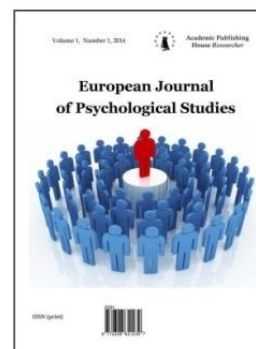


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UDC 159

### **Human Learning and Memory: The Role of Presentation and Processing Modalities**

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**Abstract.** This experiment observed the influence of channel of presentation and type of processing on the recall of meaningful words. This study used a 2 by 2 factorial design to randomly assigned 60 psychology students each into 4 groups; Visual Shadowed, Visual Non-shadowed, Auditory Shadowed and Auditory Non-shadowed groups. Participants in each specific group were presented with a list of 15 meaningful words depending on their specified treatment with an inter stimulus period of 1 second and further asked to recall after 30 seconds. Recall results indicated that there was no significant difference between auditory and visual channels of presentation in the learning and memory of meaningful words. However, participants whose processing was shadowed performed better than the non-shadowed group during recall. In addition, the experiment noted a significant level of interaction effect between the channel of presentation and the type of processing on the learning and memory of meaningful words among participants. This study has implication for both research and theoretical implications.

**Keywords:** Auditory Presentation; Visual Presentation; Shadowed Processing; Non-shadowed Processing; Memory; Recall; Learning.

#### **Introduction**

Our world today is filled with issues concerning the role learning and memory play in our everyday living. Following from pioneering works by William James and his colleagues in the 1850s, mental processes especially attention and memory has gained the interest in areas across business, medicine, psychology, education and many experimental brain studies [1]. Key to these issues concerning learning and memory has been the controversies concerning the best presentation and processing approaches. As a result, several theories and models have been propounded and tested across board over decades now.

An example of these theories is the Attenuation Model or the 'Leaky' Filter Model by Treisman. This theory suggests that selective attention necessitates stimuli to be filtered so that attention is directed much towards the attended message while the unattended message, although processed, it is done less thoroughly. This shows that there is likelihood for both shadowed and non-shadowed messages to be processed cognitively. Nonetheless, meaningful messages are much likely to be processed [2].

To enhance the chances of selective attention at any specified moment, our sensory system offers us the privilege of what to select and attend in relations to our individual disposition [3]. Even so, much controversy stand between visual and auditory presentations in association to how fast and accurate memory might be formed. According to the Dual-Coding Theory by Alan Paivio, both visual and verbal information are processed differently along discrete channels with the human mind creating separate depictions for information processed in each channel. Although both channels do not compete with each other, auditory information according to this theory is superior to visual information when sequential order is required for memory task [4].

In a recent study, visual presentation modality (with or without auditory information) is noted to increase learning rates than auditory channel alone. This result supported the fact that processing of verbal information works at slower rate among children even with learning disabilities than normal children while the superiority of the visual presentation against verbal presentation was noted on recall [5]. The aim of this experiment is to determine the role of presentation and processing modalities on learning and memory performance among participants.

**Materials and Methods**

Two hundred and forty psychology undergraduate students who offered consent after all ethical conditions required for human researches were maintained and assured throughout the experiment.

Using a 2 by 2 factorial design, participants were randomly assigned into one of the four designated groups (visual shadowing, visual non-shadowing, auditory shadowing and auditory non-shadowing). Visual channel was ensured by offering participants screen projections of meaningful words from a computer to look at while the auditory channel was ensured by playing sounds of words through headphones. Shadowing of sensory data was done by allowing participants to repeat words after presentation while the non-shadowing participants were not allowed to repeat these words.

In all, each condition were presented with 15 meaningful words in a single trial with an inter stimulus period of 1 second. The recall assessment was done after 30 seconds with each correct response getting a point.

**Results**

**Table 1: Descriptive Means and Standard Deviations of Participants**

| Channel of Presentation | Type of Processing | Mean | Std. Deviation | N   |
|-------------------------|--------------------|------|----------------|-----|
| Visual                  | Shadowing          | 6.82 | 1.55           | 60  |
|                         | Non-Shadowing      | 4.92 | 1.25           | 60  |
|                         | Total              | 5.87 | 1.70           | 120 |
| Auditory                | Shadowing          | 5.77 | 1.21           | 60  |
|                         | Non-Shadowing      | 5.42 | 1.33           | 60  |
|                         | Total              | 5.59 | 1.28           | 120 |
| Total                   | Shadowing          | 6.29 | 1.48           | 120 |
|                         | Non-Shadowing      | 5.17 | 1.31           | 120 |
|                         | Total              | 5.73 | 1.51           | 240 |

**Table 2: Summary of Two Way Analysis of Variance of Variables**

| Source of Variation | Sum of Squares | df  | Mean Square | F-Ratio | p-value | Partial Eta Squared |
|---------------------|----------------|-----|-------------|---------|---------|---------------------|
| Channel             | 4.538          | 1   | 4.538       | 2.520   | .114    | .011                |
| Type                | 75.938         | 1   | 75.938      | 42.179  | .000    | .152                |
| Channel * Type      | 36.038         | 1   | 36.038      | 20.017  | .000    | .078                |
| Error               | 424.883        | 236 | 1.800       |         |         |                     |
| Total               | 541.396        | 239 |             |         |         |                     |

*R Squared = .215 (Adjusted R Squared = .205)*

The results showed that the visual channel groups had a mean score of 5.87 while the auditory channel groups had a mean score of 5.59. Consequently, there was no significant difference between the two channels of presentation [ $F_{(1/236)} = 2.52$ ,  $p = .114$ , and a partial eta squared of .01].

