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The Effectiveness of Visual vs. Auditory Presentation of Information on Memory

Hannah L. Edwards¹

Purpose: This research project aimed to determine whether it was easier for individuals to memorize and recall words when being presented with a visual presentation than with an auditory presentation. **Method:** To gather data, an online survey was designed and conducted to test participants more sufficiently. This study consisted of individuals that were 18 years or older and who have good visual and auditory abilities. This study was conducted using two lists of 10 words that contained six letters, three syllables, and were nouns. Half of my participants were presented with 10 words visually whereas the other half of the participants were shown the 10 words auditorily. Specifically, half of the participants received List A either visually or auditorily while the other half received List B either visually or auditorily. Each participant only received one list of words during the trial, presented in different ways. After collecting the data, the difference between the two groups of subjects and the number of words correctly recalled were compared using an independent samples t-test. **Results:** The analysis then revealed which presentation, visual or auditory, was easier to memorize and recall. **Discussion:** Thus, I hypothesized that it would be more challenging to memorize and recall a list of words when presented auditorily than visually.

Keywords: easier, memorize, recall, presented, visually, auditorily, challenging

The purpose of this study is to better understand whether visual or auditory presentation of information has an effect on an individual's memory. Is it more challenging for an individual to memorize and verbally recall words that are spoken to them or shown visually to them?

Various empirical studies have been conducted to identify whether visual or auditory presentation is more challenging to memorize and verbally recall. Heikkilä et al. (2015) investigated the relationship between audiovisual encoding and recognition memory performance. They asked participants to memorize auditory or visual stimuli such as spoken and written words while trying to ignore stimuli presented in the other modality. Kroll et al. (1970)

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2022-2023 RESEARCH JOURNAL

on the other hand presented 10 undergraduate students with a single letter of the alphabet to remember while hearing letters being repeated in the background. The participants were asked to first memorize the letter in a 1-s interval when presented both visually and auditorily. This was then proceeded by being asked to memorize the letter in a 25-s interval when presented both visually and auditorily. Both studies have found that it was easier for individuals to verbally recall visual presentations when compared to auditory presentations (Heikkilä et al., 2015 & Kroll et al., 1970).

In another study, Gloede et al. (2017) investigated to see if recognition memory for sounds is indeed inferior to memory for pictures. They proceeded to a total of three experiments to evaluate the role of experience in visual and auditory memory. Participants were first asked to study both pictures and sounds and then take a recognition memory test. Participants were then asked to complete auditory training with each of the sounds that were presented to them and then take a second memory recall test. Gloede et al. (2017) found that even though the participants went through auditory training in each experiment visual memory was superior to auditory memory each time. Overall, this study found that auditory memory and visual memory are different memory systems and that the differences between auditory and visual recognition memory could be due to the different amounts of experience with auditory and visual information (Gloede et al., 2017).

Marian et al. (2021) investigated if environmental sounds vs. spoken words have anything to do with how well humans encode and later recall concurrently presented visual objects. Participants in this study were asked to view a series of drawings while listening to a word or sound that was congruent to that drawing in stages congruent, incongruent, and neutral.

2022-2023 RESEARCH JOURNAL

For example, Marian et al. (2021) presented participants with a drawing of a cat and then proceeded to play a recording that was congruent to that drawing. That is, while being presented with the drawing of a cat, the participants were presented with either a recording of the word “cat” or a recording of a cat meowing. This study found that it was easier for individuals to recall the visual objects when presented with the congruent environmental sound than spoken words. Overall, Marian et al. (2021) showed how cross-modal interaction between visual and auditory input impacts memory retrieval.

Contradictory findings were reported in an empirical study conducted to identify the modality on memory span for words (Drewnowski & Murdock 1980). The study provided evidence which showed that auditory presentation led not only to greater recall of words, but also greater recall of word order given. Drewnowski and Murdock (1980) discovered this evidence by conducting two experiments with 64 college students using both visual and auditory stimuli. They first tested the students using the up-and-down method where half of the participants either started with a larger number of words and slowly descend to a smaller number of words to memorize and recall, while the other half of the participants start with smaller number of words and slowly ascend to a larger number of words to memorize and recall. Drewnowski and Murdock (1980) then proceeded to test the students using constant stimuli where they present the lists in blocks of 30 or 40 at each list length. Drewnowski and Murdock (1980) showed that it was easier for the participants to memorize and recall words using the auditory presentation compared to the visual presentations.

Finally, Kurdi et al. (2017) investigated memory accuracy of word lists using both visual and auditory stimuli presented to their participants. Participants were asked to memorize either 1

2022-2023 RESEARCH JOURNAL

list of words or 10 lists of words either using a visual and auditory presentation or both auditory presentations. The visual and auditory presentation had participants read and listen to the assigned word lists at the same time. For both auditory presentations the participants were asked to listen to assigned lists of words both being played aloud and read to them. Based on those presentations Kurdi et al. (2017) revealed that regardless of the presentation method it was overall easier to recall more words with the 1-list condition with more accuracy than with the 10-list condition.

Many of these studies have found that visual and auditory presentation have an effect on memory, but in different ways. My study is similar as I chose to investigate what effects visual versus auditory presentation of information have on memory. I hypothesized that it is more challenging to memorize and verbally recall words that are spoken than it would be to memorize and verbally recall words that are shown visually. To determine which presentation is more challenging I chose to present each participant with two lists of 10 words once presented visually, and once presented auditorily.

