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Effects of Retrieval Practice on Conceptual Explicit and Implicit Consumer Memory

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Abstract

Two experiments are reported that investigate the effects of retrieval practice on explicit and implicit memory for brand names. In Experiment 1, participants were exposed to a set of brand names pertaining to a range of product categories. Following this, participants practiced retrieving a subset of the brands before taking an explicit or implicit test for the brands. The explicit test, required recall of the brands in response to product category cues. The implicit test required the generation of the first brand names that came to mind. In both tests, prior retrieval produced retrieval induced forgetting of the non-practiced brands below baseline levels. Experiment 2 replicated this effect under conditions designed to reduce explicit contamination. In addition, Experiment 2 found that increasing the amount of retrieval practice also increased the magnitude of retrieval induced forgetting on the explicit but not the implicit test. Implications for advertising and marketing are considered.

Effects of Retrieval Practice on Conceptual Explicit and Implicit Consumer Memory

Cognitive research into memory over the past 20 years has emphasised the distinction between explicit and implicit memory. Explicit tests of memory are those which require the intentional retrieval of information from a specific study context. For example, in relation to consumer memory, this could include free recall, cued recall or recognition of ad information or brand names (e.g., Bellezza, 2001; Furnam, Gunter, & Walsh, 1998; Krishan & Chakravarti, 2003; Muehling & Laczniak, 1996). Tests of implicit memory are often referred to as indirect tests as they measure the influence of a prior episode by facilitation on some task that does not require the intentional retrieval of the studied items. This facilitation is called priming and reflects the unintentional, or involuntary retrieval of information from the study episode. Priming is assessed in terms of increased speed or accuracy of processing. An example of an implicit test is word-fragment completion. This test involves presenting a list of word fragments (e.g., c _ a _ p _ g _ e) that correspond to words from the study phase (e.g., champagne). Participants are instructed to complete each fragment with the first word that 'pops' to mind. It has been found that prior study of words corresponding to the fragments increases the probability of completion with those words. Word-fragment completion, among other tests like word-stem completion and perceptual identification, has been shown to be dependent upon perceptual processing as changes in perceptual features between study and test reduce the magnitude of priming (e.g., Craik, Moscovitch, & McDowd, 1994; Jacoby & Dallas, 1981; Weldon, 1991).

Other types of implicit tests are more dependent upon conceptual or meaningful processing. An example is category-exemplar generation. During the test phase,

participants are presented with cues such as ‘Fruit’ that correspond to examples of this category that were studied earlier. Prior study of specific examples increases the probability that such examples ‘pop’ to mind during the test. This, and similar tests, are not influenced by changes in perceptual features between study and test, but are influenced by encoding manipulations that enhance semantic or conceptual processing (e.g., Hamann, 1990; Mulligan, 2002; Srinivas & Roediger, 1990). These effects are found even though participants are not attempting to intentionally and consciously retrieve studied information. The research presented here makes use of modified conceptual tests in which product classes are used as category cues and brand names are used as exemplars of the product class.

The study of implicit consumer memory is less well established but some authors have suggested an important role for this type of memory in consumer choice and decision making situations (Butler & Berry, 2001, 2002; Coates, Butler & Berry, 2004, 2006; Kronland & Bernstein, 2006; Shapiro, 1999), in accessing the effectiveness of advertising (Krishnan & Chakravarti, 1999; Shapiro & Krishnan, 2001) and developing theories about consumer memory (Duke & Carlson, 1994; Krishnan & Chakravarti, 1999). Implicit consumer memory has been measured using a number of tasks. For example, Duke & Carlson (1994) used a modified word fragment completion task using fragmented brand names as the implicit task. Krishnan & Shapiro (1996) used a word stem completion task. This involved a procedure similar to that of word fragment completion with the exception that word stems (the first few letters of the brand name) were used as test cues. Another test involves preference decisions. Shapiro & Krishnan, (2001) presented participants with a choice between previously studied brands and non studied brands with instructions to

simply select the most preferred brand. Implicit memory was inferred on the basis of a greater probability of choosing the studied brand. Again, this can occur independently of recognition memory for the studied brand (Shapiro, 1999).

