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PSYC303 Final Manuscript
I affirm that I have adhered to the Honor Code in this assignment.

Research Motivation

Sivashankar et al. (2022) studied whether the performed action should be semantically related to the target materials to manifest enactment effect and whether the action needs to be performed by the participants instead of observing others perform them to aid memory. They found that memory is best for participants who perform semantically related actions themselves. The researchers reasoned that participants who observed an experimenter perform the actions were not fully focused on the videos, and it resulted in worse recall performance than those who performed themselves. Therefore, we aimed to investigate whether a verbal task that takes up mental resources is an important component of showing the enactment effect. Specifically, participants would enact/read the verb-noun actions and verbally describe (or not) the verb-noun actions. Research has suggested that verbalization could lead to the phenomenon called verbal overshadowing, which means verbal description of visual stimuli could impair subsequent recall performance (Schooler & Engstler-Schooler, 1990). Therefore, we hypothesize that participants' recall performance would be best when they only enact the items but do not verbally describe them, and recall performance would be the worst when participants read and verbally describe the target items.

Method

Participants

A total of 25 participants took part in our study. Participants were either from an

introductory psychology course, in which case they received partial credit, or volunteers. All participants attended Oberlin College and were college-aged. An a priori power analysis was conducted using G*Power 3.1 software (Faul, Erdfelder, Buchner, & Lang, 2009). Based on an anticipated effect size of .25, an alpha level of .05, and a desired power of .90, we determined that a sample size of 30 would be needed to detect significant effects in a two-way repeated measures ANOVA. However, we were unable to recruit as many as 30 participants due to limited reward to the participants.

Design

We employed a 2 (Encoding Task; Read-only and Enact) ×2 (Mental Resource; Verbal Shadowing and No Verbal Shadowing) within-participants design. In the Read-only condition, participants read the target phrase to themselves silently. In the Enact condition, participants stand up and act out the target phrase. For example, participants may have stood up and performed the action of cleaning a window. In the Verbal Shadowing condition, participants describe out loud how they would perform the target phrase within 7.5 seconds. For example, participants may describe the steps they take to clean a window. This could include spraying a rag, locating dust, and scrubbing, however, the steps described may vary by participant.

After the participants completed all items presented, they went through a distractor task to remove any recency effects. Memory was measured through a recognition test. Participants were given a list of 64 items. 32 items were from the study list, and 32 items were distractor items.

Materials and Apparatus

We asked ChatGPT to generate 60 verb-noun pairs. An example of what ChatGPT provided

was “Throw a baseball”(ChatGPT, 2024). We eliminated pairs that were unrealistic or hard to enact, such as “Grow a unicorn” and “Bake some muffins.” We kept ordinary verb-noun pairs and made sure that each item we kept contained a unique verb and unique noun. 32 verb-noun pairs were included in the study, and 32 distractors were used in the recognition test. For example, the actual pair was “drive a car” in the experiment, and the distractor item for this pair was “drive a truck” in the recognition test presented to the participants. These distractors contained the same verb as their target item counterpart but a different noun.

Verb-noun pairs were presented one pair at a time on a PowerPoint slide. The pairs were centered on the slide and written in black using 52pt. Arial font. The list of items was randomly ordered once, and the order was held constant for all participants. To control for specific-item effects, every verb-noun occurred equally often in every condition across participants, requiring the construction of four study lists. One half of the lists began with a block of the Enact tasks followed by a block of the Read tasks, and one half of the lists began with a block of the Read tasks followed by a block of the Enact tasks. Mental Resource tasks were presented in blocks of four and in a Latin-square design to control for order effects. One half of the lists began with a block of the Verbal Overshadowing (VO) tasks followed by a block of the No Verbal Overshadowing (NV), and one half of the lists began with a block of the NV tasks followed by a block of the VO tasks.

For the recognition test, participants were asked to circle all verb-noun pairs that they remember from a list presented to them on a single piece of paper. All of the words in the list appeared in alphabetical order based on the noun of the pair. However, distractor items that were

three or fewer items away from their original item were moved to the end of the list. For example, the nouns of play chess and play checkers both start with a C and appear within three items of each other. To prevent the participant from comparing these two items, the distractor was moved.

