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Running Head: ASSOCIATIVE FALSE CONSUMER MEMORY

Associative False Consumer Memory: Effects of Need for Cognition & Encoding Task.

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Abstract

Two experiments investigated the effects of product attribute associations on false consumer memory. In both experiments, subjects were presented with sets of related product attributes under incidental encoding conditions. Later, recognition memory was tested with studied attributes, non-studied but associated attributes (critical lures) and non-studied unrelated attributes. In Experiment 1, the effect of Need for Cognition (NFC) was assessed. It was found that individuals high in NFC recognised more presented attributes and falsely recognised more associative critical lures. The increase in both true and associative false memory was accompanied by a greater number of responses that index the retrieval of detailed episodic-like information. Experiment 2, replicated the main findings through an experimental manipulation of the encoding task that required subjects to consider purchase likelihood. Explanations for these findings are considered from the perspective of activation processes and knowledge structures in the form of gist-based representations.

Keywords

False memory

Associative processing

Consumer memory

Need for cognition

Remember-Know procedure

Associative False Consumer Memory: Effects of Need for Cognition & Encoding Task.

The importance of associative representations and processes has had a long and venerable history in the psychology of learning and memory, from associationism to mathematical and computation models of memory (e.g., Anderson & Bower, 1973; Lohnas, Polyn, & Kahana, 2015; Roediger, McDermott, & Robinson, 1998). The processing of associative information in memory can also lead to memory errors (Roediger et al., 1998). One type of error is that of commission and involves incorrectly recalling or recognising non-presented items (Brainerd & Reyna, 2005; Schacter 1999). The focus of the current experiments was the false recognition of consumer information, factors influencing such false memories, and the phenomenological characteristics of these memory errors. To this end, the introduction provides an overview of relevant associative false memory research prior to considering the implications of this for consumer memory.

Associative processing & false memory

One experimental method for creating associative false memories is the Deese-Roediger-McDermott (DRM) paradigm (Deese, 1959; Roediger & McDermott, 1995). This involves the presentation of a list of associated words (e.g., hot, snow, warm, winter, ice) that are related to a non-presented item, often called the critical lure or theme word; in this example, the word is cold. A typical outcome is that subjects falsely recall or recognize the critical lure, often at levels equivalent to studied words (e.g., Gallo, Roediger & McDermott, 2001; Roediger & McDermott, 1995; Thapar & McDermott, 2001).

Associative false memories can also arise in other paradigms that capitalise on pre-existing taxonomic categories. In the category-repetition paradigm, subjects are exposed to sets of exemplars from a particular category of which some have been omitted (e.g., mango, pear, cherry, strawberry). False memories arise when subjects claim to have studied dominant but non-presented exemplars, such as apple or orange (e.g., Dewhurst & Anderson, 1999; Dewhurst & Farrand, 2004; Seamon, Luo, Schlegel, Greene, & Goldenberg, 2000; Smith, Gerkens, Pierce, & Choi, 2002).

More generally, these associative memory errors have led to a range of experimental work that demonstrates the factors that produce such errors and the importance of associative processing in false memory more generally (Gallo, & Lampinen, 2015). Although the precise nature of the stimulus relationships within each of these paradigms might differ, they both illustrate the importance of associative information in the creation of false memory effects. Consequently, in both paradigms, false memories arise because of pre-existing associations between the non-presented lures and the studied information. Associative information is also important for understanding consumer memory, as outlined later.

The role of associative representations and processing is acknowledged by two prominent explanations for false memory effects. One account, the activation-monitoring framework (Gallo, 2010; Roediger & McDermott, 1995), explains false memories arising as a result of list words activating the critical lure during encoding. Thus, during the study of items that are related by virtue of backward associative strength or taxonomic category, the non-presented critical lure is activated. Subsequently, during testing, differentiating between presented (vs. non-presented items) is particularly difficult because of the similarity of activation levels. This can then result in a monitoring failure and the creation of a false memory.

Another explanation, Fuzzy Trace Theory (FTT), differentiates between the types of memory representations created during encoding (Brainerd & Reyna, 2005). One of these, called the verbatim trace, represents an accurate record of the encoded experience and contains detailed episodic information about the study experience. The second, called the gist trace, represents the more general features or attributes of the encoded experience. Typically, the gist representation leads to memory responses that are devoid of particular details that form part of the verbatim trace. During testing, false memories can arise when the gist trace is used as a basis for responding to associated, but non-studied items.

Associative processing & consumer memory

Consumer memory refers to the sum total of the contents of information about products and brands, including marketing information (i.e., ad-claims, brand messages and visuals) and consumer generated information in the form of cognitive and emotional responses (Aaker, 1991; Bagozzi, Gürnao-Canli & Priester, 2002; Braun-LaTour, & LaTour, 2004). Thus, the content of consumer memory is not limited to those properties provided by marketers. This content is stored within consumers' long-term memory and can provide a basis for product/brand evaluation and choice (Alba, Hutchinson & Lynch, 1991; Hilbig, 2014; Lee, 2002). Many theoretical accounts of consumer memory represent brand and product category information in terms of associative networks (Bettman, Johnson & Payne, 1991; Schmitt, 2012; Teichert, & Schöntag, 2010). Processing mechanisms work within these representations to activate brand and product associations together with other pre-stored information, such as prior cognitive responses and evaluations. Ultimately, these shape the consumers' understanding of brand and product information and can influence consumer decisions (Alba, et al., 1991; Bettman et al., 1991).

In this context, prior knowledge enables the consumer to fill in the gaps between presented (e.g., advertised) and non-presented (e.g., non-advertised) information (e.g., Kardes, Posavac, & Cronley, 2004). If the consumer retrieves attributes consistent with the product category, but not necessarily the brand or the marketing claims, the evaluation of that brand may be biased. Consequently, understanding the attributes activated by product categories is of importance.

Experiment 1. The effects of Need for Cognition on consumer false memory

Need for Cognition (NFC) refers to a trait-like tendency for individuals to engage with and enjoy systematic and effortful processing of information (Cacioppo, Petty, Feinstein, & Jarvis, 1996). Thus, individuals differ in the extent to which they are *motivated* to utilise cognitive resources in tasks that require attention, or are demanding. Typically, processing differences are assessed by comparing individuals who score high (vs. low) on the NFC scale. Across a range of tasks and situations, variations between high and low NFC individuals have been found in relation to: (i) Evaluating the cogency and quality of persuasive arguments (Cacioppo, Petty, & Morris, 1983; Priester & Petty, 1995). For example, those high in NFC are more persuaded by strong (vs. weak arguments) and show greater attitudinal shifts in response to the former; (ii) Assessing the value of beliefs about products, with those high in NFC possessing more confidence in the validity of self-generated cognitive responses (Petty, Briñol, & Tormala, 2002); (iii) Engaging in deeper processing, with those higher in NFC scrutinising and making use of semantic strategies when reading texts (Kardash & Noel, 2000); (iv) Forming inferences and conclusions based on limited information. For instance, those high in NFC are more likely to infer that a product possesses a particular attribute when that attribute is not advertised explicitly (Martin, Lang, & Wong, 2003; Stayman & Kardes, 1992); (v) Showing differences in the degree of transfer of skills based on working memory training, due to the higher intrinsic motivation of high NFC subjects (Jaeggi, Buschkuehl, Shah & Jonides, 2014), and (vi) Memory retrieval, with high NFC subjects showing enhanced free recall of a set of persuasive arguments (e.g., Cacioppo, et al., 1983).