Recent research has demonstrated that the very act of retrieving information from memory brings about forgetting of other information (Anderson, Bjork & Bjork, 1994; Hicks & Starns, 2004). This is known as retrieval-induced forgetting and has been studied using the retrieval practice paradigm. This involves a number of phases. In the first phase, participants are exposed to a number of category – exemplar pairs (e.g., Fruit – Pear, Fruit – Apple; Vehicle – Lorry, Vehicle – Ship). Following this, is the retrieval practice phase, in which participants are presented with half of the studied categories and prompted to recall half of the exemplars from each of these categories (e.g., Fruit – P____?). The exemplars retrieved from the practiced categories are called Rp+ items, to indicate they are retrieval practise items. Those exemplars not retrieved from the practiced categories (e.g., Apple) are called Rp- items. This indicates that they are exemplars from retrieval practice categories but, crucially, they themselves are not retrieved. The category exemplar pairs that are not retrieved (e.g., Vehicle – Lorry, Vehicle – Ship) are called Nrp items, to indicate that no retrieval practice has occurred for these items. Following a delay is the final test phase, in which recall of all the exemplars in the first phase is requested. The typical findings are that (a) the Rp+ items are recalled better then any of the other items, (b) recall of Rp- items is lower then that of Nrp items. The first finding is hardly surprising given these items have been practised. The most important and interesting finding is that Rp- items are recalled at below baseline (Nrp) levels. Retrieval-induced forgetting has also been demonstrated on tests of implicit memory. For example, Perfect, Moulin, Conway, and Perry (2002), found

poorer performance on Rp- items (vs. Nrp items) on the conceptual implicit test of category exemplar generation. Conversely, no inhibitory effects were found on a test of perceptual implicit memory. On the basis of this they reasoned that retrieval induced forgetting effects may be limited to tests of conceptual memory. However, more recent work indicates that retrieval-induced forgetting can also be found on perceptual tests if the retrieval practice stage encourages the retrieval of perceptual-lexical information as opposed to conceptual information (Bajo, Gómez-Ariza, Fernandez, & Marful, 2006). Overall, retrieval-induced forgetting is taken to indicate that activation levels associated with the Rp- items has been decreased (Anderson, 2003; Anderson, Bjork & Bjork, 1994). It is not just that such items have suffered output interference (Roediger & Schmidt, 1980) as it is now becoming increasingly clear that actual access to Rp- items is inhibited (e.g., Veling & Knippenberg, 2004).

The notion of the consideration set has been an important one in consumer research. The consideration set refers to all the brands brought to mind by the consumer when considering a purchase decision. However, the consideration set does not refer to all the brands known to the consumer. Alba & Chattopadhyay (1985) outline a distinction between "knowledge set" and "retrieval set". The former refers to all the brands known to the consumer and the latter to those brands brought to mind at a particular point in time. This then forms the basis of the consideration set. The factors that determine which brands are brought to mind or retrieved from memory are particularly important, especially in situations where the brands themselves are not actually present. Some of these factors include brand priming (e.g., Coates, et al., 2006; Krishnan & Shapiro, 2001; Nedungadi, 1991; Posavac, Sanbonmatsu, Cronley, & Kardes, 2001; Shapiro, 1999), presence of other

brands or ads (Burke & Srull, 1988; Kent & Allen, 1993; Kumar, 2000), and presence of appropriate retrieval cues (Friestad, 1993; Keller, 1987, 1991; Krishnan & Chakravarti, 1999). As yet, no consideration has been given to the role of the act of prior brand name retrieval itself (retrieval practice) with differing retrieval goals (explicit vs. implicit tasks). The research presented here attempts to remedy this.

EXPERIMENT 1

The method used in Experiment 1 is similar to that used by Perfect et al. (2002), only product categories and brand names replaced the taxonomic category-exemplar pairs. In addition, as is more usual in studies of this sort, separate groups of participants were tested in the explicit and implicit conditions. During the study phase, participants were exposed to a set of product category-brand name pairs (e.g., Crisps – Wotsits, Crisps - Pringles). During the second phase, subsets of these pairs were selected for retrieval practice (e.g., Crisps – Wotsits). Finally, during the test phase, product categories were presented as cues with either explicit or implicit retrieval instructions. The use of product categories as cues has been used in prior research (e.g., Burke & Srull, 1988; Friestad, 1993; Kumar, 2000; Lee & Sternthal, 1999) and reflects the importance of the product category with respect to brand organisation, processing and retrieval (Buttle, Ball, Zhang, & Raymond, 2005; Fazio, Herr, & Powell, 1992; Mackie & Worth, 1990; Nedungadi, Mitchell, & Berger, 1993). For those taking the explicit test, instructions emphasised the recall of brands that were presented during phase one. For the implicit test, participants were asked to write down six brands that spontaneously came to mind for each product category.

Method

Participants

Thirty-six participants took part in the experiment. All were recruited from the student population of Manchester Metropolitan University on a voluntary basis.

Design

Experiment 1 had one independent variable with three levels, these were; brands that received retrieval practice (Rp+ items), brands from the practiced category that did not receive practice (Rp- items) and brands from non practiced categories (Nrp items). This was manipulated within participants. There were two dependent variables; brand-name cued recall (explicit text) and brand-name generation (implicit test).

