Western Libraries Undergraduate Research Awards

***This undergraduate research project – "False Recognition: Revisiting the Account for Pictorial Encoding" by Katarina Jovanovic – was one of the recipients of a Western Libraries Undergraduate Research Award for the 2022–2023 competition. On their applications, students were required to submit answers to four research reflection questions together with their research project.**

What is your research project about and why is it important?

False recognition is an inaccurate claim of having previously encountered a non-presented test item. Exceptionally high levels of false recognition are observed when participants are exposed to lists of semantically related words. Israel and Schacter (1997) showed that presenting pictures of items with their auditory label during the encoding phase significantly reduced false recognition relative to presenting only words with their auditory label. The current study excluded the auditory labels and instead investigated whether presenting pictures of items along with words during encoding would also reduce false recognition relative to presenting the written words only. The results provided no evidence to support reduced rates of false recognition in the picture encoding condition [$t(48) = 0.42$, $p > .05$]. Olszewska et al. (2015) suggested that auditory traces persist more distinctively in memory than visual traces, hence, the discrepancy in results between the core literature and the present study can possibly be attributed to the exclusion of auditory labels. Future research should focus on providing a detailed account of the role of auditory labels in reducing false recognition.

How did you choose your research topic and/or design your research question?

The broad research question "Do pictures reduce false memories?" was assigned to all students in the course. My primary interest in psychology is cognition, so an opportunity for an in-depth study of memory compelled me to narrow the research question down and learn as much as I could about the occurrence of false memories. From the two assigned articles, I discovered that my phenomenon of interest was the DRM paradigm. This paradigm suggests that people experience increased false memory formation when studying lists of semantically related words. Furthermore, I recognized that the successful reduction of the effects of the DRM paradigm shown by the two assigned articles was revolutionary, and started an avalanche of consequent investigations. Whilst I was not required to read beyond the assigned articles, I became personally invested in this project which drove me to read all relevant publications I could find. After an extensive review of the literature and an evaluation of the assigned study design, I narrowed down and shaped my research question into: "Does the presentation of pictures during the encoding phase reduce the occurrence of false recognition in the DRM paradigm?"

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How did you find library/archives services and resources for your research topic?

To establish the foundation for my experiment, I delved into all relevant literature to comply with the modern standards of experiments in psychology which tend to heavily rely on previous literature. In my search for resources, I used print and digital journal articles investigating the reduced formation of false memories in the DRM paradigm. I identified “false memories” and “DRM paradigm” as keywords. I would search for these terms using the Boolean operators to find relevant results. My primary search engines were Google Scholar, APA PsycNet and OMNI. Often, articles that I found on Google Scholar or APA PsycNet were available to me through Western hyperlinks or, if not, I was able to find them by manually searching them up on OMNI. For example, I found Olsewska et al. (2015), an article on which I base the discussion of my paper while browsing Google Scholar and although the access to it is subscription based, I was able to access it for free through OMNI. Overall, OMNI enabled me to access the majority of the articles I considered when developing my hypothesis and informing my research paper.

What library/archives services and resources did you use to perform your research?

In my introductory Political Science course, a librarian delivered a presentation about different databases available through Western Libraries and ways to navigate them. Their lecture taught me how to use keywords and Boolean operators to browse literature. Though their lecture was focused on Political Science, I was able to apply the skills I learned to my search for peer-reviewed articles on false memory reduction. My search yielded a vast number of results and, following the librarian’s advice, I only read abstracts to decide whether the content was relevant to my research topic, which saved me a lot of time. Later in the process, upon completing my bibliography, I sought reference assistance at a help desk which helped me gain confidence in my referencing style. Finally, I booked a tutoring session with Huron Writing and Learning Services to have my final draft reviewed by a librarian. I often use this service and, other than immediate assistance, I believe it equipped me with excellent editing skills that enabled me to edit my paper on my own until I was satisfied with it. The above library services improved my research skills, boosted my writing confidence and fostered my future research independence.