Need for cognition has been particularly useful for understanding individual differences in consumer settings persuasion (Haugtvedt, Petty, & Cacioppo, 1992). In this context, NFC has been valuable for examining the effect of motivation on cognition and other consumer relevant variables such as attitudes, product evaluations, and brand-related behavior (e.g., Haugtvedt et al., 1992; Hanson, Samuelsen, & Sallis, 2013; Martin, et al., 2004)

A general explanation for the range of effects found using NFC has been conceptualised in the Elaboration Likelihood Model (ELM) (Petty & Cacioppo, 1981, 1986). The ELM differentiates between central and peripheral processing routes. The former involves effortful processing based on the scrutiny, amplification and reasoned consideration of information. Elaboration itself can take a number of forms, including sheer amount (e.g., the quantity or number of thoughts generated to a stimulus), relevance (e.g., the significance or bearing of the generated cognitions in relation to the stimulus), or complexity, (e.g., generating more multifaceted cognitions making use of multiple cues) (Cacioppo, et al., 1996). Together, these *cognitive responses* (Petty, Ostrom & Brock, 1981) determine the behavioural outcome to persuasion attempts (Petty, & Cacioppo, 1986), marketing communications (e.g., Briñol, et al., 2004), and reactions to other verbal and visual stimuli (e.g., Fleischhauer, Miller, Enge, & Albrecht, 2014; Kardash, & Noel, 2000). In contrast, the peripheral route involves processing that is less cognitively demanding and may engage the use of decision heuristics and attention to simple peripheral cues. In such instances, the outcomes of persuasion attempts would be determined by factors such as the expertise or attractiveness of the communicator (e.g., Petty, Cacioppo & Goldman, 1981), or mere consideration of the brand name (e.g., Maheswaran, Mackie, & Chaiken, 1992). Across these examples, attitude change comes about because of processing of incidental or secondary features of the communication as opposed to content or cogency of the actual message.

In the context of this model, NFC is considered to be a motivational variable in which those scoring higher on this scale are driven to engage in effortful thinking across a range of situations and materials. The consequence of this is enhanced message elaboration in terms of quantity, relevance and complexity.

Within this framework it is constructive to consider the effects of NFC on false memory. For example, Graham (2007) found that subjects who were high in NFC were more likely to falsely recognise non-presented DRM critical lures. This did not extend to unassociated lures or true memory. More recently, Leding (2011), extended these findings to free recall. Particularly, over a multi-trial free recall sequence, the false recall of critical lures and true recall of studied items were reliably enhanced in high NFC subjects, especially under full (vs. divided) attention conditions.

False memories can also be observed with more consumer oriented stimuli. In particular Sherman (2013) found that consumers displayed false memories for non-presented brand names following exposure to associated brand names in a similar product class. This was observed for both recall and recognition with greater false memory effects after a delay. Similar results were also found following exposure to television advertisements (Sherman, Follows, Mushore, Hampson-Jones, & Wright-Bevans, 2015). However, in neither of these experiments was NFC assessed or incorporated as a variable.

Consequently, Experiment 1 assessed the influence of NFC on associative false memory with consumer relevant stimuli. However, rather than assessing memory for brand names, product class attributes were chosen as a means to explore associative memory in consumers. A product class refers to a set of interrelated products/brands that share similar functions and can mediate a range of consumer related cognitions and behaviours (e.g., Brucks, 1985; Chang, 2004; Rao, & Monroe, 1988). In the experiments reported here, examples of product classes included cereals and toothpastes, whilst product attributes were the associations generated in response to the product class names (e.g., whitening and fluoride for toothpaste and crunch and fibre for cereal). In both experiments, participants were exposed to sets of various product category associations. For each category, the two attributes with the highest typicality rating to the product class were omitted to form the critical lures for those products (e.g., minty and breakfast). Memory for studied and unstudied attributes was assessed as a function of NFC (Experiment 1) and encoding task (Experiment 2).

In addition to measuring overall recognition, the remember-know procedure (Gardiner & Richardson-Klavehn, 2000), was employed to assess memory for recollective details (Remember responses) and item familiarity (Know responses). This was done to provide insight into the qualitative characteristics of true and false consumer memory as related to NFC and encoding task.

It was predicted that false memory for critical lures from presented lists would be higher than that for unassociated lures or critical lures from non-presented lists. More interestingly, it was expected that false memory would be higher for participants high in NFC. It was also hypothesised that those high in NFC would show superior true recognition. This prediction may seem at odds with the results of Graham (2007) who found no effect of NFC on *recognition* of studied items. However, given that (i) much existing work shows effects of elaborative or deeper processing on recognition (as well as recall) (e.g., Craik & Tulving, 1975; Gardiner, 1988; Gardiner, Java, & Richardson-Klavehn, 1996; Rajaram, 1993; Thapar & McDermott, 2001), and, (ii) variation in NFC is conceptualised as producing differences in elaborative encoding (Petty & Cacioppo, 1981, 1986; Cacioppo, et al., 1996; Wootan & Leding, 2015), then this prediction seemed warranted from a general perspective. In addition, use of the remember-know procedure, would also confer some benefits to the assessment of recognition memory responses. This is because effects that are obscured by the analysis of only the overall hit rate, might be revealed by finer-grained analyses involving 'remember' and 'know' responses (Gardiner & Richardson-Klavehn, 2000). Consequently, the null effect of NFC on true recognition, as found by Graham (2007), might pertain only to the overall recognition responses.

Experiment 1: Method

Design

The overall design was a 2(NFC; high vs. low) between-subjects by 4(attribute type; studied list attributes vs. critical lures from studied lists vs. non-studied list attributes from the unexposed lists vs. critical lures from the unexposed lists) within-subjects mixed ANOVA.

The dependent variables were yes responses to each of the types of attributes outlined above. Each of these were further analysed in terms of 'Remember', and 'Know' responses. Additional variables were: (i) signal detection measures of sensitivity (*d*') and response bias (β) (ii) process-independence measures of recollection and familiarity (derived from the 'Remember' and 'Know' responses and described in the results section).

Participants

For the main experiment, 70 volunteers from the undergraduate population of the Manchester Metropolitan University were recruited by the experimenters and assistants. Two of these were excluded from analyses for failure to complete the recognition test. An additional 46 student participants from the same university assisted with the development of the stimulus materials. None of these took part in the main experiments.

Materials & Apparatus

General Construction of Product Category Lists

The development of the product category-attribute lists were constructed for the purpose of both experiments reported here. Stimulus development consisted of a number of stages[1]. Firstly, thirty-five product categories (e.g., toothpaste, soup, soap) were generated by the authors. These categories were then placed into a booklet with several spaces below each for written responses. A group of 20 participants were then asked to generate as many attributes/characteristics that came to mind that they considered being associated with that product. They were told to avoid just generating brand names and an example was provided.

The attributes generated were then collated to a general pool of attributes for each category. From this pool, a total of 30 categories were then selected along with 12 attributes per category. The attributes selected were those that were most commonly produced.

The category names were then placed into a booklet with the name of one of each the categories printed at the top of each page. Below this, the selected 12 attributes for that category were each placed above a 7 point Likert rating scale with the scale anchors being very uncharacteristic (1) to very characteristic (7).