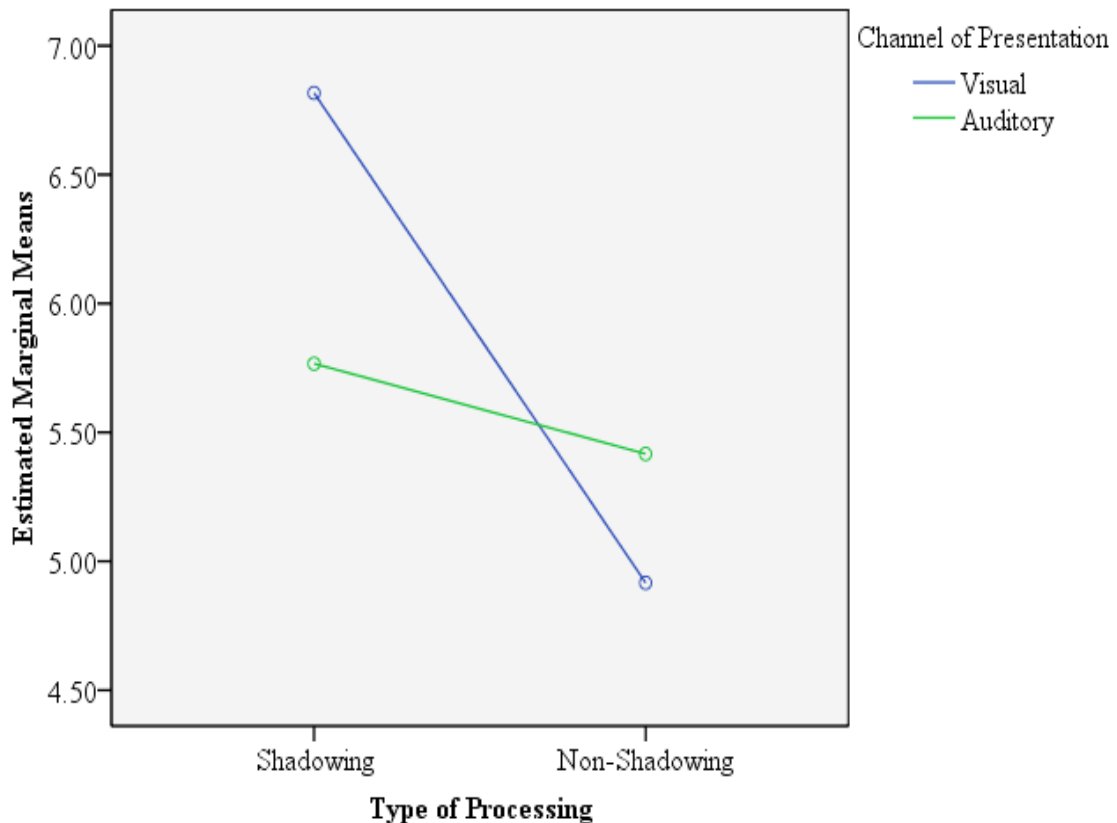
On the contrary, participants who were offered shadowing processing had a mean score of 6.29 while participants in the non-shadowing groups had a mean score of 5.17. Consequently, a significant difference existed among the two channels of presentation [ $F_{(1/236)} = 42.18$ ,  $p = .000$  and a partial eta squared of .15].

Notably, a significant interaction effect existed between the channel of presentation and the type of processing on the recall of meaningful words [ $F_{(1/236)} = 36.04$ ,  $p = .000$  and a partial eta squared of .08]. Finally, the model examined in this study could only explain about 20.5% of the change accounted for by two predictors on the learning and memory of meaningful words.

### **Discussion**

Noting from the experiment, the channel of presentation whether visual or auditory could not significantly affect the recall of meaningful words. Some consistent studies support this finding by observing that the learning-style preference and not the presentation affected learning or memory performance [1]. Contrary to this finding, other studies suggest that visual modality had a significant influence on recall [5-6] while some others observed auditory information as higher than visual information on recall although the two do not compete with each other [4].

In addition, it was noted that the modality of shadowing of meaningful words increases the chances of having an effective learning and better memory during recall than non-shadowing processing. This considerable distinction confirms the study referenced in [7] who observed that the recall performance by shadowing as better than non-shadowing processing. Notwithstanding to the assertion of a possibility of participants having previous knowledge or familiarity of words [8], shadowing of meaningful words demonstrated in this experiment to be a better option in the learning and memory. As recognised in some older studies, shadowed words are maintained in memory and are therefore recalled more easily than non-shadowed ones [9].

**Estimated Marginal Means of Total number of words recall**

### Limitations

The experiment did not use a more standardised word test although selected words have been piloted among similar populations and found to be valid and reliable. Notwithstanding this, the study makes substantial contribution to research and practice.

### Recommendations

Considerably, the study confirms a significant interaction effect between the channel of presentation and the type of processing on the recall of meaningful words. Hence, future studies should focus more on the distinct relationships among the modalities of presentation and processing. This can be enhanced by replicating similar studies in applied fields like marketing and education with participants with diverse backgrounds.

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