory.

A form of memory distortion in which source monitoring errors are thought to play a crucial role is false memory induced by the DRM paradigm (Roediger & McDermott, 1995). In this procedure, participants are presented with lists of words converging on associated non-presented lures (e.g., thread, pin, eye, sewing… for which the nonpresented lure is NEEDLE). This method has been shown to robustly elicit high rates of false recall and false recognition (see Gallo, 2006) of the critical non-presented lure. Moreover, participants are very confident that the critical lure has occurred and are able to provide descriptions and details regarding its presentation even though it has never been presented (see Gallo, 2006). Following the activation-monitoring account (e.g., McDermott & Watson, 2001; Roediger & McDermott, 1995), false memories are thought to occur because, during the presentation of the list, the critical lure is activated as a result of a spreading of activation in an associative network that will subsequently result in its easier accessibility. During retrieval, rejection of the activated lure occurs when activation is correctly attributed to the participant’s own thoughts and not to the item's occurrence in the list through a successful « reality monitoring » process (Johnson et al., 1993). As such, the DRM paradigm can be considered as a variant of a source monitoring task.

Several studies have shown that some people are more prone to make false memories than others (e.g., Gallo, 2006; Winograd, Peluso & Glover, 1998). Because a large number of studies have established that normal healthy individuals may report delusional experiences (e.g., Eaton, Romanoski and Nestadt, 1991), Laws and Bhatt (2005) examined whether a higher susceptibility to false memories exists in normal healthy participants prone to delusional thinking. Using the DRM paradigm, they investigated memory performance in two groups of healthy participants divided according to their scores on a measure of delusional ideation (PDI). They found that compared to low PDI scorers, high PDI participants recalled significantly fewer correct words and more critical lures and other intrusions. In addition, both groups did not differ in the confidence attached to recognition of studied items although high PDI participants assigned greater confidence ratings to falsely accepted items (regardless of whether they were critical or unrelated false alarms). Thus, this study showed that delusional participants were more susceptible to false recall than low delusional scorers. However, caution should be taken in the interpretation of the recognition results because recognition was preceded by the recall task which has been shown to influence the subsequent recognition of critical lures and their phenomenological ratings (e.g., Roediger & McDermott, 1995). Furthermore, another limit of the study is that the results did not pinpoint the locus of this influence (i.e., an influence on activation and/or on monitoring processes).

Previous research has also examined whether dissociation in non-clinical groups may have an impact on the occurrence of false-memories (Destun & Kuiper, 1999; Winograd et al., 1998). Indeed, studies have examined whether a tendency towards dissociative experiences is associated to a higher susceptibility to false memories using various paradigms, including the DRM paradigm. Overall, the results are somewhat mixed with some studies finding a positive association between the presence of dissociative experiences (as measured by the Dissociative Experiences Scale; DES) and the probability to produce false memories (e.g., Hyman & Billings, 1998; Winograd et al., 1998) while others not (e.g., Platt et al., 1998, Wright et al., 2005; Winograd et al., 1998).

Various methodological details might explain these opposing findings such as the specific version of the DES scale used, the nature of the source monitoring task or sample characteristics. With respect to the version of the DES used, most of the studies exploring the influence of dissociation on false memories have used the original DES form in non-clinical samples (e.g., Platt et al., 1998; Winograd, et al., 1998). However, this form has been shown to result in highly skewed scores, which are often clustered at the low end of the scale, creating floor effects. Wright and Loftus (1999) administered three different forms of the DES to groups of non-clinical participants and found that one form (the DES-C) was superior in avoiding problems of floor effects and skewness. For this reason, Wright, Startup and Matthews (2005) reexamined the relationship between dissociative tendencies and DRM false memories with this specific form of the DES scale. Because they did not find a significant association between DRM false memories and the DES using a large sample and a form better suited to non-clinical participants, they argued that dissociation might influence some specific false memory tasks and not others. That is, the procedures showing a positive relationship between dissociation and false memories (e.g., misleading or imagination inflation paradigms) differ from the DRM procedure as they require only misattributing the source of a presented item and not the generation of the items. However, the conditions in this experiment were not optimal to show any existing difference between high and low DES scorers. Indeed, they measured the correlation between DES-C scores and the production of DRM false memories in participants exposed to different encoding and retrieval conditions (some of which increased or decreased the production of false memories). In addition, they used a longer presentation time (i.e., 4s) during the study phase which is known to enhance false memory resistance (e.g., McDermott & Watson, 2001) even in participants having source monitoring difficulties (Dehon, 2006).

