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Notetaking and Recall of Auditory and Visual Information: A Pilot Study

Meagen Jensen and Keith Lowell

ABSTRACT *Does notetaking affect performance on recall tests? Past research has generally found that notetaking improves performance, but all of these studies have focused on recall of auditory information. The current study was intended as a pilot study to examine the effect of notetaking method on both immediate and delayed recall, as well as both audio and visual recall. Eighteen undergraduate psychology students in the same psychology class at a major, private university watched a 5-minute video clip and then immediately completed a 29-question test. When tested 48 hours later, participants completed a similar 29-question test. Though no significant statistical results were found, notetakers performed consistently better than non-notetakers on both audio and visual recall. A larger sample size, yielding greater statistical power, and statistical test evaluation would improve the current study. A better understanding of how notetaking improves memory could assist the student in retaining information. The researchers recommend further study on the subject to see if the effects of notetaking on visual recall carry over to a larger sample size, or if the trends were a result of insufficient sampling.*

Notetaking and its effect on memory has been a topic of research for decades, probably because of its wide application and various uses (e.g., Einstein, Morris, & Smith, 1985; Ash & Carlton, 1953). Notetaking permeates many facets of people's lives, ranging from studying for a test to preparing a presentation (Piolat, Olive, & Kellogg, 2005). Because of the wide application of notetaking, there is value in knowing which methods are the most beneficial for memory (Larson, 2009). Piolat, Olive, and Kellogg (2005) state that different notetaking methods are appropriate in different situations. This is logical because different situations require a different focus. For instance, notetaking can be used for reading comprehension, for auditory memory in lectures, or for long-term information storage (Piolat et al., 2005). To assist in notetaking, individuals use various techniques and tools, including mnemonic devices, underlining

or highlighting textbooks, and covert rehearsal (Aiken, Thomas, & Shennum, 1975).

Although there are various types of notetaking, the current study focused on the effects of free-form, hand-written notes on memory. Many studies report on the relationship between notetaking and test performance in recall of audio material, such as lectures or word recitation (e.g., Di Vesta & Gray, 1972; Fisher & Harris, 1973). Di Vesta and Gray (1972) conducted a study of notetaking and recall of word lists read by the experimenter. Their results showed a slight relationship between notetaking and recall. Fisher and Harris (1973) found that students who took notes during a lecture and later review sessions had greater information recall than other groups and therefore performed better on immediate and delayed tests. Weiland and Kingsbury (2001) found that students who took notes while listening to a guest lecturer had better immediate and delayed recall. A meta-analysis of 57 studies found a positive, albeit modest, effect of notetaking on memory (Kobayashi, 2005). These studies and others confirm that notetaking increases recall of auditory information.

However, the authors found few studies which addressed the effects of notetaking on recall of visual material such as color, shape, or layout of objects in a video presentation. One study, conducted almost six decades ago, examined the value of notetaking while watching films (Ash & Carlton, 1953). The non-notetaking group performed the highest on recall tests. The study did not report whether the participants were tested on recall of visual information or auditory information. Additionally, these results may currently be unreliable due to subsequent advances in technology and time. Ash and Carlton's study was conducted in the '50s; their conclusions are likely applicable to people with similarly limited technological background. Their modern counterparts are familiar with the current constant barrage of visual media. One more accustomed to a visual presentation of information may

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process the information faster and better. More recently, Knight and McKelvie (1986) conducted an experiment that measured test performance among college students after viewing a videotaped lecture. They found that those who took notes performed better on delayed recall test performance than those who took no notes. Again, no distinction was made between recall of visual information and audio information. Therefore, these studies do not sufficiently indicate whether notetaking enhances visual recall. No other research could be found that lends to the discussion of notetaking and recall of visually presented information.

