DREAM and False Memories of Personality:
The stuff that impressions are made of

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Abstract

We argue that false memories are a by-product of flexible memory structures. In this work we extend false memory effects to a novel associative memory structure – the implicit theory of personality (Rosenberg et al., 1968). In our study, we adapted the DREAM paradigm to impression formation and obtained false memories effects parallel to those effects obtained in the DREAM paradigm. Moreover, this extension allowed us to document the moderation of false memories by processing goals suggesting that processing goals can moderate spreading activation processes.

Keywords: Impression formation; False memories; memory: social cognition

Introduction

Research using the DREAM (Deese-Roediger-McDermott) paradigm has shown that false memories are a cost that adaptive associative memory structures have to endure. False memories have been obtained with semantic associates of a critical concept (Deese, 1959; Roediger & McDermott, 1995), with phonological neighbours (Sommers & Lewis, 1999) or even with table-related numerical near-neighbours (Pesta, Sanders & Murphy, 2001). In this work we extend the effect to yet another associative structure – the implicit theory of personality (Rosenberg, Nelson & Vivekanathan, 1968). In doing so, we are able not only to re-interpret classical effects in the literature of impression formation (i.e., the warm-cold effect, Asch, 1946) but also, to contribute a better understanding of how processing goals interact with associative structures.

The *Warm-Cold* Effect in Impression Formation and its interpretation: The Implicit Theory of Personality as an Associative Structure

Asch (1946) presented two groups of participants with two very similar lists of traits. The two lists were: the *warm* list (intelligent, skilful, industrious, *warm*, determined, practical and cautious) and the *cold* list (intelligent, skilful, industrious, *cold*, determined, practical and cautious). Participants of both groups were asked to form an impression of the type of person who could be described by those traits. Immediately after, participants wrote short descriptions of their impressions and chose the trait from each of 18 antonym trait pairs that best fit their impressions of the target. Participants of the *warm* and *cold* groups made markedly different trait choices although the two lists differed only in one of the stimulus traits. The impact of the replacement of *warm* by *cold* was nevertheless very specific. Trait pairs such as generous-ungenerous or sociable-unsociable were greatly affected (e.g., 91% of the *warm* group chose generous whereas only 8% of the *cold* group made the same choice). Trait pairs like persistent-unstable or honest-dishonest were not affected at all (e.g., 100% vs. 97% of the *warm* and *cold* groups, respectively, chose persistent). These results defied generations of researchers. Rosenberg, Nelson and Vivekanathan (1968) using a variety of research techniques (e.g., trait sorting, content analysis, etc.) showed that this pattern of results can be accounted if we conceive impressions formation as a process of target placement in a bi-dimensional semantic space formed by two relatively independent evaluative dimensions: one intellectual and one social. In fact, and according to the multidimensional analyses performed by Rosenberg et al. (1968), the list of traits used by Asch (1946) loaded heavily on the "intellectual" dimension, except for *warm* and *cold*, which loaded on the "social" dimension. Thus replacement of *warm* by *cold* should have a great impact regarding other "social" trait pairs but no effect regarding "intellectual" traits. And that was indeed the case. This semantic structure that represented the layman intuitions of what traits go together in the same target was called *implicit theory of personality* and it helped social psychologists to understand why during impression formation, participants went often beyond the information given, actively inferring non-presented traits and

incorporating them in their impressions of the personality of the targets.

False memories in the Deese-Roediger-McDermott (DREAM) paradigm

Roediger and McDermott (1995) replicated and extended a paradigm first introduced by Deese (1959). In this paradigm, the words that are most often free associated with a critical concept are used to form a stimulus list (e.g., the words, *sour, candy, sugar, bitter, good, taste, tooth, nice, honey, soda, chocolate, heart, cake, tart* and *pie* formed the *sweet* list). When participants hear lists such as this (that do not include the critical word) and they are immediately asked to recall it, they very often falsely recollect the (non-presented) critical word (*sweet*). The level of false recall of the critical word is equivalent to the level of veridical recall of words presented in the middle of the list. In recognition tests, the level of false recognition of the critical word is even greater and is accompanied by strong phenomenonological and source illusions (Payne, Ellie, Blackwell & Roediger & McDermott, 1995; Neuschatz, 1996). Opponent theories of false memories like the Activation-Monitoring framework explain these results as the outcome of two opposing processes an automatic spreading-activation process that describes how activation converges from the associates to the critical concept and the failure of a deliberate monitoring process that is supposed to discriminate presented from non-presented information (Roediger, McDermott & Watson, 2001). In sum, false memories are not, in our days, taken to be bizarre or *sui generis* effects but, instead they supposedly represent the cost of a flexible and adaptive associative memory that possesses considerable learning powers and inference skills (Roediger, 1996).