Method

Participants

Research participants for this study consisted of individuals that were 18 years or older and who had good hearing and visual abilities. A total of 53 participants took my study; however, 7 of the participants did not fully complete the survey and 6 of the participants had either a visual or auditory impairment leaving 40 viable participants. Out of the 40 viable participants 31 were women and 9 were men with ages ranging from 18-64. Based off the 40 participants there were 8 freshmen, 3 sophomores, 3 juniors, 8 seniors, 17 not in school, and 1 other. For this study, I

2022-2023 RESEARCH JOURNAL

chose to recruit participants through the Lindenwood Participant Pool (LPP) and through two different social media platforms Snapchat and Facebook. The LPP provides an opportunity for students' social science courses to earn extra credit points and it also allows student researchers to recruit participants for their research studies. For this study, students were able to receive two credit points for their participation. This study was conducted as an online study using an online survey that was created using Qualtrics. This research study did meet ethical standards evaluated by the Lindenwood Institutional Review Board and the Psychology Program Scientific Review Committee.

Materials

For this research study, I originally was going to ask participants to memorize two lists of 10 words, List A and List B, (see Appendix) presented either visually or auditorily. Therefore, I prepared two-word lists that were presented visually and auditorily. The two lists both consisted of words that contained six letters, three syllables, and were nouns. I chose these control variables so that both lists are of equal difficulty. I chose to include words that did not have any relation to each other because if the words were to relate to each other it would be easier for the participants to remember when being asked to recite the words back. For the visual presentation the words were presented to the participants at a rate of 1 word per second for 10 s and for the auditory presentation, I proceeded to an audio recording of myself reading the list of words at a rate of 1 word per second for 10 s.

Procedure

For this research study, I recruited participants through the LPP and through two social media platforms Snapchat and Facebook. However, what I originally planned to have Qualtrics

2022-2023 RESEARCH JOURNAL

randomly give out either of the two lists of words either visually or auditorily. By doing so, I would have counterbalanced the order of the word lists as well as the modality of word presentation. Unfortunately, Qualtrics did not work how I originally set it up to and therefore, every participant only received either List A or List B words delivered either virtually or auditorily resulting in an independent-groups design. Therefore, in the end, I asked the participants to either visually or auditorily memorize one of the lists of words that would be randomly presented to them. Half of the participants received List A words and the other half received List B words. Half of those who received List A words received them visual whereas the other half received them auditorily to memorize. The other half that received List B words received them visual whereas the other half received them auditorily to memorize as well. After the participants memorized the list of words presented to them either visually or auditorily, they were asked to recall the words in the recall question. After the participants recalled as many of the words that they could, they were asked to answer three short demographic questions that pertained to their gender, age, year of school. I, overall, used Qualtrics to deliver the experiment as well as a small questionnaire to the participants.

In the trial participants were asked to memorize 10 words that were either shown visually for 10 s at a rate of one word per second or auditorily at a rate of 1 word per second for 10 s and then they were asked to recall as many of the words they heard by typing them out. Half of my participants were presented with 10 words visually whereas the other half of the participants were shown the 10 words auditorily. Specifically, half of the participants received List A either visually or auditorily while the other half received List B either visually or auditorily. Each participant only received one list of words during the trial, presented in different ways.

2022-2023 RESEARCH JOURNAL

I counted the total number of words participants recalled and compared the means between the two groups of subjects. After the data were obtained from the research study, I analyzed the data using IBM SPSS Statistics (Version 28) to conduct a one-tailed independent samples *t*-test.

Results

For this study, I hypothesized that it would be more challenging for participants to memorize and recall words that are auditorily presented than it would be when being visually presented. I conducted a one-tailed independent samples *t*-test to analyze the data. After conducting the study on 40 participants, the results showed that those given the visual stimuli did not recall more words ($M = 6.86, SD = 2.61$) than those who were given the auditory stimuli ($M = 8.21, SD = 2.37$), $t(40) = -1.709, p = .048, d = .602$. The results show that there is a statistically significant difference between the two groups of subjects and the number of words correctly recalled, but in the wrong direction. That is, the results revealed that it was more challenging for participants to memorize and recall words that were presented visually than auditorily. Thus, my hypothesis was not supported.

Discussion

This study revealed that auditory presentation of information was not more challenging to memorize and recall. Thus, resulting in my hypothesis not being supported. This study does not correlate with many of the past studies findings, such as Heikkilä et al., 2015 & Kroll et al., 1970, because my study did not reveal that it was more challenging to memorize and recall a list of words auditorily than visually, which could have been due to the study being changed to an independent measures design. Since I had to change the design of the study it could have resulted

2022-2023 RESEARCH JOURNAL

in a better recall when presented auditorily than visually. Whereas a repeated measures design would have given each participant both stimuli.

My study was also different from other past studies because all previous studies conducted their studies as an in-person study. I changed the study into an online study from an in-person study because I wanted to have a greater number of participants. Changing my study from an in-person study to an online study could have affected the results because I cannot be sure that the participants are completing the study or simply just completing it correctly. The results could have also been affected because having a survey completed online can come with its complications, for example, Qualtrics not working correctly for the participants.

While conducting this study there were some limitations that arose. The biggest limitation that occurred was that Qualtrics did not display the study correctly to the participants. To overcome the limitation in the future, I recommend having a pilot test or a practice trial to ensure that the study operates correctly. To ensure that the survey works correctly, I would have individuals that I know take part in the survey and report back if there were any issues that may have arisen while taking it. My study may have been too easy for the participants to memorize considering 10 of the auditory participants recalled all 10 words perfectly while 5 of the visual participants recalled all 10 words perfectly. I would also recommend making the list of words longer and using longer words to ensure that the lists are not as easy to memorize no matter how it is presented to the participants. For future research, I recommend conducting this study as a repeated measures design instead of an independent measures design to ensure each participant receives both forms of modality instead of having one half of the participants receiving one modality and the other half of participants receiving the other modality.

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2022-2023 RESEARCH JOURNAL

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