Despite its limited study, this subject is very timely. Our society is overloaded with information. New information is presented in varying formats, including both auditory and visual formats. Because of a lack of previous research, it is unknown whether notetaking improves recall on information presented visually. The process of notetaking requires individuals to select, interpret, and comprehend material, to pay attention to stimuli while engaging in a motor task, and to ignore distractions. Yet, in the case of visual recall, notetaking itself could present a distraction, because a notetaker must look away from the visual material to write notes. Hence, the current study, intended as a pilot study, hypothesized that notetaking would yield lower test results on recall of visual information, but that notetaking would yield better test results on recall of auditory information, as assessed by custom-made memory tests.

Method

Participants

The sample consisted of 18 psychology undergraduate students attending the same major, western private university and enrolled in the same psychology class. Participants were primarily in their junior year of school. Age ranged from 18 to 25 years old ($M = 21.2$, $SD = 1.86$). Participants were randomly assigned to one of two groups, notetaking or non-notetaking. All participants were right-handed except for two non-notetakers. All participants spoke English as their first language. Three notetakers usually typed their notes when taking notes in school; all other participants usually wrote their notes by hand. Table 1 describes further demographic information indicating no significant differences. Three students failed to specify whether they were in the experimental or control group; these students were excluded from the demographic analysis. It was assumed that all participants were in good health and were not suffering from any disorder that would significantly affect performance in the experiment.

Materials

Students completed two recall tests. Both tests were custom made. There were 58 questions with similar subject matter being divided between test forms. (The tests originally included 30 questions each, but one question per test form was later eliminated from analysis because the questions were not an accurate representation of material.) Test Form A, the immediate recall test,

Table 1: Demographic Information by Group

Group	n	Age ^a		Last night's sleep ^b		Stress level ^c	
		M	SD	M	SD	M	SD
Notes	7	21	2.2	5.9	2.2	3.6	1.9
No Notes	8	21.1	1.6	5.2	2.8	6.9	2.6
		$t = -1.33, p = 0.21$		$t = -0.30, p = 0.77$		$t = -1.39, p = 0.19$	

^a measured in years

^b measured in hours

^c measured by participants from 1-10, with 10 indicating completely at ease

Table 1. Demographic information divided by group, and statistical effect on results. *M* indicates the mean for each data point. *SD* indicates the standard deviation from the mean.

contained 19 visual questions and 10 audio questions. Test Form B, the 48-hour delayed recall test, contained 14 visual questions and 15 audio questions. An audio question asked about the content of words spoken by a narrator. A visual question asked about specific details of the presentation, such as color, number, or arrangement of items.

Procedure

Participants were recruited through concurrent enrollment in a psychology class. All participants sat at school desks in a classroom. Students were told about the study and signed an informed consent form. After agreeing to participation in the study, every other student was assigned to take notes on paper; the remaining students took no notes. Seating assignment was randomized so that distance from the screen would not affect test performance.

All participants were simultaneously shown the same five-minute movie clip about Egyptian history (National Geographic, 1998). Participants were told in advance about the immediate recall test but were not told about the delayed recall test. Eighteen participants completed a custom 29-item immediate recall questionnaire, which was then collected. Participants immediately completed a demographic questionnaire. Forty-eight hours later, 14 of the original 18 students completed a similar 29-item delayed recall questionnaire.

Statistical Design

This was a between-subjects two-group design assessing a directional hypothesis that notetakers would perform better than non-notetakers. Data were analyzed with two tailed t-tests in PASW Statistics (Version 18) on a Dell Windows Vista Home Basic system. The independent variable was notetaking method (notes or no notes). The dependent variable was the number of correct answers on a measure of content retention of information observed or heard in viewing or listening to the film clip. The same software was also used to analyze demographic data for significant impact on performance.

Results

Results are shown in Figures 1– 3. Notetakers scored higher than non-notetakers on every measure. However, statistics did not find significant differences between any of the groups. Nevertheless, overall immediate recall results approached significance ($t = 2.02, p = .06$) as did immediate audio recall results ($t = 2.01, p = .06$).