False Memories and Impression Formation

Like we aforementioned, false memories effects have been shown in a variety of associative structures (i.e., semantic or phonological networks and table-related numbers). We hypothesized that these effects would also underlie impression formation and, in particular, the *warm-cold* effect. Namely, we contend that when participants form an impression of the target's personality from the traits they were presented with, they attempt to position the target in the intellectual / social semantic space described by Rosenberg et al. (1968). That is, we think that impression formation encoding processes involve not only the assemblage of specific semantic trait space but also setting off a goal to position the target in that space. In the case of the *warm-cold* paradigm, the activation of the several intellectual traits presented on Asch´s list would gradually converge to their non-presented semantic neighbours that loaded more heavily in the intellectual dimension eventually leading to false memories of them, much like it occurs in the DREAM paradigm. We will call these converging false memories, non-distinctive false memories. Moreover, we suggest that the impression formation goal may moderate spreading activation processes such that whenever the available target information regarding one of the dimensions of the implicit personality theory space is poor or absent, active inference processes go beyond available information and compensate for this omission leading to the activation of the corresponding semantic trait areas. In the *warm-cold* paradigm, the only available information regarding the social dimension is the distinctive trait (*warm* or *cold*), thus participants must go beyond available information and infer traits from the semantic neighbouring areas of *warm* or *cold* (i.e., the social dimension). We will call these divergent false memories, distinctive false memories. Figure 1 illustrates the processes of formation of distinctive and non-distinctive false memories. Specifically, if a list of "intellectual" traits with a distinctive "social" trait (or vice-versa) is presented to participants instructed either to memorize the words or form an impression of the personality of a person described by those traits, it is predicted that a) both groups of participants will exhibit non-distinctive false memories (they will falsely recognize non-presented word from areas neighbouring the semantic space of the list words); b) impression formation sets will produce more distinctive false memories than memory sets (i.e., participants from the impression formation group will falsely recognize more non-presented words from areas neighbouring the semantic space of the distinctive word).

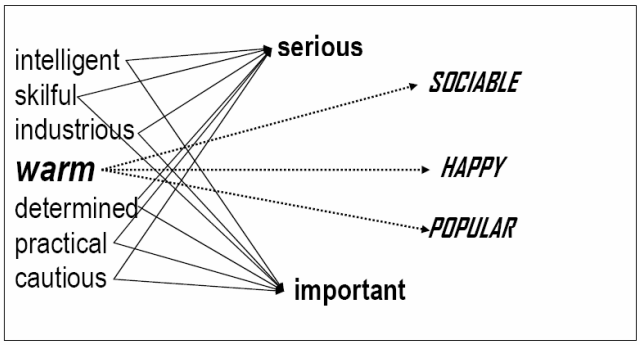

Figure 1. Patterns of activation for non-distinctive (filled lines) and distinctive (pointed lines) false memories.

Participants

117 (99 female and 18 male) students from the University of Lisbon participated in the experiment in exchange for course credits.

