INK OR IMAGINATION: What significantly impacts our memory?

Janpreet Kaur, Tod Kahvaei, Fatima Salih, Sarah Ali, Sheruni Palamandadige
Kwantlen Polytechnic University

INTRODUCTION

- Research suggested that blending textual information with labeled images improves memory retention compared to text alone.
- Research involving children aged 6 to 9 years and 11 months found that recall performance depends on the presentation format. An auditory-visual format significantly enhanced recall compared to an auditory-only format, as observed in an animated video recall task (Rooha et al., 2020).
- However, effectiveness of adding multiple modalities depends on type of recall (Henning & Ewerth, 2017). For example, research shows that visual aids in multimedia learning, such as concept maps, enhance short-term recall of detailed ideas; while bulleted text is more effective for long-term recall of main ideas (references).
- This suggests that the benefits of concept maps may be limited to short-term retention (Adesope & Nesbit, 2013; Blankenship & Dansereau, 2000; Nesbit & Adesope, 2011). The main purpose of our study was to learn more about effective learning methods and to develop deeper understanding of human memory retention.
- We hypothesized that participants presented with a visual format of information would be able to recall with higher recall accuracy compared to participants presented with text-based format of information.

METHODS

Participants

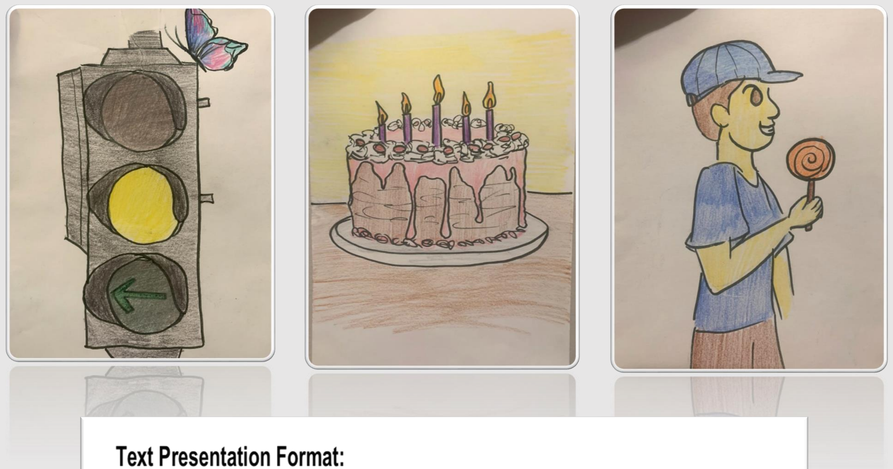
- Our sample (n=24) comprised 10 men (41.6%), 13 women (54.17%) and 1 non-binary participant (4.17%).
- The mean age of the sample was 22.3 years (*SD* = 7.19).
- Group A (text format, n=12) included 6 men (50%), 5 women (41.67%), and 1 non-binary participant (8.33%), aged 19-25.
- Group B (visual format; n=12) included 4 men (33.33%) and 8 women (66.67%), aged 18-50.
- **Materials**
- We used 5 flashcards featuring five different images and each image was paired with a corresponding text-based description, which were designed to closely match the informational content of the images, ensuring consistency between conditions. See Figure 1 for examples.
- The images used were,
    1. A traffic signal with a steady yellow light and a butterfly.
    2. A cake with 5 candles.
    3. A boy smiling wearing a blue hat and holding candy.
    4. A basket containing apples and bananas.
    5. A shovel stuck in dirt.
- Participants answered 15 multiple-choice questions immediately after viewing the flashcards. Each question had three response options and was crafted to test recall of specific details from the flashcards. These included facts such as objects in the image/text, colours, number of items, and actions depicted. The total number of correct answers served as the dependent variable for comparison between the visual and text-based groups.

METHODS

Procedure

- We used a between-group experimental design. Participants were assigned into one of two groups using random assignment by letting them pick a slip out of a hat consisting of 12 slips labelled A and 12 slips labeled B.
- Participants in Group B were shown a series of 5 flashcards each containing a different image, while participants in Group A were shown 5 corresponding text descriptions of the same scenes in the images.
- Participants had 30 seconds total (timed with a cellphone stopwatch) for reading and observing 5 flash cards and could decide how to distribute their time across the five cards.
- The participants were then asked a series of multiple-choice questions that were designed by the researchers to assess the amount of correct information or details that they could recall from the images or text that they were exposed to.

Figure 1: Example of Materials



Text Presentation Format:

Traffic Signal:

- A traffic signal is hanging at the corner of an intersection. It has three lights: red at the top, yellow in the middle, and green flashing arrow at the bottom. There is a butterfly sitting at the top right of the traffic signal.

RESULTS

- An independent samples t-test was conducted using SPSS to compare the number of correct answers between the visual and text-based groups on the recall task. Preliminary analyses demonstrated that assumption of homogeneity of variance was met.
- The 25 participants who received the drug intervention (M = 480, SD = 34.5) compared to the 28 participants in the control group (M = 425, SD = 31) demonstrated significantly better peak flow scores, t(51) = 2.1, p = .04.
- The results of the t-test indicated that there was no statistically significant difference between our groups using a .05 alpha level, $t(22) = 1.93$, $p = .066$, $r2 = .14$. However, the medium effect size indicates that there may be a meaningful difference between our groups and that our study did not have enough power to detect this difference.
- While the difference was not statistically, the direction of mean differences (i.e., the visual group showed a higher mean recall score) with p-value approaching significance, indicates a pattern consistent with the study hypothesis, thus warranting examination of this hypotheses with larger sample size."

DISCUSSION

- Our results suggested that those who viewed the visual materials tended to score higher on memory recall than those who viewed the written materials.
- While this finding did not reach statistical significance, the medium effect size suggests that this was because our study was underpowered.
- Our study aligned with earlier studies that claimed that visual format is more effective as compared to textual and audio format. (Adesope & Nesbit, 2013; Blankenship & Dansereau, 2000; Nesbit & Adesope, 2011).

Limitations:

Small sample size (low power): The sample. Size (n=24) limited statistical power that reduced the ability to detect important differences between groups.

Age (Confounding variable): Group B included participants up to age 50, however Group A did not, which leads to another potential confound because memory performance vary with age.

Individual Differences: Issues such as language barrier (English was not a first language for all the participants), limited time span of 30 seconds and personal preference towards the textual and visual formats also contributed towards insignificant results.

Distractions: Presence of researchers, other people and noise around the participants interrupted them from their assigned task.

Future Directions:

This study should be conducted again with large sample size and in the distractions free environment by mitigating the individual differences.

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