This booklet was then given out to 26 participants under the guise of a consumer survey. The participants were informed that that they would be asked to consider a number of everyday products and for each rate how characteristic they believed to be a range of attributes pertaining to that product. An example was provided that was not used in the survey itself.

Following this, the mean rating for each attribute for each category was calculated. On the basis of this, a total of 8 attributes per category were selected. The attributes selected were those with the highest ratings. From this initial pool, a total of 20 categories were chosen for inclusion in the main experiments. For each of the chosen categories, the two most characteristic or typical attributes were selected to be the non-presented critical lures. These were the attributes that were most strongly associated to the product category name. The remaining six attributes were used as presented (studied) items. For example, for the product category 'Washing Detergent', the critical lures were Clean and Laundry, and the list attributes were; Biological, Powder, Softening, Conditioning, Linen, and Colour care.

Construction of the Encoding Sets

The 20 selected product categories were divided into two sets (A and B) for the purpose of counterbalancing. Participants were only exposed to one set during the study phase. The alternative set was used to form distracters on the recognition test. For the purposes of presentation, two auditory lists were created from set A and B. Each of these lists comprised ten product names and six attributes. Each category was spoken by a female voice with the name of the product mentioned first followed by the six attributes in descending order of association.

Construction of the Recognition Tests

The recognition tests were constructed from encoding sets A and B by the selection of a total of 80 attributes as follows. Firstly, two attributes from the middle of each list for each of the categories. For each subject, 20 of these were studied and 20 unstudied list attributes. Secondly, the critical non-presented attributes from the presented category (20 in total), and the two critical attributes from the non-presented category (20 in total). The reason two items were selected as critical lures from each list was to balance the proportion of list and related attributes from each of the product sets and to ensure a reasonably wise range of responses for each item-type. In other research making use of the DRM procedure, often only one critical lure is used.

However, previous work has also followed the procedure used here (e.g., Dewhurst et al., 2005; Knott & Dewhurst, 2007).

The words were randomly arranged and printed down the left side of a test booklet. To the right of each word were the response options ‘Yes’ and ‘No’. To the right of these response options were the words ‘Remember’, ‘Know’ and ‘Guess’. The front cover of the test booklet provided participants with the details of the recognition test and the remember-know instructions (see procedure section for more information).

Other Materials: Need for Cognition

Need for Cognition was measured by the revised 18 item NFC scale (Cacioppo, Petty, & Kao, 1984). Each item on the questionnaire consisted of a statement that assesses the degree to which the respondent expresses a preference for engaging in effortful thought. Each statement is paired with a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Previous research has documented this scale to be reliable (e.g., Cacioppo et al. 1996) and the Cronbach’s alpha for the current study was .92.

Apparatus

A computer was used to present the stimuli during the encoding phase. Word lists were recorded onto a set of audio files.

Procedure

All participants were tested individually in a sound attenuated booth. Following the initial overview of the experiment and the signing of the consent forms the experiment began. Participants were informed that the experiment would consist of a number of phases but they were not given any details about the phases.

In the encoding phase, participants were randomly assigned to either encoding set A or B and informed that they were about to listen to a set of product categories and attributes that they might think about on an everyday basis or during a trip to the supermarket. Each set was spoken by a female voice with the name of the category presented first followed by the product attributes. A 1 s interval was interposed between each word and a 2.5 s interval was used between each category.

After the encoding phase, the participant took part in an unrelated task for seven minutes; this comprised writing down the names of towns and cities in the United Kingdom. In the recognition test phase, participants were presented with a recognition booklet and asked to read the instructions printed on the front cover. The instructions indicated that a number of words were printed in the booklet of which only some were presented earlier. The task of the participant was to indicate for each word if they recognized the word by circling 'yes' or 'no'. If 'no' was circled, they were informed to move onto the next word. If they claimed to recognized the word they were asked to indicate how they recognized it based on remember-know instructions adapted from Gardiner and Richardson-Klavehn (2000). In these instructions, a remember response was defined as one which is associated conscious recollection of the studied attribute. A know response was defined as one in which the attribute is recognised because it seems familiar within the confines of the study but lacks more distinctive or recollective details. A guess response was indicated as one where they felt they were simply presuming the study status of the attribute and was neither associated with recollection or familiarity. The experimenter ensured that the participants understood the instructions and were then asked to turn the page and complete the self-paced test. The NFC scale was completed ether prior to the encoding phase or after the test and was counterbalanced.

Results

Overview

The results are organised by the type of analysis performed. Initially, an analysis on the overall proportion of yes responses to the different attributes was performed as a function of NFC. This produced a 2(NFC; high vs. low) between-subjects by 4(attribute type; studied vs. critical lure of studied vs. non-studied vs. critical lure of non-studied) within-subjects mixed ANOVA. The NFC grouping was achieved by following the procedure in previous work (e.g., Cacioppo, et al., 1983; Graham, 2007; Leding, 2011; 2013) and involved a median split. The median in this study was 61.5 and similar to previous work (e.g., Graham, 2007; Leding, 2011). This produced 34 participants in each of the groups. This initial ANOVA permitted an assessment of the overall effects of NFC on true and false memory. Combining the types of attributes into one analysis allowed an examination of the comparative magnitude of true and false memory. Secondly, signal detection analyses were performed to examine recognition sensitivity (d') and response bias (β) as a function of NFC and type of memory (true vs. false).

The 'Remember' and 'Know' responses were analysed as both raw proportion scores and as transformed scores forming *process estimates* of *recollection* and *familiarity*. The raw proportion values for 'Remember' and 'Know' are only valid estimates of underlying processes if those processes operate in a mutually exclusive manner (e.g., Richardson-Klavehn, Gardiner, & Java, 1996; Yonelinas & Jacoby, 1995). However, according to certain dual-process frameworks, the underlying processes of recollection and familiarity operate *independently* of each other (e.g., Jacoby, 1998; Jacoby, Begg & Toth, 1997; Yonelinas, 2002; Yonelinas & Jacoby, 1995). If correct, this makes the use of raw proportion scores problematic and produces biased estimates of recollection and, especially familiarity. Essentially, the proportion of 'Know' responses underestimates the magnitude of familiarity as participants only use a 'Know' response when recollection fails; represented algebraically as $K = F(1 - R)$, where K equals the proportion of 'Know' responses, F represents familiarity and R represents recollection.

Through the rearrangement of this formula it is possible to calculate familiarity according to the assumption of process independence. Consequently, Yonelinas and Jacoby (1995) advocate calculating familiarity by the formula $F = K/(1-R)$. However, a potential problem with this equation is that it does not take into account the fact that a 'guess' option was used in the current experiments. If the proportion of guess responses is very low (as is the case with the present experiments), then this need not pose any difficulties. In spite of this, an alternative is to incorporate the guess responses into the analyses. One way to do this is to recognise that 'know' responses, are considered to vary on a continuum of trace or confidence strength (e.g., Diana, Yonelinas, & Ranganath, 2007; Ranganath, 2010; Yonelinas, Aly, Wang, & Koen, 2010). Consequently, one interpretation of 'guess' responses is they represent very low confidence 'know' responses and that a 'know' response would likely have been given if no guess option were available (Knott & Dewhurst, 2007; Migo, Mayes, & Montaldi, 2012; Wixted & Mickes, 2010). In the 2-step recognition procedure used here, RKG responses are made following the decision that an item is old. Thus, it makes sense that such guesses are not without any evidential (mnemonic) basis; that is, they are not simply ‘wild’ guesses. Rather, they represent very low confidence responses. Given this, the calculation of process familiarity was derived by combining the proportions of ‘know’ and ‘guess’ prior to dividing by the denominator, 1-R.