Materials & Apparatus

Ten product categories were selected on the basis that they should consist of real, familiar categories that each included a range of different and identifiable brands. The product categories chosen included: Crisps, Sportswear, Pet food, Chocolate, Washing powder, Toothpaste, Cars, Audio equipment, Soft drinks and Breakfast cereal. For each of these, a panel of 15 students from Manchester Metropolitan University was asked to list up to ten brand names associated with each category. Of these brands, six target brands were chosen from each category for inclusion within the experiment. Selected brands included those that were listed by more than half the student panel and were deemed to be familiar. Brands that were excluded included those that were unfamiliar, shared the first initial two letters (e.g., Volvo and Volkswagen) or those that were known primarily by abbreviations (e.g., JVC,

BMW). The latter two restrictions were important because during the retrieval practice phase, participants were presented with the first two letters of the brand name as cues alongside the product category. Eight of these product categories were selected as targets and two used to form primacy and recency stimuli. The product category names were then given to an additional group of thirty students, who were asked to list six brand names that came to mind. The responses from these students were then checked back against the target brands. This procedure was used to calculate the baseline probability rate of responding with the target brands. The baseline rate of responding was 0.34.

The target pool of eight categories was divided into two sets (A and B) for the purposes of counterbalancing. Each set consisted of four product categories with six brands per category. For half the participants, set A (vs. B) was designated as the retrieval practice set. These sets were further subdivided into two subsets (A1, A2 and B1, B2), each consisting of four product categories with three brand names. Thus, A1 differed from A2 (and B1 from B2) by containing different brands for the same product categories. For example, set A contained the product category of crisps. Consequently, subset A1 contained the brands Wotsits, Pringles and Doritos, while A2 contained Skips, Quavers and Squares. For the set designated for retrieval practice (e.g., A or B), only half of the brand names from that set were actually practiced (i.e., A1 or A2; B1 or B2). This was counterbalanced across participants. The subsets of brand names upon which retrieval practice took place were labelled the Rp+ brands. The subsets that came from the same product class but were not practiced were the Rp- brands. Those that came from the alternate sets were the Nrp brands. For example, if set A were designated for retrieval practice, then for half the participants A1 (vs. A2) would constitute the Rp+ brands while

A2 (vs. A1) would be the Rp- brands. Set B would then form the Nrp brands. The two remaining product categories were used as primacy and recency buffers for the study and retrieval practice phases. Three from each were placed at the beginning and end of both the study set and the retrieval practice set.

The retrieval practice booklets consisted of forty one pages. The first page contained the instructions. Printed separately on each of the next forty pages was the name of a product class followed by a dash and the initial two letters of the brand to be recalled (e.g., Crisps – W O _ _ _ _ _). The first and last two of these pages cued the recall of filler brands from the primacy and recency positions in the study phase. The other thirty six pages cued the recall of the target (Rp+ brands). Each brand from the selected subset was cued for recall three times throughout the booklet. The order of the product categories and cues was pseudo-random, with the constraint that no two brands from the same product class were presented consecutively.

The final test booklet consisted of eleven pages. The first page contained the instructions. The other ten pages contained the name of a product category printed across the top with six spaces below for participants to write down their responses. Of these ten pages, two referred to the products used in the primacy and recency positions and were not scored. The other eight pages contained all the product categories presented during phase one. A computer was used to present the stimuli in phase one of the experiment.

Procedure

All participants were tested individually. The experiment consisted of three phases. In phase one, the participants were exposed to all the target brands (a total of forty-eight) plus

the twelve primacy and recency brands. Each trial consisted of the presentation of a product category-brand name pair centred on a computer monitor. Each pair was presented for five seconds in a pseudo-random manner with the constraint that no two pairs from the same product category were seen in succession. Participants were asked to read each pair as it appeared and were not informed about the subsequent test of memory. In phase two, participants were presented with the retrieval practice booklets. The instructions indicated that on each page of the booklet was the name of a product category followed by a two letter cue that indicated a brand name associated with that category and that was presented in phase one. Participants were asked to write down the brand name presented earlier that was indicated by the product category and the cue.

Following this, participants were provided with a distractor task in which they were asked to write down the names of towns and cities in Great Britain for five minutes. Finally, participants were randomly allocated to either the explicit or implicit test condition and provided with the appropriate test booklet. The booklets only differed with respect to the instructions printed on the front cover. For those in the explicit test condition, instructions emphasised that each product category should be used as a cue to recall as many brand names as possible from phase one. For those in the implicit test condition, instructions emphasised that for each product category up to six brand names were to be generated on the basis of those that just happened to ‘pop’ to mind when thinking about the product category.

Results

Explicit Test: Brand-name cued recall.

The proportion of studied brands recalled for each condition was calculated and can be found in Table 1. These proportions were entered into a 1 way ANOVA with levels of retrieval practice as the within participants factor. Overall, the effects of retrieval practice were significant, $F(2, 34) = 36.70$, $p \leq 0.001$. Planned comparisons indicated that more Rp+ brands were recalled compared to Nrp brands $t(17) = 5.51$, $p \leq 0.001$. In addition, fewer Rp- brands were recalled compared to Nrp brands $t(17) = 3.66$, $p = 0.001$.