Stimulus materials

In order to assemble the stimulus materials, we first asked a different sample of 25 students to provide short trait-based descriptions of liked and disliked persons (both their personal acquaintances and persons they didn't know personally). From these descriptions we chose the most frequent 40 positive and 40 negative traits. Following Rosenberg et al. (1968), another sample of 27 students sorted the 80 traits in 12 groups according to what traits more often go together in different people. From these sorting data, we performed a MDS analysis that basically reproduced the Rosenberg et al. (1968)'s results reproducing the bi-dimensional structure identified by them (stress = .21). We also performed a 4-Way Cluster Analysis, which

reproduced the four quadrants of the MDS. We also used the 4-Way Cluster Analysis to select the 15 words of each cluster closest to the cluster centroid. We used the 5 words closer to each centroid as the critical lures (never to be presented to participants) and the 10 next words to form two lists (the intellectual and the social list). We chose four distinctive words among the opposite pairs of each dimension that were closer to the respective centroid. Thus for the intellectual dimension, *cultured* and *uncultured* were chosen. For the social dimension, *warm* and *cold* were chosen.

In sum, in this study we used two lists of 10 words for the intellectual and for the social dimension (we only formed lists using the positive pole) and 4 critical distinctive words (warm vs. cold and cultured vs. uncultured). We always presented each list of one dimension with the distinctive word (either positive or negative in valence) from the other dimension. The distinctive word was always presented in the eighth position. In the present experiment, list items always belonged to a different trait dimension than did the distinctive item (intellectual versus social dimension or vice-versa).

In addition we also formed 2 filler lists with 9 and 10 words that loaded less in both dimensions. The critical list was always presented in between the two filler lists.

The recognition test contained the 20 critical lures (5 per quadrant), 20 list words (5 presented words per list), the 4 distinctive words, 10 words presented in the filler lists.

Design

The design was a 2 Processing Goal (Memory vs. Impression Formation) X 2 Lists (Intellectual vs. Social) X 2 Distinctive Word Valence (Positive vs. Negative) X 2 False Memories (Non-distinctive vs. Distinctive) mixed design, the last factor being within-participants.

Procedure

The experiment was run in small groups of 4 to 8 participants. Participants first read instructions that either asked to memorize the lists of words they were going to be presented with or to form an impression of the personality of different target persons described by set of adjective traits provided by people who were well acquainted with the targets. In memory conditions, participants were asked to try memorize the words verbatim so that they could reproduce them successfully in a memory test, and to recapitulate the list mentally for 90 seconds before the presentation of the next list. In impression formation conditions, participants were asked to try imagined the type of person the target might be and to recapitulate their impressions for 90 second before the presentation of the adjective trait list describing the next target person. After reading these instructions, participants heard the three CD-recorded lists. In the memory condition, the experimenter announced each list designating it with a letter label (a, b and c) and asked the participants to memorize the words. In the impression formation condition, the experimenter announced each list designating it by common first and family name (e.g., Peter Jones) and asked participants to form impressions of the target person. In each case, 90 seconds mediated between lists. The first and last lists were fillers and constant across conditions, only the middle list was critical and changed according to the independent variables. After hearing the three lists, participants performed a distracter task for 10 minutes. After the distracter task, participants performed the recognition test. We follow the instructions used in Roediger and McDermott (1995) such that, whenever participants recognized a trait they were asked to report whether they remember some of the circumstances in what the item was presented (a R response) or simply knew somehow that the item had been presented (a K response). Again, we followed the instructions of Roediger and McDermott (1995) that, in turn, followed Gardiner (1988). At the end of the sessions, participants were fully debriefed and thanked.

Results and Discussion

Our critical data regards both the *proportion non-distinctive false memories* (falsely recognized items that semantically correspond to the semantic quadrant of the list items) and the *proportion of distinctive false memories* (falsely recognized items that semantically correspond to the semantic quadrant of the distinctive item). Remember that list items always belonged to a different trait dimension than did the distinctive item (intellectual versus social dimension or vice-versa).

Non-Distinctive False Memories We performed a 2 Processing Goals (Memory vs. Impression Formation) X 2 List (Intellectual vs. Social) x 2 Distinctive Item Valence (Positive vs. Negative) between-participants ANOVA on the proportion of non-distinctive false memories. Only a non-interpretable interaction between Processing Goal and List emerged, $F(1, 109) = 7.75$, $p = .006$, $MSe = .09$, $\eta^2 = .07$, showing that whereas for the social list, Impression Formation made more false recognitions than Memory participants ($M = .49$ vs. $M = .23$), the reverse occurred for the intellectual list ($M = .39$ vs. $M = .45$).