The assessment of the process of recollection is less problematic than familiarity and can be calculated by subtraction of the remember responses to non-studied items from remember responses to studied items. For completeness, both proportion and process-based estimates are included in the results.

Overall proportion yes responses.

The proportion of yes responses to each type of attribute were entered into a 2(NFC; high vs. low) between-subjects by 4(attribute type; studied vs. critical lure of studied vs. non-studied vs. critical lure of non-studied) within-subjects mixed ANOVA. The descriptive statistics for these and all other analyses for this experiment can be found in Table 1.

INSERT TABLE 1 ABOUT HERE

This revealed a main effect of attribute type, $F(3, 198) = 126.55, p < .001, \eta_p^2 = .66$. Inspection of the means shows the lowest number of yes responses for non-studied items with critical lures in between studied and non-studied. The main effect of NFC was significant, $F(1, 66) = 6.87, p = .01, \eta_p^2 = .09$, showing higher proportion scores for the high NFC group. The interaction was also significant, $F(3, 198) = 7.16, p < .001, \eta_p^2 = .09$. The interaction was assessed further by the use of simple main effects at each level of attribute type. For studied attributes this produced a significant difference between high and low NFC groups $t(66) = 3.77$, $p < .001$, Cohen's $d = 0.91$, showing higher true recognition scores for the high group. For critical false memory, the difference was also significant, $t(66) = 2.29$, $p = .02$, Cohen's $d = 0.51$, again showing higher false recognition scores for the high NFC group. The difference between the non-studied attributes was not significant, for either of the attribute types p's > .05.

Signal detection analyses

The signal detection measure of sensitivity (*d*') for true memory was calculated by using the hit and false alarm rates for studied and non-studied attributes respectively. In relation to false memory, *d'* was calculated by treating the proportion of yes responses to critical lures from studied lists as hits and proportion yes responses to critical lures from unstudied lists as false alarms. For false memory, *d'* shows the extent to which subjects falsely recognise critical attributes associated with studied lists compared to similar attributes from non-studied lists. Higher scores show greater discrimination between the two types of attribute. In previous research this has been referred to as a measure of gist-based memory (e.g., Schacter, Israel, & Racine, 1999), as higher scores show responses that are more influenced by the gist or theme of the list.

These scores were entered into a 2(NFC; high vs. low) between-subjects by 2(memory type; true vs. false) within-subjects mixed ANOVA. This produced a significant main effect of attribute type $F(1, 66) = 59.30$, $p < .001$, $\eta_p^2 = .47$, showing higher *d'* scores for true memory. The main effect of NFC was also significant $F(1, 66) = 11.63$, $p = .001$, $\eta_p^2 = .15$, revealing higher *d'* scores for those high in NFC. The interaction was not significant, $F(1, 66) = .97$, $p = .33$, $\eta_p^2 = .01$. These results show that the ability to differentiate between attribute type was higher for true compared to false memory and higher for those high in the NFC.

Response bias β was calculated using the same item types as for *d'*. The raw scores were skewed and the analyses were based on log transformed scores. These were placed into a 2(NFC; high vs. low) between-subjects by 2(memory type; true vs. false) within-subjects mixed ANOVA. This produced a main effect of memory type, $F(1, 66) = 8.83$, $p = .004$, $\eta_p^2 = .12$, showing a more liberal response tendency for false memory. There was no main effect of NFC, $F(1, 66) = 0.34$, $p = .56$, $\eta_p^2 = .005$, and no interaction, $F(1, 66) = 2.00$, $p = .03$.

Proportion analyses for RKG responses

The proportion responses for 'Remember', and 'Know' responses were entered into two separate 2(NFC; high vs. low) between-subjects by 4(attribute type; studied vs. critical lure of studied vs. non-studied vs. critical lure of non-studied) within-subjects mixed ANOVAs.

For 'Remember' responses this produced a significant main effect of attribute type, $F(3, 198) = 81.88$, $p < .001$, $\eta_p^2 = .55$, showing the fewest remember responses for non-studied attributes. The proportion of remember responses for critical attributes was between those for studied and non-studied items. The main effect for NFC was significant, $F(1, 66) = 13.48$, $p < .001$, $\eta_p^2 = .17$, with more 'Remember' responses for those high in NFC. The interaction was also significant, $F(3, 198) = 10.19$, $p < .001$, $\eta_p^2 = .13$. The interaction was assessed by simple main effects analyses by comparing high with low NFC subjects at each level of attribute type. This indicated a significant difference between levels of NFC for both presented and critical attributes, $t(66) = 4.25$, $p < .001$, Cohen's $d = 1.02$, and, $t(66) = 2.79$, $p = .007$, Cohen's $d = 0.68$, for studied and critical attributes respectively. In both comparisons, the proportion of 'Remember' responses were higher for the high NFC group. The difference between the non-studied attributes was not significant, for either of the attribute types p's > .05.

For 'Know' responses, the main effect of attribute type was significant, $F(3, 198) = 35.39$, $p < .001$, $\eta_p^2 = .35$. The main effect of NFC was not significant, $F(1, 66) = 0.97$, $p = .33$, $\eta_p^2 = .14$ The interaction was not significant, $F(3, 198) = .09$, $p = .96$, $\eta_p^2 = .001$. The main effect of attribute type was examined by comparing 'equivalent' attributes. This involved, firstly, a comparison of responses to list attributes from studied lists with those to list attributes from unstudied lists, and secondly, a comparison of responses to critical lures from studied lists with those to critical lures from unstudied lists. For both comparisons, the effects were significant, $t(67) = 7.75$, $p < .001$, Cohen's $d = 1.04$, for list attributes and $t(67) = 6.47$, $p < .001$, Cohen's $d = 0.82$, for lures respectively. In both comparisons, the mean for the studied and lure from the studied list was higher.

The proportion of 'Guess' responses were not subject to analyses because these responses are restricted by the magnitude of 'Remember' and 'Know' responses; consequently, they are not independent of these values. However, the descriptive statistics can be found in Table 1, and shows the overall proportion of guesses to be very low.

Process estimates for recollection & familiarity

Process estimates for recollection were placed into a 2(memory type; true vs. false) within-subjects by 2(NFC; high vs. low) between-subjects mixed ANOVA. The findings indicated a main effect of memory type, $F(1, 66) = 48.66$, $p < .001$, $\eta_p^2 = .42$, showing greater recollection estimates for true memory. The main effect of NFC was significant, $F(1, 66) = 15.46$, $p < .001$, $\eta_p^2 = .19$, showing greater recollection estimates for those high in NFC. The interaction was also significant, $F(1, 66) = 4.15$, $p = .04$, $\eta_p^2 = .05$. The interaction was assessed by the use of simple main effects that compared high with low NFC groups at each level of memory type. This produced a significant difference between high and low groups for both true ($t(66) = 4.25$, $p < .001$, Cohen's $d = 1.04$) and false ($t(66) = 2.45$, $p < .02$, Cohen's $d = 0.62$) recollection. The magnitude of the difference was larger for true recollection.