INSERT TABLE 1 ABOUT HERE

Implicit test: Brand-name generation.

The proportion of studied brands generated for each condition was calculated and can be found in Table 1. These were placed into a 1 way ANOVA with levels of retrieval practice as the within participants factor. This revealed a significant effect of retrieval practice $F(2, 34) = 30.71$, $p \leq 0.001$. Planned comparisons revealed that more Rp+ brands were generated compared to Nrp brands $t(17) = 4.82$, $p \leq 0.001$. In addition, fewer Rp- brands were generated compared to Nrp brands, $t(17) = 2.07$, $p = 0.002$.

One sample t-tests were used to compare the proportion of items generated against the baseline production rate of 0.34. This comparison tests the significance of the priming effect above baseline. The results revealed significant effects for Rp+ brands, $t(17) = 16.10$, $p \leq 0.001$ and for Nrp brands, $t(17) = 6.50$, $p \leq 0.001$. A significant effect was also

observed for Rp- brands $t(17) = 3.70$, $p = 0.001$ but the magnitude of the priming effect was reduced compared to the Rp+ and Nrp comparisons.

Discussion of Experiment 1.

Experiment 1 found that practicing retrieval of brand names to product categories produced comparable effects on both explicit and implicit consumer memory. In particular, recall and generation of practiced brands was enhanced, whilst retrieval-induced forgetting was observed for non-practiced brands from practiced categories. Finding similar effects of a variable on both explicit and implicit tests can be problematic from an interpretative point of view. Two conclusions are possible. The first is that the variable in question produces similar, genuine, effects on both tests. Alternatively, participants assigned to the implicit test may recruit the use of intentional or explicit retrieval strategies. This is called explicit contamination. It has been noted that the potential for explicit contamination may be particularly evident on conceptual tests, which engage meaning based processing or elaborative strategies during retrieval (Perruchet & Baveux, 1989; Schmitter-Edgercombe, 1999). As the current tests are conceptual in nature, then it is possible that explicit contamination may have occurred. If this is the case, then clearly no valid conclusion can be made about the influence of retrieval practice on brand-name generation as participants may have covertly adopted an explicit retrieval strategy. In the current experiment, although participants were simply asked to think of brands that just 'popped' to mind, they may have noticed that some of the studied brands were relevant and attempted to improve their performance by intentionally retrieving these brands. In order to rule out this explicit

contamination account, Experiment 2 was conducted with procedures to minimise the use of intentional strategies in the implicit test.

EXPERIMENT 2

The main purpose of Experiment 2 was to rule out the possibility of explicit contamination in the brand-name generation task. In addition, Experiment 2 also considered the effects of increasing the number of retrieval practice attempts upon the magnitude of retrieval-induced forgetting. To minimise the effects of explicit contamination, two procedures were used. Firstly, implicit test participants were actually informed that some of the brands they generate may come from the earlier phase of the experiment but, nevertheless, to continue to generate whatever brands spontaneously come to mind. This may appear to be somewhat counterintuitive but the purpose of this is to control for the possibility of participants 'catching-on' to the true purpose of the 'disguised' implicit test and then attempting to increase performance by use of intentional retrieval strategies (Bowers & Schacter, 1990; McKone & Slee, 1997; Ramponi, Richardson-Klavehn, & Gardiner, 2004, 2007; Richardson-Klavehn, Gardiner, & Java, 1996). For example, if the implicit test is 'disguised', the possibility exists that participants will at some point realize that memory is being tested. As a consequence they may then make use of explicit retrieval in order to improve their performance. By informing participants that some of their responses may come from the study episode, and at the same time emphasizing the importance of following the assigned retrieval instructions, the possibility of explicit contamination is reduced. This approach has been used successfully in previous research in which explicit

contamination has been reduced (e.g., McKone & Murphy, 2000; McKone & French, 2001; Parker, Dagnall, & Coyle, 2007; Ramponi, et al., 2004, 2007; Richardson-Klavehn & Gardiner, 1995, 1996). Secondly, a post-test questionnaire is used wherein participants are asked a set of questions about the retrieval strategies they employed. Implicit test participants that claim to be making use of explicit or intentional retrieval strategies can then be either eliminated or analyzed separately (e.g., Bowers & Schacter, 1990; McKone & Slee, 1997; McKone & French, 2001; Mulligan, Guyer, & Beland, 1999; Parker, et al., 2007; Smith & Hunt, 2000).