In summary, previous studies exploring the influence of dissociative and delusional tendencies on false memories with the DRM paradigm have produced inconsistent results or have not been replicated. In addition, whenever a relationship has been reported between either of these two variables and the production of false memories, it remains unclear which underlying processes (i.e., activation and/or monitoring) are affected by either delusional ideation or dissociation. For these reasons, the aim of this study was to examine the influence of dissociative experiences and delusional ideation on the creation of false memories with the use of the DRM paradigm. To this purpose, normal participants were asked to complete questionnaires assessing either delusional ideation or dissociative experiences, and were presented with DRM lists in a modified DRM procedure (Brédart, 2000; Dehon, 2006) designed to obtain estimates of activation and monitoring processes. In this procedure, participants were asked after the memory test to say whether, during the learning phase or during the recall phase, a word came to their mind, but that they did not write it down during the recall task because they thought the experimenter had not produced it. This modification allowed us to examine the distribution of the critical lures throughout the experiment and to determine the best explanation for why false memories did not occur for some trials (i.e., reflecting a monitoring success versus an activation failure). Specifically, a failure to recall a critical lure either in the initial recall phase or during the added phase suggests that the list failed to evoke it. On the other hand, reporting a critical lure during the added phase for a list that did not initially produce a false memory is indicative of successful monitoring. Based on this procedure, the unsuccessful source monitoring rate (Mukai, 2006) was calculated by dividing the number of falsely recalled critical lures by all activated critical lures (falsely recalled critical lures plus critical lures recalled during the added phase).

A correlational approach was used to investigate the relationship between scores on the delusion and dissociative questionnaires, false recall, activation rate and unsuccessful monitoring of the critical lure, and to test specific predictions. With respect to delusional ideation, we expected to replicate Laws and Bhatt's (2005) finding that PDI is associated with a higher susceptibility to false memories in the DRM paradigm. Furthermore, we wanted to determine whether delusion-proneness influenced efficient source monitoring or activation of the critical lure. With respect to dissociation, as in Wright et al. (2005), we wanted to explore whether dissociation is related to the production of false memories when using a version of the DES scale that is more appropriate for non clinical samples (i.e., the DES-C). In addition, as one study showed that scores on the DES influenced the decision criteria in source monitoring decisions (Hekkanen & McEvoy, 2002), one would expect high DES-C scorers to recall more critical lures during the memory task, and less critical lures during the added phase than low DES-C scorers. Thus, we hypothesized that dissociation should be positively associated with false recall and reduced monitoring abilities. In contrast, we did not expect dissociation to be associated with a deficit in the generation of the critical lure and no correlation between dissociation and activation was expected.

METHOD

Participants.

A hundred and fifty-eight undergraduates (79 females) aged between 18-31 years (M= 21.28, SD= 2.73) were approached for their co-operation, which was voluntary and was not required for course credit. None of the volunteers had a previous history of mental illness, alcohol or drug abuse.

Materials.

False memory task. We used a modified DRM procedure (Brédart, 2000; Dehon, 2006). The participants were presented with eight French DRM word lists of 15 items for which the critical lures were (English translation is provided in brackets): *arbre* (tree), *informatique* (computer science), *chaise* (chair), *temps* (time), *mouton* (sheep), *maison* (house), *musique* (music) and *odeur* (odour).