Process estimates for familiarity were assessed by a similar ANOVA to recollection. This produced a main effect of memory type, $F(1, 66)$, = 19.71, $p < .001$, $\eta_p^2 = .23$ with higher familiarity estimates for true memory. The main effect of NFC was not significant, $F(1, 66) = 2.03$, $p = .16$, $\eta_p^2 = .03$. Finally, the interaction was not significant, $F(1, 66) = 0.23$, $p = .63$, $\eta_p^2 = .003$.

Discussion

Experiment 1 succeeded in creating false memories for associated, non-presented, product attributes; when a product category was presented, false memories for non-exposed associated attributes were found. More interestingly, associative false memories were more likely for those high in NFC. False memories for attributes that were not activated by prior exposure showed no difference as a function of NFC. Consequently, the difference between high and low NFC groups for associative false memories is not simply the result of a difference in response bias. True memory for presented attributes was also greater for those individuals high in NFC.

Those high in NFC also retrieved more detailed true and false memories as measured by 'Remember' responses and process estimates of recollection. For true memory, this amounted to the more detailed recall of encoded information. For false memory, this related to the detailed recall of *non*-studied information. Effectively, those high in the NFC were more likely to retrieve studied and non-studied episodic-like information.

For know/familiarity based responses, the both proportion and process-based analyses indicated no effect of NFC or interaction. Only that 'know' responses and familiarity were higher for studied items. Thus, a dissociation between memory type (recollection vs. familiarity) as a function of NFC was observed and joins other similar dissociations reported in the literature (e.g., Yonelinas, 2002).

At a general level, the explanation of the results can be framed in terms of previous theories. Thus, the presentation of product attribute information activated associated attributes that were not encoded (Roediger, et al., 2001; Roediger & McDermott, 1995), or to the generation of a gist-based representation of the product category information (Brainerd & Reyna, 2005). The relative merits of these accounts are assessed later, after the presentation of the results of Experiment 2.

From the perspective of the current work, the most interesting finding is that, subjects' high in NFC were more likely to produce associative false recognition responses. In previous work, this has been described as the result of more elaborative *encoding* activities (Graham, 2007; Leding 2011; 2013). In terms of the ELM, this is deemed to occur through central route processing that can lead to more widespread activation of associative networks or the more likely extraction of a gist-based representation. One way to examine if elaborative encoding processes are conducive to eliciting false memory is to directly manipulate processing orientation during encoding itself. Previous research has examined this by the use of a depth of processing manipulation and this is assessed in Experiment 2.

Experiment 2. The effects of encoding task on consumer associative false memory

Experiment 2 examined the idea that manipulating the nature of the encoding task can enhance both true and false associative consumer memory. Previous research has shown that more elaborative processing increases associative false memories (e.g., Thapar & McDermott, 2001; Toglia, Neuschatz, & Goodwin, 1999). Such experiments typically compare the outcome on memory of encoding tasks in which some stimuli are processed for meaning, whilst others are processed in terms of surface level features such as vowel judgements or item color.

In the context of the current experiment, rather than instructing participants to consider the meaning of the words, a more consumer relevant task was used. Particularly, participants were given a purchase intention task (e.g., Burke & Srull, 1988; Homer & Kahle, 1990; Mitchell, 1981) to perform during the encoding phase. Considering one's purchase intention has been argued to lead to more elaborative processing and has been found to enhance consumer memory for advertised information (e.g., Burke & Srull, 1988; Homer & Kahle, 1990).

Thus, in Experiment 2, one group of participants were presented with lists in the same manner as the first experiment, but asked to think about each attribute and consider the importance of that attribute when making a purchase decision. Another group of participants were given a non-elaborative task and asked to consider how the word sounded.

Method

Design

The experiment had two independent variables. The first was encoding task (elaborative vs. non-elaborative) and was manipulated between-subjects. The second independent variable was attribute-type as in Experiment 1. The dependent variables were also the same as Experiment 1.

Participants

The participants were 80 individuals from the Manchester Metropolitan University. All took part on a voluntary basis and were recruited by experimental assistants via opportunity sampling.

Materials & Apparatus

The product-attribute lists, counterbalancing procedure, encoding sets and recognition tests were the same as Experiment 1. The only difference was that in this experiment, counterbalancing took place over the two levels of the encoding task manipulation. Need for cognition was not measured in Experiment 2.

Procedure

All participants were tested individually. The procedure followed that of Experiment 1 with the only difference being in the instructions given to the subjects during the encoding phase. Those assigned to the elaborative processing task, were asked to consider each attribute in terms of its importance with regard to making a purchase decision. Those assigned to the non-elaborative task were asked to think about the intonation and voicing of the attributes. Placement in these conditions was randomised.

Results

Overview

The results are organised in the same manner as Experiment 1 covering, in order, the analyses of: overall proportion scores, signal detection measures, proportion analyses of RKG responses and process estimates of recollection and familiarity.

Overall proportion yes responses

A 2(encoding task; elaborative vs. non-elaborative) between-subjects by 4(attribute type; studied vs. critical lure of studied vs. non-studied vs. critical lure of non-studied) within-subjects, mixed ANOVA was performed on the proportion scores. The descriptive statistics for these and other analyses for Experiment 2 can be found in Table 2.

INSERT TABLE 2 ABOUT HERE

This produced an overall effect of attribute type, $F(3, 234) = 241.\ 11$, $p < .001$, $\eta_p^2 = .76$. Inspection of the means show the lowest response rate to unstudied and unassociated items. The values for critical items was in-between the latter and studied information. The effect of encoding task was significant, $F(1, 78) = 5.44$, $p =.\ 02$, $\eta_p^2 = .06$. The interaction was also significant, $F(3, 234) = 4.33$, $p = .01$, $\eta_p^2 = .056$. The interaction was examined by comparing between the levels of the encoding task for each type of attribute. This found a significant difference between the conditions for both true and critical items ($t(78) = 2.09$, $p = .04$, Cohen's $d = 0.47$, and $t(78) = 2.09$, $p < .001$, Cohen's $d = 0.85$, for true and critical attributes respectively). In both comparisons, the means were higher for the purchase intention task. The difference between the non-studied attributes was not significant, for either of the attribute types p's > .05.

Signal detection analyses

The signal detection measures were calculated as in Experiment 1. These scores were entered into a 2(encoding task; elaborative vs. non-elaborative) between-subjects by 2(memory type; true vs. false) within-subjects mixed ANOVA. The results revealed a significant main effect of memory type, $F(1,78) = 33.74$, $p < .001$, $\eta_p^2 = .30$, showing higher discrimination accuracy for true memory. The main effect of encoding condition was also significant, $F(1, 78) = 5.04$, $p = .03$, $\eta_p^2 = .06$, showing better discrimination for the elaborative condition. The interaction was non-significant, $F(1, 78) = 0.43$, $p = .51$, $\eta_p^2 = .005$.

Response bias score were skewed and analyses were based on log transformed scores as in Experiment 1. The analyses revealed a non-significant main effect of encoding task, $F(1, 78) = 0.01$, $p = .92$, $\eta_p^2 < .001$, no effect of memory type, $F(1, 78) = 0.82$, $p = .37$, $\eta_p^2 = .01$, and no interaction, $F(1, 78) = 0.01$, $p = .92$, $\eta_p^2 < .001$.

Proportion analyses for RKG responses

Similar to Experiment 1, proportion responses for 'Remember', and 'Know' responses were analysed by separate 2(encoding task; elaborative vs. non-elaborative) between-subjects by 4(attribute type; studied vs. critical lure of studied vs. non-studied vs. critical lure of non-studied) within-subjects mixed ANOVAs.