False Recognition: Revisiting the Account for Pictorial Encoding

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Abstract

False recognition is an inaccurate claim of having previously encountered a non-presented test item. Exceptionally high levels of false recognition are observed when participants are exposed to lists of semantically related words. Israel and Schacter (1997) showed that presenting pictures of items with their auditory label during the encoding phase significantly reduced false recognition relative to presenting only words with their auditory label. The current study excluded the auditory labels and instead investigated whether presenting pictures of items along with words during encoding would also reduce false recognition relative to presenting the written words only. The results provided no evidence to support reduced rates of false recognition in the picture encoding condition [$t(48) = 0.42$, $p > .05$, one-tailed]. Olszewska et al. (2015) suggested that auditory traces persist more distinctively in memory than visual traces, hence, the discrepancy in results between the core literature and the present study can possibly be attributed to the exclusion of auditory labels. Future research should focus on providing a detailed account of the role of auditory labels in reducing false recognition.

Keywords: False Memory, Study Lists, Encoding Condition, DRM

False Recognition: Revisiting the Account for Pictorial Encoding

Recognition, a memory retrieval technique, is the ability to accurately identify previously encountered items (Medina, 2008). False recognition happens when individuals mistakenly claim to have previously studied a new test item (Underwood, 1965). Expanding on Deese (1959), Roediger and McDermott (1995) examined false recognition by exposing participants to lists of semantically related words - *targets* (e.g., green, leaf, flower, pot) that converge on a non-presented *critical lure* word (e.g., plant). Subsequently, on a recall or recognition test, participants were asked to remember target items but often reported false memories for critical lures. In some circumstances, the false-alarm rates to the critical lure words were greater than 80% (Roediger & McDermott, 1995). This phenomenon became known as Deese/Roediger-McDermott (DRM) paradigm, which shifted the previously held conception that false recognition occurs in moderation.

In response to this discovery, a number of different encoding manipulations have been tested for reducing the formation of false memories (e.g., Israel & Schacter, 1997; Schacter et al., 2001). Some studies suggest that high-false recognition rates in the DRM paradigm can be attributed to the collective presentation of a large number of semantically related words because it emphasizes their shared semantic features rather than individual perceptual details (Norman & Schacter, 1997, as cited in Israel & Schacter, 1997). From this, Israel and Schacter (1997) hypothesized that studying pictures could aid the formation of distinctive perceptual representations of items, enabling the participants to form more specific memories and resulting in fewer false alarms to related lures respective to only studying words. In their experiments, they compared the following conditions: (1) the presentation of the items accompanied by their auditory label (e.g. participants would see and hear the word ‘leaf’) and (2) the pictorial

presentation accompanied by the auditory label of the items (e.g., participants see an illustration of a leaf and hear the word 'leaf'). Participants studied lists in the described manner and were subsequently presented with a filler task to prevent rehearsal. This was followed by a recognition test that was composed of both old and new items that were presented as pictures or as words depending on participants' respective assigned conditions. Additionally, among the new items, there were both control lures (unrelated to studied lists) and critical lures (closest semantic associates of the studied lists of items). While the hit rates were similar for both conditions, the false alarm rates significantly decreased in the picture encoding condition relative to the word-only condition. These findings support the hypothesis that pictures make items more distinctive which increases the participants' ability to "remember" studied items, and in turn, decreases the effects of false recognition in the DRM paradigm.

Expanding on Israel and Schacter (1997), Schacter et al. (2001) suggested that the decrease in false recognition observed after encoding distinctive perceptual information (i.e., the pictures) is dependent on participants' evaluation of the information they *feel* they should remember. Specifically, the reduction in false recognition might have resulted from "a general rule of thumb" which relies on participants' expectation that if an item had been previously studied it should evoke a vivid perceptual recollection. In contrast, the participants in the word encoding condition would not expect to remember distinctive perceptual information, therefore, would be far less likely to gain access to specific memories. The hypothesized "rule of thumb", in participants in the picture encoding condition, was named the *distinctiveness heuristic* (Schacter et al., 1999, as cited in Schacter et al., 2001). It was suggested that participants that rely on the distinctiveness heuristic are particularly attentive to their ability to remember distinctive details about an item and establish discrimination criteria such as: "If I do not recall