Delusional ideation. A French version of the 21-item version (Peters & Garety, 1996) of the Peters et al. Delusions Inventory (PDI; Peters, Joseph, & Garety, 1999) was used to assess delusional ideation. 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 was asked to indicate whether the belief was endorsed or not on a four-point scale (“never”= 0, “sometimes”= 1, “often”= 2 and “all the time”= 3). Scores were added across items to obtain a total DES score (range 0-63) with higher scores indicating higher delusion-proneness. Studies have shown that the French version used in the present study measures delusion-proneness adequately in the normal population (e.g., Verdoux, et al., 1998).

Dissociative experiences. Participants were also asked to complete a French version (Darves-Bornoz et al., 1999) of the Dissociative Experiences Scale (DES; Bernstein & Putnam, 1986). The DES is a 28-item scale, developed to obtain a self-reported measure of the frequency of experiencing dissociative symptoms such as derealization and depersonalization. Based on recommendations from Wright and Loftus (1999), the original response form of the DES was modified so that participants were asked to rate how often they have each of the 28 experiences compared with other people. One end of the scale has the label “much less than others”, the other end “much more than others”, and the midpoint of the scale “about the same as others”. Participants were asked to place a tick in one of the 11 boxes above the response. The 11 boxes were coded as ranging from 0 to 100, in increments of 10. Scores are averaged across items to obtain a total DES score (range 0-100) with higher scores indicating higher dissociative experiences. A study including non-clinical samples (Larøi, Defeldre & Van der linden, in preparation) confirmed that this modified form of the French adaptation of the DES possesses good psychometric properties (i.e., α=0.94, corrected item-to-total score correlations ranging from 0.40 to 0.74, un-skewness of scores and avoidance of floor effects).

For both the PDI-21 and the DES-C, 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.

Procedure.

Participants were tested individually. They were told that the experimenter would read 8 lists of words and that they would be tested for each list after having counted backwards by 3's for 30 seconds. The lists were presented in a random order for each participant. The words were read aloud by the experimenter at the rate of one word per 1.5 s. For each recall phase, the participants were instructed to write down on a sheet of paper as many words as possible from the list they had just heard, in any order, but without guessing. They were given 90 seconds to complete each recall phase. After having recalled all the lists, the participants were instructed to say if, during the learning phase or during the recall phase, a word came to their mind but that they did not write it down during the recall task because they thought the experimenter had not produced it (later referred to as “added phase”). The participants were presented successively with the word lists they recalled in the first phase and the participants were asked to write down (with a different-colored pen) any other words they had thought of for that list. The participants were instructed to only write down words they remembered having thought of during the presentation of the lists and not to infer or to guess the words from the current instructions. Finally, participants were asked to complete the PDI, the DES-C and were debriefed.

RESULTS AND DISCUSSION

Overall Memory performance and personality questionnaires. A one-way ANOVA (Item Type: veridical vs. critical vs. non critical intrusion) with repeated measures was carried out on the mean proportions of recall and showed $[F(2,314)= 635.05;\ p< .0001]$ that participants recalled higher proportions of veridical items (M= .61, SD= .09) than critical items (M= .28, SD= .20), and that both kinds of responses were significantly more recalled than non critical intrusions (M= .04, SD= .11). The mean score on the PDI scale was 7.46 (SD=6.09, ranging from 0 to 49). The mean score on the DES-C was 33.24% (SD= 16.49, ranging from 8.21% to 93.21%) which is very similar to results from previous studies (e.g., Wright & Loftus, 1999).

Correlational analyses. Table 1 shows the Pearson correlations between false recall (i.e., percentage of critical lures recalled during the recall task), correct recall (i.e., percentage of studied items recalled during the recall task), unsuccessful source monitoring (i.e., number of falsely recalled critical lures divided by the number of falsely recalled critical lures plus critical lures recalled during the added phase; M= .52, SD= .34), activation rate (i.e., the sum of critical lures recalled during the recall task and during the added phase; M= .58, SD= .24), PDI and DES-C scores. We will first discuss the correlational results directly related to the general predictions following the activation/monitoring account of DRM false memories (e.g., Roediger et al., 2001) and then turn more specifically to the effects of delusional and dissociative differences on these components.