In addition, Experiment 2 considered the effects of the amount of retrieval practice on subsequent explicit and implicit memory. This was achieved by requesting the repeated retrieval of brand names to product categories either three or six times. Repetition is an important variable in consumer research because repetition can reverse the effects of forgetting (Unnava & Burnkrant, 1991), can also strengthen the association between a brand and a benefit of the product (Burke & Srull, 1988), and increase the probability that the brand will be retrieved into the consideration set (Posavac, et al., 2001). Also, it has been shown that increasing the numbers of retrieval practice attempts can bring about increased inhibition (Anderson & Green, 2001; Shivde & Anderson, 2001). During the final phase, the instructions given to those in the explicit test were the same as those in Experiment 1. For those taking the implicit test, the instructions were modified. In particular, the instructions indicated that some of the brand names that come to mind may have appeared during the first or second phases of the study. They were informed that this was OK but that it was important to simply generate those brands that ‘pop’ to mind

irrespective of where the brands were originally encountered. Finally, a post-test questionnaire was provided that asked three questions about how the brands came to mind**.**

Method

Participants

Eighty participants took part in the experiment. All were recruited from the student population of Manchester Metropolitan University on a voluntary basis.

Design

Experiment 2 had two independent variables. The first was the same as Experiment 1 (brands that received retrieval practice (Rp+ items), brands from the practiced category that did not receive practice themselves (Rp- items) and brands from non practiced categories (Nrp items). This was manipulated within participants. The second variable was the amount of retrieval practice; three vs. six retrieval attempts. This was manipulated between participants. The dependent variables were the same as Experiment 1; brand-name cued recall (explicit text) and brand-name generation (implicit test).

Materials & Apparatus

The materials were the same as for Experiment 1. However, for participants in the six repetition condition, the number of pages in the retrieval practice booklet was increased by thirty-six. This of course reflected the fact that practice took place six times for the selected subset of product categories.

Procedure

The study and retrieval practice phase was the same as in Experiment 1, with the exception that half the participants practiced retrieval six times. The implicit test instructions were altered. Instructions emphasised that for each product category, up to six brands were to be generated on the basis of those that 'popped' to mind. In addition they were told that some of these brands may be ones that they came across earlier in the experiment. They were informed that if this happened, it was OK and to just write down whatever brands they thought about irrespective of whether they appeared earlier or not. Finally, implicit test participants were provided with a post-test questionnaire that contained the following three yes/no questions: (i) I intentionally attempted to recall the brands from the first phase of the experiment. (ii) I did recognize some of the brands from the first phase of the experiment. (iii) When I thought about the product category names I used the brands that "popped" to mind. Participants who answered yes to the first question were excluded from the analysis as they admitted to making use of inappropriate retrieval strategies.

Results

Explicit Test: Brand-name cued recall.

The proportion of studied brands recalled were entered into a 3(retrieval practice type: Rp+ vs. Nrp vs. Rp-) within participants by 2(amount of practice: three vs. six) between participants ANOVA. The means and SDs can be seen in Table 2. This produced a significant main effect of retrieval practice type, $F(2, 76) = 109.46$, $p \leq 0.001$, and a significant interaction between retrieval practice type and amount of retrieval practice, $F(2,$

76) = 3.26, $p = 0.004$. The main effect of the amount of retrieval practice was not significant, $F(1,36) = 1.45$, $p = 0.24$. To assess the interaction, simple main effects were calculated at each level of amount of retrieval practice. For three practice attempts, a significant effect of retrieval practice type was found, $F(2, 38) = 28.64$, $p \leq 0.001$. For six retrieval practice attempts, the results were again significant, $F(2, 38) = 110.13$, $p \leq 0.001$. The effect size, partial eta squared, was larger in the six (0.85) compared to the three (0.60) repetition condition. For the three repetition condition, planned comparisons revealed a significantly greater proportion of studied items recalled in the Rp+ condition compared to the Nrp condition, $t(19) = 6.43$, $p \leq 0.001$, and fewer brands recalled in the Rp- condition compared to the Nrp condition, $t(19) = 2.13$, $p = 0.02$. In the six repetition condition, planned comparisons revealed a significantly greater proportion of studied brands recalled in the Rp+ condition compared to the Nrp condition, $t(19) = 13.97$, $p \leq 0.001$, and fewer brands recalled in the Rp- condition compared to the Nrp condition, $t(19) = 4.40$, $p \leq 0.001$.

INSERT TABLE 2 ABOUT HERE

Implicit test: Brand-name generation.

