

The Effect of Peanut Butter on Free Recall of Words in LTM

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Abstract

In an attempt to expand upon Fakedata & Fraud's (2001) finding that eating nut-based products can enhance recognition of words in LTM, an experimental study was conducted on 30 A –Level students from a Worcestershire College. 15 PPs free-recalled a list of 20 words whilst their foreheads were covered in peanut butter. A further 15 PPs acted as a control group. Mann-Whitney U analysis showed that peanut butter significantly depressed recall ($p < 0.05$). Since this contradicted the findings of Fakedata & Fraud, it was concluded that the sensation caused by the peanut butter served to distract PPs attention from the recall task. There is no compelling reason to believe that topical application of peanut butter has a direct effect on the functioning of LTM.

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Introduction

Recent research has indicated that memory functioning can be affected in a number of ways by the ingestion of different foodstuffs (Nonsense, 1998). The precise mechanism for this is still unclear (Pseud & O'Science, 2000), but is likely to involve a range of factors including the relative size of nutritive particles in different foods and the selectively permeable nature of the blood-brain barrier (Stuff & Nonsense, 1999).

Of particular interest within this field has been the work of Fakedata & Fraud (2000; 2001) who indicated in a series of experiments that peanut-based foodstuffs significantly enhance PPs ability to select previously seen stimulus words from a randomised list. In their studies, participants consumed either a Snickers™ bar or a bar of soap prior to two-minute exposure to a word-list on a screen. In an unexpected test of recognition given 15 minutes later, those in the Snickers™ group recognised more words from the original list and misidentified fewer. In a further experiment designed to control for the presence of chocolate, three groups of PPs consumed either a Snickers™ bar, a Mars™ bar, or a chocolate-covered bar of soap prior to a similar test of recognition. As expected, recognition was poorest in the soap group, but Snickers™ recognition scores were still measurably superior to those in the Mars™ group. Fakedata & Fraud concluded:

'...whilst the hypothesis that Mars™ helps you work rest and play has been shown by empirical test to be of at best dubious validity, our results clearly indicate that the peanut-packed goodness of a Snickers™ has a measurable and reliable effect on recall.'

(2001; p 32)

The intention of this experiment is to extend Fakedata & Fraud's milestone work. Whilst the basic format of their experimental procedures has been retained, two important modifications have been made. First, in order to control for ingredient-variables that may have confounded the original work, peanut butter was used instead of Snickers™ bars. Being made purely of peanuts (Sun, Pat & Crunchy, 1966) this represents a superior way of testing the peanut hypothesis than Snickers™ bars, which are affected by a range of contaminants including nougat and caramel (Cadbury & Schweppes, 1984). Second, in the experiment here reported, the peanuts were applied topically to the foreheads of the experimental group. This was done in order to control for the possible effect of the participants not liking peanuts, something that Fakedata & Fraud did not consider in their research.

On the assumption that peanut butter is sufficiently oily to penetrate the derma, cranium, dura mater, pia mater and blood-brain barrier (as suggested by Imp & Ossible, 1987), it is expected that participants given the topical application of peanut butter will experience the memory enhancing effects described by Fakedata & Fraud through a mechanism as yet unspecified.

Hypotheses

H₁: PPs in the peanut butter group will recall significantly more words than the control group.

H₀: Any difference in recall between experimental and control groups will be due to chance.

Method

Design

30 participants were used in an experiment with independent measures design. This was adopted in order to avoid order and fatigue effects and the confounding variables introduced by the use of different wordlists. The IV was whether or not PPs had peanut butter smeared on their foreheads. The DV was the number of words correctly recalled from a list of 20.

In order to ensure a fair test of the hypothesis, basic controls were employed, including the use of standardised procedure and instructions and the random assignment of participants to experimental and control groups. Additionally, both groups were given the same word list, under the same conditions (temperature, humidity and time of day) for the same amount of time (2 minutes). A distraction task was used between learning and recall in order to prevent rehearsal.

Ethics

The procedures of this experiment were submitted to the ethics committee of Worcester College of Technology and passed as ethically acceptable provided that steps were taken to avoid exposing PPs to the risk of anaphylactic shock due to nut allergies. All participants recruited were asked whether they were aware of any nut allergies and those that were, excluded from the experiment. Remaining participants were screened by a dermatologist. Besides this, informed consent was obtained at every stage of the procedure and PPs were fully debriefed after the experiment.

Participants

An opportunity sample of 30 PPs was recruited from the student body a large, general Further Education college in Worcestershire. 13 were female, 17 were male and all were studying A –Level courses. Their mean age was 17 years 3 months with a range of 13 months.

Materials

A word list was drawn up consisting of 20 two-syllable concrete nouns known to be in the vocabulary of the target population and age group. The list was prepared so that the words were presented in a single column (see appendix 1). Two jars of crunchy peanut butter (unsalted) were purchased from a nearby supermarket. Participants were also supplied with pens and paper for the free recall test.