seeing a picture of an item, it is most likely new" (Schacter et al., 2001). To test this theory, Schacter et al. (2001) conducted two experiments. In their first experiment, during the encoding phase, they presented participants with either: (1) half of the items as words and half as pictures accompanied by their auditory label or (2) items presented as words accompanied by their auditory label (Schacter et al., 2001, Experiment 1). The observed results showed significantly reduced false recognition in the half-and-half condition respective to the word-only condition. Therefore, even when half of the items are encoded as pictures the false recognition is reduced. In their second experiment, Schacter et al. (2001) directly replicated the results of Israel and Schacter (1997) observing reduced false recognition of the picture encoding condition relative to the word encoding condition.

Similarly to Israel and Schacter (1997), the present study aims to reduce the occurrence of false recognition in the DRM paradigm through the presentation of pictures during the encoding phase. Unlike the previous studies, the current investigation seeks to determine whether the observed reduction in false recognition persists when the auditory labels are excluded from the experiment. It is predicted that studying pictures alongside words will make items more memorable which will reduce the number of falsely recognized critical lures relative to studying only words.

Method

Participants

A total of 84 participants took part in the study. All participants were undergraduate students enrolled in an introductory psychology course at Huron University College in Canada.

Design and Materials

The present study used lists of items adapted from Roediger and McDermott (1995), and Foley, Wozniak and Gillum (2006). The inclusion criteria for item lists was their ability to be depicted pictorially. Pictorial stimuli consisted of black-and-white illustrations developed by Duñabeitia et al. (2018) and supplemented with images from google images. The participants studied a total of 12 lists, each containing 8 semantic associates (see Appendix A). They were subsequently tested on a 96-item recognition test. The test consisted of 48 real targets - studied words, 36 control lures - new words that aren't semantically related to targets, and 12 critical lures - closest semantic associates of the targets. For both conditions, the order in which the test items were presented was randomly assigned. Participants completed the experiment on their personal computers facilitated through the run.pavlovia.org engine.

Procedure

Upon accessing the survey link, participants were presented with a letter of information. This letter briefly stated the purpose of the experiment and continuing onto the next slide implied participants' consent. All participants were randomly assigned to either the picture-word condition or the word-only condition. In the encoding phase, no data was collected. The same 96 study items were presented in a randomized order across both conditions. Participants in the word-only condition were presented with written words presented on the screen, while those in the picture-word condition were presented with both the written word and the black-and-white illustration representing it. Thus, the only difference was the presence or the absence of the pictures. Irrespective of the condition, new pictures and/or words appeared every three seconds.

Following the encoding phase, participants were presented with a filler task. They were instructed to rate 10 images of animals based on their cuteness. The images were randomly

selected from a larger database of 40 images. Ratings were made on a 5-point slider scale (1: Not at all cute, 5: Ridiculously cute). There was no time limit for this task and each image was projected on the screen until participants submitted a response.

After completing the filler task, participants were instructed they would be shown 96 words and will need to decide if the word was previously encountered in the study phase ('old') or if it was newly presented ('new'). If participants decided a word was old, they were instructed to press '1' on the keyboard, while if they decided it was a new word they were instructed to press '2' on the keyboard. For target words, the correct answer was '1', for control and critical lures it was '2'. If a participant pressed '1' when presented with a lure word it would be considered a false alarm (for the full list of correct answers, consult Appendix B). Randomized ordering of items ensured that the test was identical for all participants regardless of their condition.

Lastly, once the experiment was completed, participants were informed about their withdrawal rights and debriefed through a short description of the study.

Results

A random sample (N=50) was generated from the total sample (N=84) using random.org software. Twenty-five participants were selected from the word-only condition and 25 from the picture-word condition.

The mean of the observed critical lure false alarms for the word-only condition was 5.44 (SD = 2.38), and 5.72 (SD = 2.32) for the picture-word condition. An independent samples t-test found no significant difference in the number of critical lure false alarms among the two conditions [$t(48) = 0.42$, $p > .05$, one-tailed).