Three participants claimed to make use of explicit retrieval strategies by answering yes to question 1 of the post-test questionnaire. These were replaced by three participants who made use of the designated strategies. The means (SDs) of the proportion of brands generated can be seen in Table 2. These were entered into a 3(retrieval practice type: Rp+ vs. Nrp vs. Rp-) within participants by 2(amount of practice: three vs. six) between participants ANOVA. This produced a significant main effect of retrieval practice type,

$F(2, 76) = 43.65$, $p \leq 0.001$, and a significant interaction between retrieval practice type and amount of retrieval practice, $F(2, 76) = 5.56$, $p = 0.006$. The main effect of recalling six (vs. three) times was marginally significant, $F(1, 36) = 3.85$, $p = 0.06$. To assess the interaction, simple main effects were calculated at each level of amount of retrieval practice. For three practice attempts, a significant effect of retrieval practice type was found, $F(2, 38) = 9.26$, $p = 0.001$. For six retrieval practice attempts, the results were also significant, $F(2, 38) = 41.05$, $p = \leq 0.001$. The effect size, partial eta squared, was larger in the six (0.68) compared to the three (0.33) repetition condition. For the three repetition condition, planned comparisons revealed a significantly greater proportion of studied items generated in the Rp+ condition compared to the Nrp condition, $t(19) = 2.01$, $p = 0.02$, and fewer brands generated in the Rp- condition compared to the Nrp condition, $t(19) = 2.60$, $p = 0.008$. In the six repetition condition, planned comparisons revealed a significantly greater proportion of studied brands generated in the Rp+ condition compared to the Nrp condition, $t(19) = 6.36$, $p \leq 0.001$, and fewer brands generated in the Rp- condition compared to the Nrp condition, $t(19) = 4.00$, $p \leq 0.001$.

One sample t tests were used to compare the proportion of items generated against the baseline production rate of 0.34. The results for the three repetition condition revealed significant effects for Rp+ brands, $t(19) = 5.72$, $p \leq 0.001$ and for Nrp brands, $t(19) = 6.54$, $p \leq 0.001$. However, no significant difference was observed for the Rp- brands $t(19) = 1.47$, $p = 0.16$. For the six repetition condition, significant differences were found for Rp+ brands, $t(19) = 12.72$, $p \leq 0.001$ and for Nrp brands, $t(19) = 7.70$, $p \leq 0.001$. No significant difference was found for Rp- brands, $t(19) = 1.46$, $p = 0.15$. Thus, significant priming

effects were observed for all conditions apart from those brands that had undergone retrieval induced forgetting.

Discussion of Experiment 2

Experiment 2 replicated the main findings of the first study. In relation to explicit memory, retrieval practice was found to increase the recall of Rp+ brands and to bring about retrieval-induced forgetting of Rp- brands. Similar effects were found for implicit memory. As precautions were taken to ensure that explicit contamination was minimal, these effects cannot be attributed to participants in the implicit test making covert use of explicit test strategies. Increasing the amount of repetition had slightly different effects under explicit and implicit test conditions. For the explicit test, the magnitude of the retrieval-induced forgetting effect was larger following six (vs. three) retrieval practice attempts. For the implicit test, the magnitude of the facilitation effect was greater following six (vs. three) retrieval practice attempts. An interesting finding was that priming levels of Rp- brands was reduced to baseline levels and indicates that the effect of prior exposure was effectively negated. This finding differs from Experiment 1 in which a priming effect (albeit much reduced) was still evident for Rp- brands. The reason for this difference is unclear as the procedures employed were similar across both experiments. It seems unlikely to be due to explicit contamination in Experiment 1 as the mean Rp- scores for the explicit test were actually *lower* compared to the implicit test (see Table 1). Thus if explicit contamination were a problem, then the Rp- scores on the implicit test would expected to be lower and in line with the recall scores of the explicit test.

GENERAL DISCUSSION

In both experiments, practice at retrieving specific brands from a particular product category was found to have two effects; relating to facilitation of the Rp+ brands and inhibition of the Rp- brands. Firstly, Rp+ brands were recalled and generated more frequently than Nrp brands. This finding is not too surprising as practice in the current experiments involved strengthening the product category-brand association. More surprising is that the amount of retrieval practice did not appear to matter for explicit brand cued recall. One explanation for this finding is that when participants are provided with explicit retrieval instructions, a more extensive search of memory is undertaken until the target information is found. If more effort is expended searching memory, this may compensate for weaker associations between the product category and the brand name. For the implicit test, the magnitude of facilitation was greater following six (vs. three) prior recall attempts and indicates that the association between the product category and the brand name had been strengthened. With regard to the Rp-brands, the magnitude of the inhibitory effect on the explicit test was larger following six prior retrieval attempts. However, for implicit memory, increasing the amount of retrieval practice did not increase the magnitude of the inhibitory effect. Finding that increasing the number of retrieval practice attempts produces a greater inhibitory influence on tests of explicit memory is consistent with previous work (e.g., Anderson & Green, 2001; Shivde & Anderson, 2001). We are not aware of any existing research that has assessed the effects of the amount of retrieval practice on implicit tests and thus replication of these findings would be useful.