Figure 1: Effect of Note-Taking on Recall

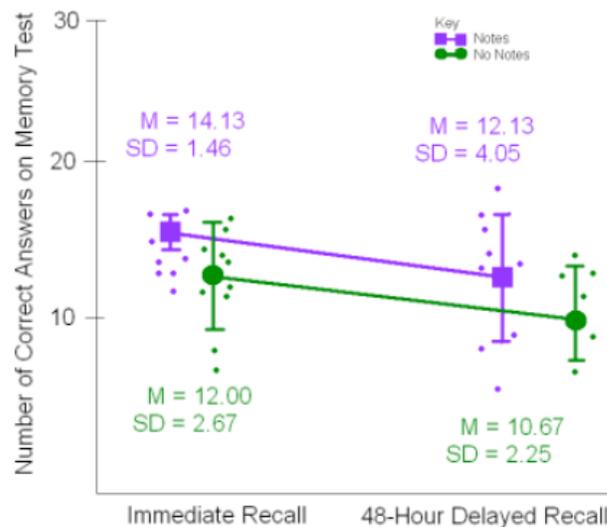


Figure 1. Effect of notetaking method on number of correct answers on the overall immediate and delayed memory tests. Notetakers performed better than non-notetakers. No significant differences were found. For immediate recall, $t = 2.02, p = .06$. For delayed recall, $t = 0.79, p = .45$. M indicates the mean for each data point. SD indicates the standard deviation from the mean. Error bars indicate standard error of the mean. Dots indicate individual scores on the test. Immediate and delayed recall divisions are explained within the text.

Figure 2: Effect of Note-Taking on Audio Recall

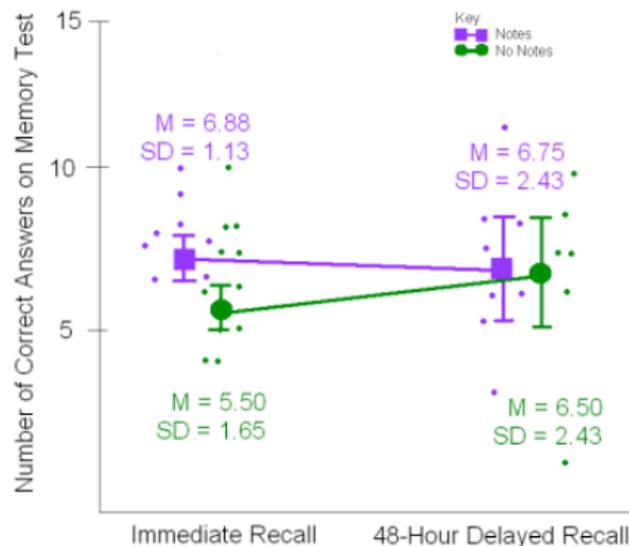


Figure 2. Effect of notetaking method on number of correct answers on the auditory items of the immediate and delayed memory tests. Notetakers performed better than non-notetakers. No significant differences were found. For immediate audio recall, $t = 2.01, p = .06$. For delayed audio recall, $t = 0.19, p = .85$. Legend is explained in Figure 1.

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Figure 3: Effect of Note-Taking on Visual Recall

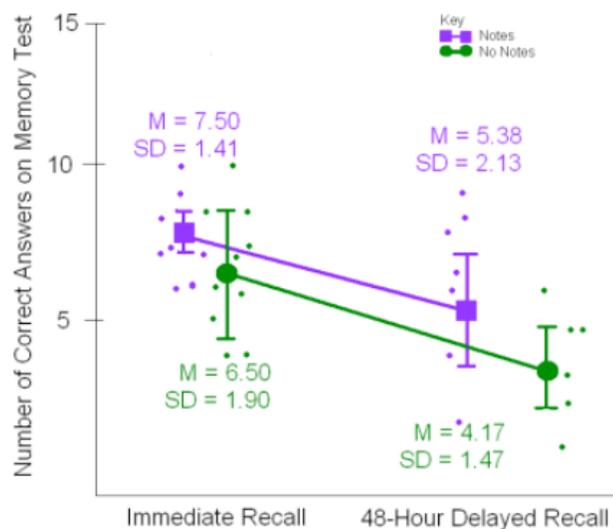


Figure 3. Effect of notetaking method on number of correct answers on the visual items of the immediate and delayed memory tests. Notetakers performed better than non-notetakers. No significant differences were found. For immediate audio recall, $t = 1.24, p = .23$. For delayed audio recall, $t = 1.19, p = .26$. Legend is explained in Figure 1.