Discussion

Previous experiments have demonstrated that studying pictures alongside words reduces the effects of false recognition in the DRM paradigm. However, in previous experiments, pictures were accompanied by auditory labels of the items, hence, the participants would both see a picture and hear a designated word. The aim of the present study was to determine whether the observed reduction in false recognition still occurs if the auditory label is excluded from the experiment. The results indicate that pictorial encoding on its own does not decrease false recognition of semantic associates.

This contradicts previous studies (Israel & Schacter, 1997; Schacter et al., 2001) and particularly challenges the hypothesized distinctiveness heuristic account. However, the validity of the results found in this study can be questioned - allowing participants to complete the survey from their homes challenges the internal validity as there is no guarantee that survey instructions were sincerely followed. Furthermore, it is possible that participants were unmotivated to participate in this study. Participation was a course requirement for the Introductory Psychology course and there was no monetary compensation for it. Previous research suggests that participants who are unmotivated to perform well tend to engage in random responding which can significantly bias results toward the null hypothesis (Osborne & Blanchar, 2011). Random responding in this study would be pressing ‘1’ or ‘2’ on the keyboard without considering whether the word was old or new. While it is hard to distinguish the effects of this bias on the current study, future research should seek to include attention checks in the recognition test as a controlled variable. This could be established by including attention checks throughout the survey (e.g., “This is an attention check. Please press ‘1’ on your keyboard”) in which case participants who answer incorrectly would be excluded from the study.

According to Olszewska et al. (2015), the auditory presentation of lists of semantic associates results in reduced false recognition relative to visual presentation. It has also been argued that acoustic memory traces are intricate, more extensive, and persist longer than visual memory traces (Olszewska et al., 2015). Furthermore, compared to visual traces, these detailed auditory traces provide greater item distinctiveness, which results in reduced false recognition rates (Hunt, 2003 as cited in Olszewska et al., 2015). Given that both Israel & Schacter (1997) and Schacter et al. (2001) included auditory labels of items, the lack of observed reduction in false recognition in the current study can possibly be attributed to the exclusion of the auditory labels. It is highly recommended that future studies provide further insight into the role of auditory labels in reducing false recognition in the DRM paradigm.

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Appendix A: Word lists presented during encoding and the associated critical lure for each list

Critical lure	CHAIR	BUTTERFLY	FRUIT	SWEET	SHIRT	CAR	LION	RIVER	NEEDLE	FOOT	WHISTLE	CABBAGE
Item 1	couch	net	basket	candy	pants	truck	bear	run	eye	hand	tune	leaf
Item 2	cushion	worm	juice	tooth	tie	key	cage	tide	knitting	shoe	stop	sauerkraut
Item 3	desk	flower	cherry	sugar	button	jeep	hunt	bridge	point	yard	sing	soup
Item 4	bench	wing	orange	heart	pocket	van	tiger	fish	pin	toe	dog	vegetable
Item 5	wood	fly	apple	cake	shorts	highway	circus	water	thorn	boot	train	plant
Item 6	stool	bee	banana	honey	iron	race	jungle	lake	thread	mouth	wolf	head
Item 7	table	cocoon	pear	pie	belt	garage	feline	boat	thimble	inch	lips	garden
Item 8	legs	bird	salad	chocolate	vest	bus	den	swim	haystack	sock	boy	carrot

Appendix B: List of 96 words presented in the recognition memory test (randomized order)

{word: couch, type: target, correct answer: 1},
{word: desk, type: target, correct answer: 1},
{word: bench, type: target, correct answer: 1},
{word: table, type: target, correct answer: 1},
{word: flower, type: target, correct answer: 1},
{word: wing, type: target, correct answer: 1},
{word: bee, type: target, correct answer: 1},
{word: cocoon, type: target, correct answer: 1},
{word: cherry, type: target, correct answer: 1},
{word: orange, type: target, correct answer: 1},
{word: apple, type: target, correct answer: 1},
{word: banana, type: target, correct answer: 1},
{word: candy, type: target, correct answer: 1},
{word: sugar, type: target, correct answer: 1},
{word: cake, type: target, correct answer: 1},