In addition, in Experiment 2, it is notable that retrieval practice reduced the proportion of brands generated to baseline levels. In effect, this is equivalent to eliminating

the effects of prior exposure. In advertising terms, retrieval practice may serve not simply to reduce the probability of an Rp- brand being generated, but potentially abolish any prior marketing communication.

It might be questioned whether the retrieval-induced forgetting effects found in the experiments reported here reflect inhibitory processes as opposed to some non-inhibitory influence or output interference. Against this view, many studies have now shown that the retrieval practice paradigm as used here produces inhibitory effects on tests that reduce output interference and rule out non-inhibitory explanations (e.g., Anderson, et al., 1994; Anderson & Spellman, 1995; Hicks & Starns, 2004; Veling & Knippenberg, 2004). However, future research may like to address further the question of inhibitory influences. For example, use could be made of the independent probe technique (Anderson & Spellman, 1995). In this, participants are tested with retrieval cues that were not initially studied. For example, the participant may initially study 'red-blood' and 'red-tomato'. Following this, retrieval practice on 'red-blood' has been found to impair the recall of 'tomato' in response to the cue 'red'. So far this is identical to the procedure used here. However, if the word 'tomato' is actually inhibited, then retrieval should be impaired when tested with other cues that are not studied. In this case, if the category 'food' is presented as a retrieval cue, then recall of 'tomato' should still be impaired. The basic idea behind this technique is that the inhibitory effect is not limited to the association between the category and the exemplar but that the activation of the exemplar itself has decreased. To assess this in terms of consumer memory would require brand names that are associated with different product categories. For example, during study participants could be presented with 'Drinks – Tango' and 'Drinks - Cadburys'. During the retrieval practice phase, Tango is cued for

recall. Finally, during the test phase, Cadburys is cued from a different product category such as 'Chocolate'. In tests of implicit memory, the independent probe technique has been used recently by Camp, Pecher, & Schmidt (2005). They found that retrieval-induced forgetting was present only for participants who were aware of the relationship between the study and test phases. In Experiment 2 of the current study, the participants in the implicit test were made study-test aware (by virtue of the testing instructions) but were nevertheless requested to produce only brands that 'popped' to mind. In Experiment 1 of the current study, it is possible that participants became study-test aware at some point during the implicit test. Of course we do not know this for certain as no measures of study-test awareness were employed. However, research that has made use of such measures indicates that many participants do become aware spontaneously of the study-test relationship even if not informed by the experimenter (e.g., Bowers & Schacter, 1990; Camp et al., 2005; Mulligan, et al., 1999). The issue at stake here relates to the distinction between *retrieval intention* and *awareness* (Richardson-Klavehn, & Gardiner, 1995; Richardson-Klavehn et al., 1996). Retrieval intention refers to the retrieval orientation adopted by the participant during the test (i.e., intentional vs. incidental retrieval). Awareness refers to the extent to which the participant is conscious of the fact that some test items appeared as study items. In the Camp et al. (2005) study, participants were classified as test aware if they indicated knowledge of the overlap between the study and test phase and, crucially, continued to use incidental (implicit) retrieval strategies as indicated by responses on the post-test questionnaire. Thus these findings do not contradict the findings of Experiment 2 as in this experiment participants were aware and made use of the assigned retrieval strategies, again as indicted by responses on the post-test questionnaire. With regard to Experiment 1, the

situation is less clear, as no post-test assessment was made of whether participants became aware or continued to make use of the assigned retrieval strategies. A stronger case for asserting that different retrieval strategies have been employed is to demonstrate a dissociation between an explicit and an implicit version of a test, thus satisfying the retrieval intentionality criterion (Schacter, Bowers, & Booker, 1989). If a variable can be found that produces different effects on the two versions of a test, then confidence that different retrieval strategies are being used is enhanced. In this context, a limitation of the current study is that both retrieval practice and repetition produced similar effects on the explicit and the implicit test. Although we note a small difference as repetition produced greater effects on the Rp- items for the explicit (vs. implicit) test whilst producing greater effects on Rp+ items for the implicit (vs. explicit) test. As a consequence, it will be useful for future research to consider variables that produce clear dissociations between the two types of test. In addition, as Camp et al., (2005) did not find retrieval-induced forgetting for test *unaware* participants, this may set some limitations on the generality of these effects. Thus together, the search for dissociations between explicit and implicit consumer memory, and the role of awareness are important goals for consumer psychology research.

Another way of extending the current research would be to make use of different types of test that do not depend upon the use of category cues. These could include tests of item recognition or item-specific tests of implicit memory such as lexical decision or perceptual identification (e.g., Hicks & Starns, 2004; Perfect, et al., 2002; Veling & Knippenberg, 2004). Finding impairments on Rp- brands in these tests would strengthen the case for inhibitory influences in consumer memory.