For 'Remember' responses this produced a significant main effect of attribute type, $F(3, 234) = 249.90$, $p < .001$, $\eta_p^2 = .76$. The effect of encoding task was significant, $F(1, 78) = 3.82$, $p = .05$, $\eta_p^2 = .47$, showing more 'Remember' responses for the elaborative processing group. The interaction was not significant, $F(3, 234) = 1.13$, $p = .34$, $\eta_p^2 = .01$. As in Experiment 1, the main effect of attribute type was examined by comparing 'equivalent' attributes. Both comparisons revealed significant effects, $t(79) = 18.84$, $p < .001$, Cohen's $d = 2.61$, for true memory and $t(79) = 9.86$, $p < .001$, Cohen's $d = 1.35$, for false memory. In both instances, higher 'Remember' responses were related to either studied attributes or lures of studied lists.

For 'Know' responses the main effect of attribute type was significant, $F(3, 234) = 10.04$, $p < .001$, $\eta_p^2 = .11$. The effect of encoding task was not significant, $F(1, 78) = 1.04$, $p = .31$, $\eta_p^2 = .01$. The interaction was not significant, $F(3, 234) = 1.53$, $p = .21$, $\eta_p^2 = .02$. The main effect of attribute type indicated non-significant difference for true memory, $t(79) = 1.69$, $p = .10$, Cohen's $d = 0.18$, and a significant difference for false memory, $t(79) = 5.32$, $p < .001$, Cohen's $d = 0.70$.

The proportion of 'Guess' responses were not subject to analyses; the rationale for this was given in the results section of Experiment 1.

Process estimates for recollection & familiarity

Process estimates for recollection were placed into a 2(memory type; true vs. false) within-subjects by 2(encoding task; elaborative vs. non-elaborative) between-subjects mixed ANOVA. The findings indicated a main effect of memory type, $F(1, 78) = 179.38$, $p < .001$, $\eta_p^2 = .70$, showing greater recollection estimates for true memory. The main effect of encoding task was not significant, $F(1, 78) = 2.38$, $p = .12$, $\eta_p^2 = .03$, although the numerical value for the elaborative group was higher than the non-elaborative group. The interaction was not significant, $F(1, 78) = 0.34$, $p = .56$, $\eta_p^2 = .004$.

Process estimates for familiarity were assessed by a similar ANOVA to recollection. This produced a non-significant effect of memory type, $F(1, 78)$, $= 0.08$, $p = .77$, $\eta_p^2 = .001$. The main effect of encoding task was not significant, $F(1, 78) = 2.55$, $p = .11$, $\eta_p^2 = .03$, and the interaction was not significant, $F(1, 78) = 2.81$, $p = .10$, $\eta_p^2 = .03$.

Discussion

Experiment 2 found that manipulating elaboration during encoding brought about similar effects to NFC. Principally, purchase intention (vs. sound judgements) increased the proportion of both true and associative false memories. Like Experiment 1, both true and associative false memories were typically accompanied by 'Remember' and 'Know' responses as opposed to mere guessing. In addition, more elaborative encoding increased the number of 'Remember' responses, but not 'Know' responses. Process estimates for recollection were only numerically higher for the more elaborative task. Process estimates for familiarity did not show an effect of encoding task and thus resemble the effects of NFC in Experiment 1.

General Discussion

General overview & summary

The experiments reported here demonstrated that false associative memories can be produced for non-presented, but associated product attributes. In both experiments, increasing the degree of elaboration led to higher true and associative false memories. In Experiment 1, this was achieved as a function of NFC. In Experiment 2, this was found by a direct manipulation of the encoding task. Increasing the degree of elaboration also enhanced the retrieval of specific episodic details as measured by 'Remember' responses. Irrespective of NFC and encoding task, associative false memories were comprised mainly of 'Remember' and 'Know' responses; indicating that consumer associative false memories may represent the outcome of both recollection and familiarity. Process estimates of recollection were greater for those high in NFC. Elaborative processing also produced a numerical increase in recollection in Experiment 2. Process estimates of familiarity were not influenced by either NFC or encoding task. More generally, a dissociation was found between remembering and knowing as a function of elaborative encoding.

These experiments exemplify the role of NFC and encoding tasks in the production of associative false memories, (e.g., Graham, 2007; Leding, 2011) and extends existing work in consumer false memory (Sherman, 2013; Sherman et al., 2014). For NFC, this serves to clarify the nature and qualitative characteristics of false memory effects produced by this variable as first suggested, but not assessed, by Graham (2007).

An inconsistency between the findings of Experiment 1 and those of Graham (2007) concerns true memory. Particularly, the current work found increased true recognition memory (as well as 'remember' responses) in high NFC subjects, whereas Graham (2007) found no difference as a function of NFC. There are a number of potential reasons for this discrepancy that could relate to both stimulus and strategy differences. With regard to the former, Graham made use of DRM lists, while the current experiments made use of lists that might be considered as taxonomic in nature. Differences in the effects of experimental variables have been found in previous research (e.g., Smith et al., 2002), and is likely due to differences in the backward associative strength between DRM and taxonomic lists. Consequently, the difference observed here might simply reflect this. Alternatively, subjects in the current experiments may have adopted different processing strategies. For example, because the current experiment made use of the remember-know procedure (as opposed to just old/new as did Graham), then retrieval strategies could have been altered, especially in high NFC subjects. As these are motivated to engage in effortful processing, the use of the remember-know procedure could have provided additional opportunities to deploy more demanding retrieval strategies. For example, a search for additional item-specific information that in turn would provide the basis for recollection and

'Remember' judgements (Rajaram, 1996; 1998). Of course, an assessment of this would require a direct comparison of overall recognition scores between conditions in which remember-know judgements are (vs. are not) required and remains for future work. However, irrespective of the precise reasons for the different outcomes of Graham (2007), and the current experiments, we would assert that the present results are consistent with the notion that NFC, like many experimental manipulations (e.g.,Craik & Tulving, 1975; Gardiner, 1988; Gardiner, et al., 1996; Rajaram, 1993; Thapar & McDermott, 2001), influences the degree of elaboration and therefore impacts upon true (as well as false) recognition memory.

Theoretical accounts of the findings

The false memory effects found here can be explained by reference to either activation-monitoring theory (Roediger et al., 1998; 2001), or FTT (Brainerd & Reyna, 2005). Within the framework of the former, presentation of interrelated attributes leads to the activation of non-presented information. At test, this is mistakenly recognised as being presented because of a source monitoring error. With regard to FTT, encoding associated items leads to the creation of both a verbatim memory trace (for each item) and the extraction of a gist-based trace that represents a global summary of the presented information (in this instance, the product-attribute list). Associative false memories arise when the gist representation is used to respond to non-presented test items. The research presented here does not attempt to distinguish between these two accounts; however, it is worth considering how the effects of the principal variables (NFC and encoding task) can be accommodated within these frameworks.

To the extent that high (vs. low) NFC and encoding task (purchase intention vs. sound), correspond to variations in the degree of elaboration, this can be considered to lead to more widespread activation within product-attribute networks. Assuming equivalent source monitoring abilities between the conditions, this would lead to a greater number of false recognition errors at test. The nature of the activation/elaboration process could potentially reflect both controlled and automatic processing. It would seem that controlled processing undoubtedly plays an important role as those high in the NFC are motivated to engage in effortful and attentive thinking. In addition, the purchase intention manipulation required the conscious and deliberative processing of attributes during encoding.