{word: pie, type: target, correct answer: 1},
{word: shorts, type: target, correct answer: 1},
{word: tie, type: target, correct answer: 1},
{word: belt, type: target, correct answer: 1},
{word: vest, type: target, correct answer: 1},
{word: bus, type: target, correct answer: 1},
{word: truck, type: target, correct answer: 1},
{word: van, type: target, correct answer: 1},
{word: jeep, type: target, correct answer: 1},
{word: circus, type: target, correct answer: 1},
{word: tiger, type: target, correct answer: 1},
{word: den, type: target, correct answer: 1},
{word: cage, type: target, correct answer: 1},
{word: water, type: target, correct answer: 1},
{word: lake, type: target, correct answer: 1},
{word: boat, type: target, correct answer: 1},
{word: swim, type: target, correct answer: 1},
{word: pin, type: target, correct answer: 1},
{word: thimble, type: target, correct answer: 1},
{word: haystack, type: target, correct answer: 1},
{word: thread, type: target, correct answer: 1},
{word: shoe, type: target, correct answer: 1},
{word: sock, type: target, correct answer: 1},
{word: boot, type: target, correct answer: 1},
{word: inch, type: target, correct answer: 1},
{word: tune, type: target, correct answer: 1},
{word: sing, type: target, correct answer: 1},
{word: train, type: target, correct answer: 1},
{word: lips, type: target, correct answer: 1},
{word: garden, type: target, correct answer: 1},
{word: head, type: target, correct answer: 1},
{word: plant, type: target, correct answer: 1},
{word: leaf, type: target, correct answer: 1},
{word: ledge, type: control lure, correct answer: 2},
{word: house, type: control lure, correct answer: 2},
{word: breeze, type: control lure, correct answer: 2},
{word: shade, type: control lure, correct answer: 2},
{word: glass, type: control lure, correct answer: 2},
{word: frame, type: control lure, correct answer: 2},
{word: shutter, type: control lure, correct answer: 2},

{word: home, type: control lure, correct answer: 2},
{word: vines, type: control lure, correct answer: 2},
{word: ivy, type: control lure, correct answer: 2},
{word: cheese, type: control lure, correct answer: 2},
{word: woods, type: control lure, correct answer: 2},
{word: fence, type: control lure, correct answer: 2},
{word: art, type: control lure, correct answer: 2},
{word: horn, type: control lure, correct answer: 2},
{word: radio, type: control lure, correct answer: 2},
{word: piano, type: control lure, correct answer: 2},
{word: fluffy, type: control lure, correct answer: 2},
{word: cotton, type: control lure, correct answer: 2},
{word: hard, type: control lure, correct answer: 2},
{word: feather, type: control lure, correct answer: 2},
{word: kitten, type: control lure, correct answer: 2},
{word: touch, type: control lure, correct answer: 2},
{word: pillow, type: control lure, correct answer: 2},
{word: fur, type: control lure, correct answer: 2},
{word: patient, type: control lure, correct answer: 2},
{word: medicine, type: control lure, correct answer: 2},
{word: stethoscope, type: control lure, correct answer: 2},
{word: nurse, type: control lure, correct answer: 2},
{word: hospital, type: control lure, correct answer: 2},
{word: lawyer, type: control lure, correct answer: 2},
{word: ill, type: control lure, correct answer: 2},
{word: clinic, type: control lure, correct answer: 2},
{word: building, type: control lure, correct answer: 2},
{word: noon, type: control lure, correct answer: 2},
{word: dive, type: control lure, correct answer: 2},
{word: chair, type: critical lure, correct answer: 2},
{word: butterfly, type: critical lure, correct answer: 2},
{word: fruit, type: critical lure, correct answer: 2},
{word: sweet, type: critical lure, correct answer: 2},
{word: shirt, type: critical lure, correct answer: 2},
{word: car, type: critical lure, correct answer: 2},
{word: lion, type: critical lure, correct answer: 2},
{word: river, type: critical lure, correct answer: 2},
{word: needle, type: critical lure, correct answer: 2},
{word: foot, type: critical lure, correct answer: 2},
{word: whistle, type: critical lure, correct answer: 2},

{word: cabbage, type: critical lure, correct answer: 2}