Procedure

Participants were run in groups of 2-8 with other participants of the same counterbalancing group. Exactly 8 participants were used for each counterbalancing group. The groups were A1, A2, B1, B2. All of the participants were run within a 7-day period. The experiment was conducted in a standard classroom in Severance Hall at Oberlin College. Participants' consent to participate was obtained when they came into the classroom. Participants received instructions as an overview of the tasks and example items for each condition. Participants also received specific instructions prior to each condition. All the instructions were presented to the participants through a PowerPoint slide shown on a projection screen. All participants were presented with the same list of 32 verb-noun pairs. The word pairs were divided into four lists of eight items that correspond to the four conditions described in the earlier section. Each item was presented for 7.5 seconds on the screen. The items were automatically advanced, and conditions were separated by an instructional slide. This slide reminded participants of whether they should or should not be verbally overshadowing or enacting. To provide the instructions simply, the text said whether or not to be audible or move around.

After the encoding phase, participants were asked to complete a visual distractor task, which lasted for around 12 minutes. Then, participants received the recognition test sheet and were given another 5 minutes to complete. Following the test, participants were provided a verbal

debrief of the experiment by one of the experimenters.

Results

A two-way repeated measure ANOVA was run to examine the effects of Encoding Task and Mental Resource on the ability to recognize the verb-noun pairs. Results indicated that there was a main effect of Encoding Task on recognition, indicating that significantly more items were recognized in the Enact condition than in the Read condition, F (1, 24) = 14.42, $p < 0.001$, MSe = 1.22, η^2_p = .38. A main effect of Mental Resource on recognition was found, indicating that significantly more items were recognized in the VO condition than in the NV condition, F (1, 24) = 26.38, $p < 0.001$, MSe = .87, η^2_p = .52. An interaction between Encoding Task and Mental Resource was found, which means Mental Resource only matters if participants Read the items, F (1, 24) = 18.46, $p < 0.001$, MSe = 1.25, η^2_p = .44 (See Table 1 for descriptive statistics and Figure 1 for a graph of the interaction).

Post hoc pairwise comparisons showed that in the Read condition, significantly more items were recognized if participants performed the VO task (M = 7.64, SD = .64) than the NV task (M = 5.72, SD = 1.93), $p < 0.001$; in the NV condition, significantly more items were recognized if participants Enact (M = 7.52, SD = .71) than Read (M = 5.72, SD = 1.93).

Discussion

Previous studies have suggested that acting out a word instead of simply reading it could enhance the memory of the word. In this current study, we examined whether verbal overshadowing would negatively influence the enactment effect. Prior studies have shown that verbal descriptions of visual stimuli would impair the memory of the stimuli in later recall. There

are three main findings in our study. First, memory was better when participants enacted the verb-noun pairs relative to reading them silently. This result is consistent with findings in previous studies and our predictions, suggesting that the enactment effect is ubiquitous and strong.

Our second significant result indicated that participants recognized more items across the conditions when they verbally described the actions than when they did not. This finding was contrary to our hypothesis of this Mental Resource variable that verbally describing the verb-noun pairs presented as visual stimuli would hurt the memory of the items in later recall. Our results suggested that verbal descriptions of visual stimuli would not impair memory. This contradiction might be due to the difference in the stimuli in Schooler & Engstler-Schooler (1990) and the current study. The stimuli used in Schooler & Engsler-Schooler (1990) were either a videotape with a salient individual, color cards, or black and white photos. All of these stimuli were almost completely visual with no verbal or auditory features. In our study, however, the stimuli we used were phrases and they were linguistic stimuli. Although presented visually to the participants, linguistic stimuli have verbal and auditory features. Therefore, the encoding process of a set of entirely visual stimuli and visual stimuli with auditory features would be different. This difference suggests that verbally describing the visual stimuli used in our study might not interfere with the original visual memory, which might be a possible explanation for our results.