In both experiments, the finding that not only was true memory enhanced, but also ‘Remember’ responses is of importance. Firstly, controlled and elaborative processing enhances true memory, especially that associated with detailed remembering (Gardiner, 1988; Gardiner, Gawlik, & Richardson-Klavehn, 1994). Secondly, ‘Remember’ responses are often found to accompany associative false recognition errors and have been argued to be a function of controlled/conscious activation during encoding (Roediger & McDermott, 1995; Gallo, 2006). Indeed, manipulations that enhance or limit controlled processing during encoding have been shown to increase or decrease the number of ‘Remember’ responses respectively (e.g., Dewhurst, Barry & Holmes, 2005).

Neither NFC nor elaborative processing influenced the proportion of ‘Know’ responses. However, as noted earlier, such responses may underestimate the contribution of familiarity-based processing as contended by certain dual-process models in which recollection and familiarity act independently (Jacoby, 1998;

Yonelinas, 2002; Yonelinas & Jacoby, 1995). However, process-estimates of familiarity showed a similar pattern of findings to the proportion ‘Know’ responses. Of course, this does not mean that familiarity-based processing plays no role in the results obtained here because a sizable proportion of ‘Know’ responses and process familiarity were found overall, regardless of the experimental manipulation. Both familiarity and knowing index the fact that the item lacks the detailed characteristics associated with recollection, and has been taken to indicate that this arises as a function of non-conscious automatic activation processes during encoding (e.g., Dewhurst et al., 2005; Knott & Dewhurst, 2007; Roediger & McDermott, 1995; Seamon, et al., 1998). Consequently, some proportion of the false memories found here reflect the outcome of an automatic spreading activation mechanism.

With regard to FTT, elaborative or deeper processing during encoding can serve to enhance the processing of global summary information across the list, and verbatim information (Brainerd & Renya, 2005). In the lists used here, global summary details could be the gist of particular product categories. Later, during testing, reliance on gist-based information would lead to false recognition errors that would be expected to be associated with ‘Know/familiarity’ responses. However, this was not found; rather, elaborative encoding was associated with enhanced memory for details. In particular, the increase in ‘Remember’ and recollection responses under elaborative processing conditions can be accounted for by the retrieval and use of verbatim representations.

Distinguishing between activation-monitoring and FTT is not always easy as both make similar predictions (Gallo, 2006). However, FTT makes the claim that gist representations are more resilient to decay over a retention interval, and thus false (vs.

true) memories should remain more stable over time (Brainerd, Payne, Wright, & Reyna, 2003). Experimental evidence exists to support this contention for both false recall and recognition (e.g., Seamon, et al., 2002; Thapar, & McDermott, 2001). Little work has been done on the effects of retention interval on consumer memory, however, one recent report found that false brand name memories *increased* over a delay of one week (Sherman, 2013). Such increases in false memory have been found on previous occasions (e.g., Howe, Candel, Otgaar, Malone, & Wimmer, 2010), but remain to be more fully explored and explained in consumer settings.

Broader implications for marketing and advertising

Although the current research was directed primarily towards theoretical and experimental concerns, the findings do have broader implications. For example, advertisers, often by necessity, omit attribute information about a particular brand. Under such circumstances, consumers 'fill in the gaps' by deriving inferences about these (e.g., Kardes, et al., 2004). This has consequences for brand evaluation, especially when consumers are motivated to process information. For example by additional elaboration (e,g., McQuarrie, & Phillips, 2005; Sawyer & Howard, 1991). The current findings demonstrate consumers can develop false memories for attributes based on product class information. If this occurs for a specific brand, and these attributes are less valued than those of the actual brand (as might be expected if these are based largely on average prototypical features), then overall brand evaluations are likely to be lower. Consequently, marketing strategies should ensure that consumers do not have a reason to rely on product class information when specific brand attributes are clearly superior.

An additional implication derives from the above; if consumers develop false beliefs about brands based on product category attributes, then brands lose differentiation. Brand differentiation is considered to be of principal importance in marketing because it helps to minimise competition and make alternate brands less appropriate substitutes (e.g., Becerra, Santaló, & Silva, 2013; Caves & Williamson, 1985; MacMillan & McGrath, 1997). Thus, the formation of (false) brand representations based on product class, could lead to fewer perceived differences between brands and increased competition. In addition, based on the findings reported here, elaborative processing could exacerbate this effect. Consequently, marketers need to concern themselves with ensuring that advertising promotes unique brand attributes (Cardello, et al., 2016). More generally, as noted in the introduction, if the consumer recalls associations based on the product category, but not the brand or marketing claims, the knowledge and evaluation of that brand may be biased. Accordingly, understanding the attributes activated by product categories is of importance.

Potential limitations & future considerations

The recognition task used in the present experiments comprised a greater number of distractors compared to studied targets. This is in contrast to many ‘standard’ recognition tests that use equal numbers of targets and distractors and is often recommended as a guideline (Murdock, 1982). Variation in the number of targets to non-targets can result in variation in the false alarm rate (e.g., Dodson & Johnson, 1996), and could bias subjects to respond to some of the non-presented items. In spite of this, it is not uncommon in false memory research with associative lists to have unequal numbers of targets and distractors. For example, in a typical

DRM experiment, each list contributes one critical lure but multiple list items (e.g., Dewhurst, Bould, Knott, & Thorley, 2009; Roediger & McDermott, 1995; Seamon, Lee, et al., 2002). Although presenting equal numbers of targets to non-targets seems ideal, it would also create another type of imbalance; it would mean having unequal numbers of each item-type. Thus, the decision was made to use of equal numbers of each type of item. This was not considered to be particularly problematic as the results show clear differences between responses to the types of items (e.g., critical vs. noncritical lures) and this was of key importance in showing associative false memory effects.

In Experiment 2, only one type of elaborative encoding task was used. This of course does not exhaust the range of potential tasks that could be relevant to consumer settings and processing objectives. These objectives shape where attention is allocated, and impact upon subsequent memory organisation and accessibility (Biehal, & Chakravarti, 1982; Burke & Srull, 1988; Wyer, Hung & Jiang, 2008). In addition, although those high in NFC are more likely to engage in elaborative processing, the exact nature of the encoding operations that they employ is much less clear. Accordingly, it will be important for future work to evaluate the impact of different processing objectives and what strategies are adopted spontaneously by those high in NFC.

In both experiments, the primary dependent variables were memory-based. In consumer settings, although memory is important, consumers typically do not use memory as an end in itself, but as an input to judgement and decision making (e.g., Alba et al., 1991; Wyer, et al., 2008). Prior information about a brand or product has the potential to impact on choice judgements, even when the activation of attributes is only incidental and non-conscious (e.g., Fitzsimons, Hutchinson, Williams, Alba, Chartrand, Huber, et al., 2002; Nedungadi, 1990; Yi, 1990). Consequently, future work might want to consider whether associative activation, as observed in the current experiments, impact on measures beyond recognition performance.

Summary & conclusion

The research presented here found robust associative false consumer memory for product attributes. These effects were dependent upon variables known to be related to or elicit elaborative processing. Increases in false memory were also related to responses that index the retrieval of detailed episodic information. It is concluded that associative knowledge structures pertaining to product categories can assist with the retrieval of both studied and non-studied related information. The precise mechanisms and structures that support such effects likely involve a combination of controlled and conscious activation processes together with organised summary representations that could implicate gist or prototypes.