In any case, the overall mean proportion of non-distinctive false memories was $M = .40$. We interpret the considerable level of non-distinctive false memories obtained as a corroboration that false memories can also be obtained within an impression formation semantic structure (the so called implicit theory of personality).

Non-Distinctive False Memories (Remember vs. Know). Participants' phenomenological reports of their non-distinctive false recognitions as remember (R) or know (K) were included in a subsequent analysis. This resulted in a 2 Processing Goals (Memory vs. Impression Formation) X 2 List (Intellectual vs. Social) x 2 Distinctive Item Valence (Positive vs. Negative) X Phenomenological Report (Remember vs. Know) mixed-model ANOVA, with the last factor being within-participants on non-distinctive false memories. Only the main effect for Phenomenological Report and an interaction qualifying it between Processing Goal and Phenomenological Report emerged. The former, $F(1, 109) = 28.71$, $p = .001$, $MSe = .19$, $\eta^2 = .21$, reflects a somewhat surprising prevalence of Know ($M = .55$) relative

to Remember reports (M = .23). The interaction with Processing Goal [F (1, 109) = 10.65, p = .001, MSe = .19, η^2 = .09] revealed that this difference was greater for Memory (M =. 64 vs. M = .12) than for Impression Formation participants (M = .46 vs. M = .34). This prevalence of Know over Remember reports in both Impression Formation and Memory conditions stands in contrast with the results of Roediger and McDermott (1995) for general semantic lists. This difference may indicate that the memory illusions typically obtained in the original DREAM paradigm are phenomenologically more compelling than the memory illusions obtained in the present paradigm.

Distinctive False Memories. We performed a 2 Processing Goals (Memory vs. Impression Formation) X 2 List (Intellectual vs. Social) x 2 Distinctive Item Valence (Positive vs. Negative) between-participants ANOVA on the proportion of distinctive false memories[1]. The three factors were significant.

First and foremost, the Processing Goal main effect emerged, F (1, 109) = 5.89, p = .017, MSe = .03, η^2 = .05, attesting the fact that, as predicted, Impression Formation made more false recognitions than Memory participants (M = .15 vs. M = .08).

A List effect was also reliable, F (1, 109) = 12.81, p = .001, MSe = .03, η^2 = .10, indicating that, participants made more false recognitions for the Social than for the Intellectual list (M = .17 vs. M = .06).

The last main effect to emerge was the Distinctive Item Valence, F (1, 109)= 29.94, p= .001, MSe = .03, η^2= .21, reflecting the difference between the proportion of false recognitions made when the distinctive item was positive (M= .20) relative to when the item was negative (M= .03).

Finally, the Processing Goal X List interaction was also significant, F (1, 109) = 4.17, p = .044, MSe = .03, η^2 = .02, showing that the difference between Impression formation and Memory participants in the proportion of distinctive false memories was higher for the Social (M = .24 vs. M = .10) than for the Intellectual list (M = .07 vs. M = .05).

In sum, our main prediction was confirmed; the goal of forming and impression made Impression Formation participants to show a higher level of distinctive false memories than Memory participants. In our view, this difference is due to the active attempt from Impression Formation participants to position the target in the implicit theory of personality space. It is our contention that this finding illustrates how a processing goal can moderate automatic spreading-activation effects.

[1] Preliminary analyses showed the assumption of homoscedasticity did not hold. For this reason, we recoded the data in a dichotomous way (0 vs. 1 or more false memories) and performed a logistic regression on this score using Processing Goal, List, Distinctive Item Valence and their interactions as predictors. The three factors were significant, thus replicating the above-presented results (only the interaction Processing Goal X List failed to emerge. For coherence and commodity of presentation, we kept the ANOVA results in the text.

Distinctive False Memories (Remember vs. Know). Participants' phenomenological reports of their distinctive false recognitions as remember (R) or know (K) were included in a subsequent analysis. This resulted in a 2 Processing Goals (Memory vs. Impression Formation) X 2 List (Intellectual vs. Social) x 2 Distinctive Item Valence (Positive vs. Negative) X Phenomenological Report (Remember vs. Know) mixed-model ANOVA, with the last factor being within-participants on non-distinctive false memories. Only one effect involving Phenomenological Report was significant – the main effect. F (1, 109) = 7.66, p = .007, MSe = .53, η^2 = .07, reflecting the prevalence of Know (M = .52) relatively to Remember (M = .24) reports. The same result pattern as the one found in the case of non-distinctive false memories.