Third, the interaction between the Encoding Task and Mental Resource showed that Verbal Overshadowing only matters in the Read condition. Specifically, memory was better

when participants both Read and Verbal Overshadowing than when they Read and No Verbal Overshadowing. In the Enact condition, the memory remained at the same level as in the VO and NV conditions, indicating that the interference of verbal overshadowing on the memory of the items was not as strong as the enactment effect. It was surprising that more items were recognized in the Read + VO condition than in all three other conditions, which contradicts our prediction that reading and verbal overshadowing the verb-noun pairs together would have a greater negative impact on memory. This is probably because when instructed to read and verbally describe the verb-noun pairs, the participants automatically started to imagine themselves performing the actions in their minds. Imagination might have been involved in this condition probably because a visual representation was required when participants were asked to verbalize the actions. Prior research found that simply imagining oneself performing the action could enhance memory (Engelkamp, 1995). Therefore, imagination in the Read + VO might lead to a better memory in the recognition test.

One limitation of our study was the possible ceiling effect in the results. Except for the Read + NV condition, the mean items recognized for the other three conditions were around 7.5, which means that participants were able to recognize most of the target items without choosing the distractor items. This might be due to the recall test used in our study. Although we had a distractor task that lasted roughly 12 minutes between the study phase and the recognition test, the recognition test might have been too easy for the participant. This ceiling effect made it difficult to interpret the results and might cover the greater effect of the variables.

Conclusion

Taken together, the current study found that performing the action could enhance memory relative to simply reading it. Verbal overshadowing did not have an expected negative impact on memory, possibly due to the nature of linguistic stimuli. Future research should take imaging oneself performing the action into account with the existing two variables and employ another recall test to avoid the ceiling effect.

References

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Tables and Figures

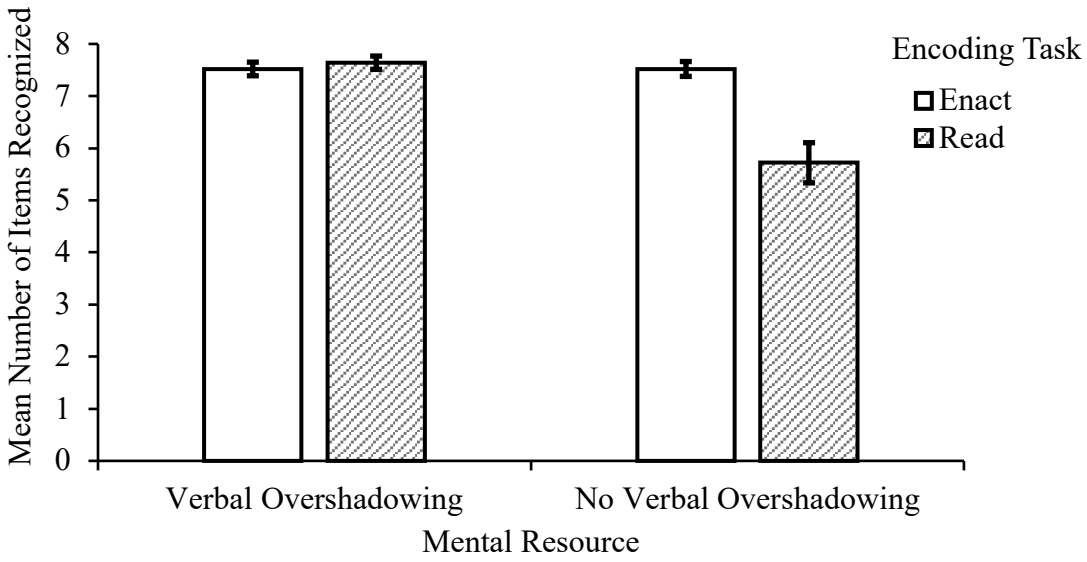
Table 1

Descriptive statistics for each condition.

Condition	*N*	*M*	*Std. Error*	*SD*
Enact + VO	25	7.52	.13	.65
Enact + NV	25	7.52	.14	.71
Read + VO	25	7.64	.13	.64
Read + NV	25	5.72	.39	1.93

Figure 1

Bar chart for the Mental Resource by Encoding Task interaction.



Note. The error bars represent the std. error.