Discussion

Though results showed no statistically significant differences in test performance, several findings approached significance. Overall, notetakers scored higher than non-notetakers on both immediate and 48-hour delayed recall tests. Notetakers also scored consistently higher on both audio and visual questions. These results were unexpected, because notetaking inherently requires the notetaker to look away from the visual presentation on which participants are later tested. Notetakers were predicted to score higher on audio recall, and non-notetakers were predicted to score higher on visual recall. However, despite the visual disadvantage, notetakers scored higher than non-notetakers on visual recall. This finding could mean that notetaking somehow enhances the brain's retention of information.

Additionally, as seen in Figures 1–3, the notetaking group averaged smaller standard deviations than the non-notetaking group. In other words, notetakers had more identical within-group scores across time, whereas the non-notetaking group had greater variance in scores over time. The lower variance in scores indicates that notetaking has a *consistent* effect on performance, indicating a possible trend.

Several factors could potentially have affected the

participants' performance on the recall tests, creating limitations within the study. The current study did not control for notetaking quality in either group. Quality of notes has been shown to affect recall (Peverly et al., 2007). Variables such as transcription fluency, fine motor skills, reading comprehension ability, verbal working memory, executive attention, accuracy of notes, previous knowledge of the subject, and focus on text note quality can all affect the quality of notes (Peverly, et al., 2007; Sumowski, 2008; Williams & Eggert, 2002). Previous memory ability could also significantly affect performance on a memory test. Gobet (2000) reviewed a theory that long-term memory schemas and retrieval structures may enhance memory. However, based on the homogeneity of the participants' education level and other demographics, this study assumed similar memory abilities and notetaking quality between participants.

Another possible confounding factor is participant stress level, which has been shown to have an impact on memory (Tollenaar, Elzinga, Spinhoven, & Everaerd, 2008). In their study, Tollenaar et al. (2008) found that those exposed to stress performed poorer in both immediate and delayed recall than those who were not exposed to stress. In the current study, the notetaking group reported higher stress than the non-notetaking group, but the difference was statistically insignificant, as noted in the methods section. It is unknown whether this difference in stress level was due to testing or to larger life factors for which this study did not control.

This study could also have benefited from a different scoring procedure. In this study, demographic information was not connected to individual scores, and individual immediate/delayed scores were not connected. This means that within-subjects scores could not be analyzed. A within-subjects analysis would have more accurately shown the effects of variables on participants. Also, control participants and experimental participants were tested together. Participants could possibly have cheated. It was assumed that students adhered to their university's academic honesty code. A further test weakness is that the tests were not psychometrically tested for either reliability or validity. Rather, both tests were constructed by the authors to adequately reflect content of the video. A validated measure of visual recall would have been more beneficial to the study, but would also be extremely challenging to administer, due to the lack of actual research on the topic. The authors found no such psychometrically validated tests for recall of a video.

The greatest weakness of this study was its lack of statistical power. The immediate recall test had only

18 participants, and the delayed recall test had only 14 participants. The sample was homogenous and not randomly selected. This was probably the greatest contribution to a lack of statistically significant results. Congruently, the greatest improvement in this study would be a larger sample size, which would give the statistical analysis more power and reveal a stronger or smaller effect. However, this study was intended only as a pilot study with a small sample size to examine potential notetaking effects. This study fulfilled that purpose.

Though the data were statistically insignificant, the data neared significance and indicate a consistent positive trend effect of notetaking on both audio and visual recall. The results of this study agree with previous research that has found notetaking to positively affect test performance on audio recall (Kobayashi, 2005). The experimenters found no previous literature about the effect of notetaking on visual recall, and thus cannot compare their results to validated research. The experimenters believe that further study is merited, particularly with a larger sample and statistical analysis of the memory assessments, and would yield more reliable and predictive results.

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