Procedure

Participants were approached in the canteen of the college and asked if they would mind taking part in an experiment. Those that agreed were taken to the laboratory and the procedure explained to them. Once 30 PPs had been recruited, the experimental group was assigned by flipping a coin for each PP and assigning the first ten 'heads' to the experimental group.

Participants were then taken to the experimental location and a copy of the word list placed face-down in front of each. In the experimental group, the researchers then went round the room and smeared 40g of peanut butter on the forehead of each participant, attempting to ensure even coverage of the area between hairline and eyebrows.

PPs were then informed that they would have two minutes to study the word list in front of them and to turn it over. The time was measured with a stopwatch. The participants were then instructed to turn the wordlist back over and these were removed. For the distraction task, the participants watched a 5-minute 'Ren and Stimpy' cartoon. Each was then given a pen and a piece of paper and instructed to write down as many words from the list as they could recall. Unlimited time was given for this task. Finally, participants were debriefed and those in the experimental group led away to suitable washing facilities (see appendix 2 for standardised instructions).

Scoring Procedure

PPs were scored +1 for each word written on their sheet of paper that had appeared on the original list. Synonyms and guesses were ignored.

Results

Description of results

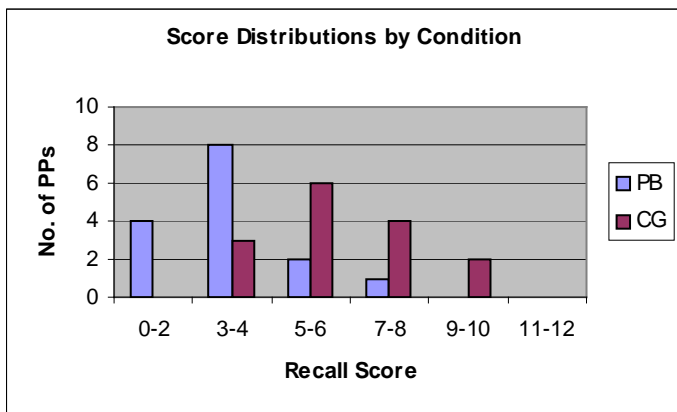
The results of the experiment were not entirely as expected. Comparison of group means indicates a markedly lower recall score in the peanut butter group (2.3) compared to the controls (5.7).

Table 1 – Recall of words by experimental condition

Condition	Peanut Butter	Control Group
Mean	2.3	5.7
Range	5	6

That both sets of scores have similar ranges (see table 1) and follow a roughly normal distribution (see fig 1) suggests that this unexpected trend is not the result of aberrant data.

Fig. 1 – Score Distributions by Condition



Since the trend in the results is clearly opposite to that predicted by H_1 , the null hypothesis was accepted. Topical application of peanut butter does not enhance free recall. In fact, the results appear to suggest that it has an adverse effect.

Treatment of results

In order to establish whether or not this unexpected result was due to chance variability in the data, the results were subjected to an inferential test. Since recall scores do not satisfy the criteria for interval level (there is no measurement scale), data were treated as ordinal. The appropriate test for use with ordinal level data in a test of difference with an independent measures design is the Mann-Whitney U test.

The critical value for significance ($N_1 = 15$, $N_2 = 15$, $p < 0.05$ two-tailed) is 64. Observed U was 21. Since this is lower than the critical value it was concluded that the difference in scores between the conditions was unlikely to be due to chance.

Discussion

This experiment is not in line with the predictions of Fakedata & Fraud (2001). It is unlikely that this is because of an error in their research, which has been replicated on a number of occasions (e.g. Boring & Boring, 2003). One possibility is that the permeability of the cranium by nut-based oily substances hypothesis (Imp & Ossible, 1987) is incorrect. It is impossible within the scope of this report to comment on this.

It seems more likely that the results were contaminated by a confounding variable. A distinct possibility is that the physical sensation of having peanut butter smeared on their foreheads acted as a distractor to the experimental group, interfering with their ability to learn the words effectively. The 'distraction' hypothesis is supported by observations of the PPs during the experimental procedure, many of whom recoiled from the initial application of the peanut butter, and some of whom were heard to pass negative comments (e.g. "euch, that's disgusting.").

In future tests of this hypothesis it is recommended that the control group's foreheads are smeared with a similar (but peanut free) substance such as window putty. Furthermore, the peanut butter in this experiment was applied cold, and it would be advisable in future to heat it to room temperature before application.

It is possible that the ability of the peanut butter to penetrate the heads of the experimental PPs might have been adversely affected by the 'crunchy' variety selected for the experiment. The extent to which this is true is impossible to ascertain given that the distraction effect appears to have masked any facilitative effect of peanut butter on memory function. However, assuming that effective controls for this can be established (see above), it would be an interesting line of enquiry to compare the relative effects of smooth and crunchy peanut butter on LTM functioning.

However, for the time being, the true extent to which peanut butter facilitates memory cannot be established. In fact, if the results of this investigation are taken at face value, peanut butter appears to inhibit LTM functioning, although the exact mechanism for this remains obscure. Further research into this area is clearly necessary. However, on the basis of the evidence presented above, students should, for the time being, be strongly discouraged from relying on peanut butter as an aid to learning and examination performance.

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