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Footnotes

1. The stimulus sets were created by making use of a multistage procedure that involved initial generation and ranking of attributes followed by a relevance rating task. The reasoning behind this reflected our appraisal of the research literature on both false memory and categorisation. Associative word lists such the DRM sets were developed based on free -association procedures (e.g., Gallo & Roediger, 2002), with list items possessing a strong backward associative strength to the critical lures. Other types of lists, such as those employed in the category-repetition procedure are based on pre-existing taxonomic categories. In categorization research, the strength of relationship between exemplars from a category and the category name can also be judged by association norms but other procedures involve rating the relevance of exemplars to category labels or prototypes (e.g., Fehr, & Russell, 1984; Rosch, 1973; 1978). This procedure has also been used in consumer psychology to assess relatedness between products/brands and attributes (e.g., Loken, & Ward, 1990; Mao & Krishnan, 2006). Consequently, we adopted a hybrid approach to the development of the stimulus sets that capitalised initially on item generation followed by relevance ratings.

Appendix

Sets of product classes and attributes used in Experiments 1 and 2. Bold-underlined are the product classes, bold are the critical lures and normal font are the list words.

<u>Chocolate:</u> cocoa, bar, dark, Belgium, melting, nut & raisin, smooth, bitter; **<u>Tea:</u> hot, bags**, leaf, brewed, traditional, British, herbal, iced; **<u>Soft Drink:</u> fizzy, can**, bottled, carbonated, refreshing, diet, energising, artificial; **<u>Pet Food:</u> meaty**, **chunky,** tinned, jelly, fish, moist, foiled, marrowbone; **<u>Cereal:</u> breakfast, crunchy**, bowl, flakes, fibre, grain, oats, morning: **<u>Washing Detergent:</u> clean, laundry**, biological, powder, softening, conditioning, linen, colour care; **<u>Cheese:</u> mature, mild**, strong, hard, creamy, spreadable, crumbly, pungent; **<u>Television:</u> flatscreen, high-definition**, plasma, LCD, clear, sound, portable, contrast; **<u>Glove:</u> warm, winter,** woollen, protective, padded, boxing, mitten, driving; **<u>Chair:</u> comfortable, sit**, lounge, office, sofa, fabric, cushion, headrest; **<u>Milk:</u> dairy, calcium**, cow, skimmed, farm, whole, shake, baby; **<u>Soap:</u> hand, cleansing**, antibacterial, liquid, lather, fragrant, moisturising, face: **<u>Juice:</u> fruity, cold**, quenching, fresh, pure, squeezed, concentrate, cordial; **<u>Pen:</u> biro, writing**, fountain, ink, roller ball, marker, paper, click; **<u>Toothpaste:</u> minty, whitening,** fluoride, strengthening, sensitive, plaque, stripy; **<u>Candy:</u> sugary, sweet**, tasty, colourful, chewy, tangy, boiled, sour; **<u>Bread:</u> loaf, brown**, white, sandwich, crust, flour, bun, soft; **<u>Bed:</u> sleep, double**, king, relaxing, queen, bunk, four post, water; **<u>Sausage:</u> pork, butcher**, hotdog, grill, camp, mash, cocktail, smoked; **<u>Deodorant:</u> antiperspirant, scented**, spray, sweat, hygienic, roll-on, exercise, sport.

TABLE 1
Mean proportion (and SE) of measure type as a function of need for cognition and response measure.

	Need for Cognition	
Response Measure	Low	High
	Overall Proportion Measure	
Proportion Attribute Type		
Studied	0.48 (0.03)	0.65 (0.03)
Critical Lure	0.32 (0.03)	0.43 (0.04)
Non-Studied	0.15 (0.02)	0.14 (0.02)
Critical of Non-studied	0.19 (0.02)	0.20 (0.02)
	Signal Detection Measure	
Signal Detection Measure		
d' True	1.09 (0.12)	1.68 (0.14)
d' False	0.41 (0.09)	0.79 (0.12)
Log β True	0.69 (0.13)	0.48 (0.13)
Log β False	0.28 (0.08)	0.34 (0.09)
	Proportion RKG Measure	
Remember Responses		
Studied	0.25 (0.03)	0.48 (0.03)
Critical Lure	0.14 (0.02)	0.27 (0.04)
Non-Studied	0.06 (0.01)	0.04 (0.01)
Critical of Non-studied	0.07 (0.08)	0.08 (0.01)
Know Responses		
Studied	0.16 (0.02)	0.18 (0.02)
Critical Lure	0.12 (0.01)	0.14 (0.02)
Non-Studied	0.04 (0.01)	0.06 (0.01)
Critical of Non-studied	0.06 (0.01)	0.06 (0.01)
Guess Responses		
Studied	0.07 (0.02)	0.03 (0.01)
Critical Lure	0.06 (0.01)	0.03 (0.01)
Non-Studied	0.05 (0.01)	0.03 (0.01)
Critical of Non-studied	0.07 (0.01)	0.05 (0.01)
	Process Estimate Measure	
Process Recollection		
True	0.19 (0.03)	0.40 (0.04)
False	0.08 (0.02)	0.19 (0.04)
Process Familiarity		
True	0.33 (0.02)	0.40 (0.04)
False	0.21 (0.02)	0.26 (0.04)

TABLE 2
Mean proportion (and SE) of measure type as a function of encoding task and response measure.

	Encoding Task	
Response Measure	Low Elaboration	High Elaboration
	Overall Proportion Measure	
Proportion Attribute Type		
Studied	0.60 (0.03)	0.67 (0.03)
Critical Lure	0.36 (0.02)	0.47 (0.02)
Non-Studied	0.24 (0.03)	0.23 (0.03)
Critical of Non-studied	0.18 (0.02)	0.22 (0.02)
	Signal Detection Measure	
Signal Detection Measure		
d' True	1.05 (0.12)	1.34 (0.12)
d' False	0.62 (0.06)	0.80 (0.07)
Log β True	0.39 (0.08)	0.37 (0.12)
Log β False	0.45 (0.07)	0.45 (0.08)
	Proportion RKG Measure	
Remember Responses		
Studied	0.43 (0.03)	0.48 (0.03)
Critical Lure	0.14 (0.02)	0.19 (0.02)
Non-Studied	0.06 (0.02)	0.06 (0.02)
Critical of Non-studied	0.04 (0.01)	0.06 (0.01)
Know Responses		
Studied	0.10 (0.01)	0.13 (0.02)
Critical Lure	0.12 (0.01)	0.16 (0.01)
Non-Studied	0.09 (0.02)	0.08 (0.01)
Critical of Non-studied	0.08 (0.01)	0.08 (0.01)
Guess Responses		
Studied	0.07 (0.01)	0.06 (0.01)
Critical Lure	0.10 (0.01)	0.11 (0.01)
Non-Studied	0.09 (0.02)	0.08 (0.01)
Critical of Non-studied	0.06 (0.01)	0.07 (0.01)
	Process Estimates Measure	
Process Recollection		
True	0.36 (0.02)	0.41 (0.03)
False	0.10 (0.01)	0.13 (0.02)
Process Familiarity		
True	0.30 (0.03)	0.32 (0.03)
False	0.26 (0.02)	0.34 (0.02)