Please insert table 1 about here

Following the activation/monitoring model (Roediger et al., 2001), processing the list items should activate the critical lure and false recall should be reflected in a failure to correctly monitor the source of this activation. Hence, false recall should be positively correlated to the activation rate and to the unsuccessful monitoring measure. Accordingly, the results showed strong positive correlations between false recall and unsuccessful monitoring (r = .74, p< .001) and false recall and activation rates (r = .44, p< .001). Correct recall and activation rate are sometimes correlated depending on the encoding conditions (e.g., McDermott & Watson, 2001). In the current study, the encoding condition tends to favour the use of item-specific information to correctly recall studied items. In support of this interpretation are, first, the absence of a significant correlation between correct recall and activation rate (r = .08, p = .35). Second, as monitoring abilities also rely on item-specific information to correctly attribute an origin to a mental experience, there should be a negative correlation between correct recall and the unsuccessful monitoring measure, which was indeed observed (r = -.31, p< .001). Third, false recall and correct recall should be negatively correlated, which was also the case (r = -.26, p < .01). Hence, overall, the pattern of correlations supports the assumptions made by the activation/monitoring model.

With respect to individual differences, as expected, DES-C and PDI scores were found to be positively correlated with false recall (r = .18, p < .05 and r = .21, p < .01, for the DES-C and PDI scores, respectively) suggesting an influence of these individual differences on the production of false memories. However, such a correlation does not on its own determine whether this higher susceptibility to false memories is driven by a higher activation of the critical lure (e.g., over-reliance on associative processes) or by reduced monitoring abilities in participants scoring high on these scales. Hence, another aspect of the data which deserves closer inspection is the pattern of correlations between scores on theses scales and unsuccessful monitoring, on the one hand, and activation measure, on the other hand. The significant positive correlation between both scales and the unsuccessful monitoring measure (r = .28, p < .001 and r = .17, p < .05, for the DES-C and PDI scores, respectively) and the absence of correlation between these scales and the activation rate (r = -.08, p = .30 and r =

.06, p = .43, for DES-C and PDI scores, respectively) suggest that individual differences did not influence the activation of the critical lure but impaired the source monitoring abilities. It is also interesting to note that the effects of individual differences on source monitoring do not seem to be due to a general memory problem as there was no correlation between these scales and correct recall ($r = -.09$, $p = .25$ and $r = .04$, $p = .61$, for DES-C and PDI scores, respectively). Caution should be taken however, in the interpretation of our data as the there was a significant positive correlation between both scales ($r = .38$, $p < .001$). Indeed, partial correlations between false recall and the unsuccessful monitoring measure were conducted while controlling for the influence of each scale independently. This revealed that the correlation between false recall and unsuccessful monitoring measure remained significant when controlling for both PDI ($r = .734$, $p < .001$) and DES-C scores ($r = .733$, $p < .001$). This shows that the questionnaires have an influence on theses measures but that this influence is limited (originally, $r = .74$). Similarly, the correlation between unsuccessful source monitoring and the DES-C scores remained significant ($r = .24$, $p = 0.003$) when controlling for delusional-proneness. In contrast, the correlation between unsuccessful source monitoring and the PDI scores did not reach significance ($r = .07$, $p = .384$) when controlling for dissociative experiences. This latter result suggests that there is an overlap between dissociative experiences and delusional ideation which is consistent with previous findings (e.g., Merckelbach & Giesbrecht, 2006).