To the extent that retrieval practice impaired both the recall and generation of brands is of consequence in situations where brand choice is in whole or in part memory based. The current findings indicate that retrieval of brands from the knowledge set into the retrieval set (Alba & Chattopadhyay, 1985), is influenced by prior recall attempts. Prior recall of a brand not only increases the probability of that brand being retrieved at a later date, but also decreases the probability of retrieving competing brands. The fact that this can be observed under both explicit and implicit conditions underpins the potentially far reaching consequences of these findings. Basically, the current results indicate that even when retrieval is not directed towards recalling specific advertised brands (i.e. when retrieval is implicit), inhibitory effects can still be found.

In the conditions of both experiments reported here, strengthening the product category-brand association was achieved by asking participants to recall brands to the product category (retrieval practice). Previous research that has sought to strengthen this association has made use of techniques that involve repeated exposure to the product category and brand, rather than recall (e.g., Posavac, et al., 2001). This may not be sufficient to bring about the inhibitory effects observed here as it has been shown that the act of recall itself is particularly important. For example, when participants are simply provided with extra study opportunities without the request to recall, then inhibitory effects are not found (Anderson, Bjork & Bjork, 2000). These findings are taken to indicate that inhibitory effects are recall specific, and only occurs in situations where competitive interference arises. In the case of the current study, competitive interference arises when participants are asked to recall specified brands in response to the product category cue. In these situations, the product category acts as a cue for all brands within that product class.

As a consequence, inhibitory mechanisms are brought into play in order to reduce activation of all brands within that product class with the exception of the one being cued. To the extent that inhibitory influences are observed under such conditions has an important consequence for understanding the implications of retrieval practice in advertising and marketing. Specifically, mere exposure to the advertised brand may be insufficient to bring about inhibitory influences. Instead, marketers may like to consider how advertising may be used to prompt the consumer into actively retrieving the brand name. One such situation in which this may occur is via the use of so-called mystery ads. In mystery ads, the name of the brand is not revealed until the end of the advert. This strategy prompts the consumer into thinking about which brand is being advertised. Particular clues, such as logos, could be provided within each ad in order to suggest which brand is being promoted and thus prompt retrieval of the appropriate brand. Evidence already exists that this technique is able to increase the strength of the association between the product category and the brand name (Fazio, et al., 1992). However, the effects of this strategy upon the retrieval of brand competitors and inhibitory processes are not known and may suggest an avenue for future work.

The current experiments also made use of rather impoverished stimuli; namely word pairs. Of course in real advertising situations, the amount and complexity of material being promoted is much greater. Consequently, it may be useful to consider the extent to which the effects observed in the current experiments generalise to ad stimuli of greater complexity.

Experiment 2 used testing instructions and a post-test questionnaire to minimise the effects of explicit contamination on the implicit test. Future research might like to consider

other techniques to reduce further the possibility of explicit contamination. The present experiments used a between participants measure of baseline retrieval. The use of a within participants measure could be considered. At test this would require participants to generate brands to non-presented product categories. Thus the overlap between the study and test phase would be less obvious and reduce the chances of participants engaging in intentional retrieval strategies. A number of other procedures have been outlined by Roediger and McDermott (1993) and include making use of speeded responding, increasing the delay between study and test, using long lists and several filler tasks. All these factors are known to reduce intentional uses of memory and thus improve the measurement of implicit memory.

In summary, the experiments reported here found that prior recall of a subset of brands from a particular product category impaired both explicit and implicit memory of the non-recalled brands. This is taken to indicate that brand name information can be inhibited by the retrieval of competing brands. Future research might like to consider further the nature and conditions of these effects and the impact upon brand choice.

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Table 1. Mean Proportions (SDs) of Brand Names Recalled or Generated as a Function of Retrieval Practice Type.

	Retrieval Practice Type		
Test Type	Retrieval practice items (Rp+)	Baseline items (Nrp)	No retrieval practice items (Rp-)
Explicit	0.75 (0.19)	0.52 (0.18)	0.35 (0.15)
Implicit	0.73 (0.10)	0.53 (0.13)	0.45 (0.14)

Note: baseline retrieval rate = 0.34.

Table 2. Mean Proportions (SDs) of Brand Names Recalled or Generated as a Function of Retrieval Practice Type and Amount of Retrieval Practice.

	Retrieval Practice Type		
Test Type & Amount of Practice	Retrieval practice items (Rp+)	Baseline items (Nrp)	No retrieval practice items (Rp-)
Explicit			
Three	0.79 (0.16)	0.54 (0.13)	0.44 (0.21)
Six	0.82 (0.13)	0.49 (0.11)	0.32 (0.17)
Implicit			
Three	0.60 (0.20)	0.51 (0.12)	0.40 (0.19)
Six	0.78 (0.16)	0.54 (0.12)	0.40 (0.17)

Note: baseline retrieval rate = 0.34.