Veridical Memories. We performed a 2 Processing Goals (Memory vs. Impression Formation) X 2 List (Intellectual vs. Social) x 2 Distinctive Item Valence (Positive vs. Negative) between-participants ANOVA, on the proportions of hits (list items recognized). Only one effect emerged, a Processing Goal main effect. F (1, 109) = 4.03, p = .047, MSe = .04, η^2 = .04, showing that Impression Formation (M = .86) recognized more list items than Memory participants (M = .77). Moreover, Impression Formation (M = .87) recognized the distinctive item more than did the Memory participants (M = .69), χ^2 (1) = 5.83, p = .016. Thus Impression Formation performed better than Memory participants. This result reproduces a classical difference found in the social cognition literature (Hamilton, Katz & Leirer, 1980), and probably reflects the fact that forming impressions of the personality requires more integrative and elaborative processes of encoding that are beneficial to later retrieval.

Discussion

Our results corroborate the presence of non-distinctive false memories, already identified in several semantic spaces, within an impression formation semantic structure (the so called implicit theory of personality).

In addition, the results suggest that under an impression formation goal another type of false memories arise, namely, distinctive false memories.

Flexible associative memory structures are able to store information but must go further than storage to compensate for inevitable information loss that occurs in our complex world. Thus these structures need to infer, to complete and to go beyond the information given in order to accomplish our learning needs. False memories may represent the implicit cost of these considerable learning powers and should be encountered in all associative memory structures. The present study enables us to illustrate that false memories can also occur in a novel semantic structure – the so-called, implicit personality theory (Rosenberg et al., 1968). Moreover, we think we have shown that impression formation encoding processes involve not only a specific semantic trait space, the position of the target in that space but also the setting off of active inference processes that compensate for missing or poor information moderating automatic spreading-activation effects. In this sense, we

contend that our data suggests that impression formation occurs in a flexible semantic space.

Acknowledgments

Preparation of this paper was supported in part by the Grant POCTI/PSI/47252/2002 from the FCT (Portugal).

References

Asch, S. E. (1946). Forming impressions of personality. *Journal of Abnormal and Social Psychology, 41*, 258-290

Deese, J. (1959). On the prediction of occurrence of particular verbal intrusions in immediate recall. *Journal of Experimental Psychology, 58*, 17-22.

Hamilton, D. L., Katz, L. B., & Leirer, V. O. (1980). Cognitive representation of impressions: Organizational processes in first impression formation. *Journal of Personality & Social Psychology, 39*, 1050-1063.

Payne, D. G., Elie, C. J., Blackwell, J. M., & Neuschatz, J. S. (1996). Memory illusions: recalling, recognizing, and recollecting events that never occurred. *Journal of Memory and Language, 35*, 261-285.

Pesta, B., Sanders, R., & Murphy, M. (2001). Misguided multiplication: Creating false memories with numbers rather than words. *Memory & Cognition, 29*, 478-483.

Roediger, H. L., III. (1996). Memory illusions. *Journal of Memory and Language, 35*, 76–100.

Roediger, H. L. III, & McDermott, K. B. (1995). Creating false memories: Remembering words not presented in lists. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 21*, 803-814.

Roediger, H. L., III, Watson, J. M., McDermott, K. B., & Gallo, D. A. (2001). Factors that determine false recall: A multiple regression analysis. *Psychonomic Bulletin & Review, 8*, 385-407.

Rosenberg, S., Nelson, C., & Vivekanathan, P. S. (1968). A multidimensional approach to the structure of personality impressions. *Journal of Personality and Social Psychology, 9*, 283-294.

Sommers, M.S. & Lewis, B.P. (1999). Who really lives next door: Creating false memories with phonological neighbors. *Journal of Memory and Language, 40*, 83-108.