GENERAL DISCUSSION

The present study examined the influence of individual differences in dissociative experiences and delusional ideation on false memories with the use of the DRM paradigm. We replicated Laws and Bhatt’s (2005) results that high scores on a measure of delusional ideation in normal healthy participants is associated with increased rates of false recall. In contrast, we did not find a significant association between delusional-proneness and correct recall. It has been argued that high PDI scorers reveal a tendency to falsely accept non presented items and the fact that this effect applies to unrelated unseen items as well suggests that it does not depend solely upon the activation of related materials (Laws & Bhatt, 2005). Our results partially support this point of view provided that activation rates were not associated with PDI scores, which suggests that high PDI scorers did not show abnormal semantic activation. Rather, the observed positive correlation between unsuccessful source monitoring and PDI scores suggests that a source monitoring problem for highly activated information may account for their performance.

Studies have also explored whether a tendency toward dissociative experiences is associated with a higher susceptibility to false memories but have provided largely inconsistent results that may be explained by some floor effects caused by the use of the DES in non clinical samples. Recently, one study explored the relationship between DRM false memories and results on an appropriate form of the DES in a sample of non-clinical participants but failed to find any association (Wright et al., 2005). These authors argued that dissociation might influence some specific false memory tasks that require only misattributing the source of a presented item and not the DRM paradigm which requires both generation and misattribution of the critical lure. This argument is not consistent with the current results as we found that a measure of dissociative experiences was positively associated with a higher susceptibility to false recall (see also, Cann & Katz, 2005). In addition, DES-C scores were not associated with the activation of the critical lure. Overall, these results from the added phase suggest that dissociation influenced the accurate monitoring of the critical lure and has no effect on its generation. This supports previous studies showing that the presence of dissociation influences the decision criteria in source monitoring decisions (Hekkanen & McEvoy, 2002) and effortful source monitoring aspects. Although Wright et al.s' (2005) failure to find a significant association between false memories and dissociation might be partly due to methodological details (i.e., their data came from individuals presented with different encoding and retrieval conditions), another explanation might be found in the heterogeneous character of dissociation, in particular as it is measured in non-clinical participants by the DES. Indeed, studies using the original version of the DES in normal healthy samples have reported up to 7 relatively independent factors (for a brief review, see Wright & Loftus, 1999). In contrast, to our knowledge, only one study has examined the factor structure of the DES-C in a non clinical sample and found only one factor (Wright & Loftus, 1999).

Although based on the activation-monitoring account, the overall results also fit with the fuzzy-trace theory (e.g., Brainerd & Reyna, 2002). Indeed, both accounts imply that the critical lure will be likely to seem familiar due to either activation or reliance on gist traces. In addition, both explanations rely on the availability of item-specific information for the successful editing of memories. However, our study has revealed that participants may sometimes consciously think of the critical lure and note that it was not in the list, which is not consistent with the fuzzy-trace account in which critical lures seem familiar at retrieval because they are gist-consistent. One might argue that results from the added phase are not a pure online memory monitoring measure as it involves re-presenting the recalled items. This may have reactivated the critical lures in the participant's mind which, in turn, would have overestimated the monitoring measure through unconscious activation processes (e.g., Seamon et al., 2002). Although likely, we do not think that this has played a major role in our results as we found in previous studies (Dehon, 2006; Dehon & Brédart, 2004) that results in the added phase were influenced by manipulations that are known to specifically affect monitoring processes (e.g., aging, divided attention) which is not consistent with the previous argument and gives some validity to our procedure.

In conclusion, future studies should examine the relationship between confidence and “Remember–Know” responses (Tulving, 1985) in participants with delusional and dissociative tendencies in order to precise the influence of these tendencies on the resistance to false memories. One explanation could be that participants prone towards delusional and dissociative experiences might commit more intrusions because of deficits in item-specific/verbatim information. As we did not find significant correlations between these scales and correct recall in our study to support this hypothesis, an alternative explanation could be that they use more lax decision criteria in which “Know” judgments resulting from activation/gist processing might be sufficient to accept an item with confidence. In this latter case, warnings might be useful to make their criteria stricter and reduce their susceptibility to false positives. In addition, future studies are needed to identify what underlies the overlap between dissociative experiences and delusional ideation.

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