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# An Examination of Audio-visual Effects on Memory Capacity of Production Workers Based on Educational Targets

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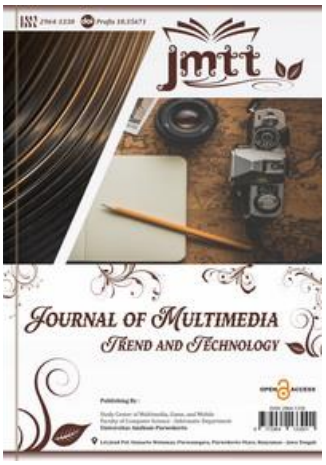


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**ABSTRACT**

Humans have two different types of memory: short-term memory and long-term memory. Information is momentarily stored in short-term memory before being transferred to long-term memory. A string of characters, numbers, colours, or names that can be spoken or presented in less than two seconds can be stored in short-term memory. Many work environments overwhelm workers; for instance, a tailor may be able to maximise productivity if he works while listening to music. One of the things that can affect the workplace is audio-visual. Humans differ in how old their short-term memory is. Those who are still productive tend to have stronger memories than those who are older. The purpose of this study is to ascertain, in light of educational attainment, how audio-visuals affect short-term memory in adults of working age. Because it can still use short-term memory to effectively receive, process, and communicate information in a work environment, productive age is used. The results of an analysis conducted using Work Design software and Design Tools for Methods Standard indicated that the mistake rate at the productive age level at the undergraduate education level had a greater impact than it did at the high school level. This may be the result of short-term memory loss brought on by ageing.



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## INTRODUCTION

A common occurrence in society, particularly in the workplace, is hearing stories from workers about how boring their jobs are[1]. For instance, tailors may be able to perform at their best if they listen to music while they work. Listening to music might help you decompress while working. For instance, music therapy helps get rid of workplace dullness[2].

Music is the expression of ideas through sound whose main elements are melody, rhythm and harmony with supporting elements of ideas, nature and color of sound. Music is a series of various dynamic note notes, resulting in sounds that are comfortable to hear which can have a positive influence on work performance[3].

This can be an example of making workers comfortable working and making them more competent at work. One of the factors that influence the work environment that must be considered is audio-visual[4]. Audio is related to the sense of hearing. The message to be conveyed is expressed in auditive symbols, both verbal (in words/spoken language) and non-verbal[5]. Meanwhile, visual is a graphic medium, a medium that only produces an image without producing sound or sound[6]. What is included in visuals is what can be seen with the sense of sight (eyes)[7]. The channel used concerns the sense of sight, while the message to be conveyed is expressed in communication symbols[8]. From the two definitions above, it can be concluded that audio visual is a modern instructional media that is in line with current developments, including media that is obtained, seen and heard. Audio visuals can be in the form of sounds or voices, which many people like is music[9][10].

Every human has a unique short-term memory when considering several factors, including age. folks tend to forget things more easily as they age compared to younger or more productive folks. The average human productive age is between 17 and 30 years old. Because he can still effectively use short-term memory to receive and respond to information as well as convey messages in a professional environment, the author of this research used productive age[11].

There are two levels of memory that humans have, namely long-term memory and short-term memory. Long Term Memory is memory that has no capacity limitations and lasts from just a few minutes to a lifetime. Short term memory is a temporary storage memory for information before being forwarded to long term memory. Short-term memory can only accommodate around 7 items. Meanwhile, storage in short-term memory can be in the form of a series of letters, numbers, colors or names that can be displayed or pronounced within 2 seconds. Memory that makes things easier for users is known items that can be letters or numbers[12].

There are many failures or disturbances that hinder the memory process or in a person's memory, for example in the case of encoding failure, this is the failure of type term memory to enter information into long-term memory. When information is not conveyed then we cannot access that information[13].

Every human being has limited memory, this limited memory can be caused by several factors. Factors that influence human memory include internal factors (in the form of interest, motivation), external factors (in the form of surrounding conditions, physical environmental conditions in which we are), individual human characteristics (forgetful, careless), and age[14].

Age is one of the factors that influences memory. A person's young or old age greatly influences the limited memory they have[15][16]. Age 10 - 14 years is the age when a person has a very sharp memory, this is because there is still little information that he receives. Meanwhile, older people over 50 years tend to forget quickly, this is because they have received and stored too much information[2][1][17]. Humans who have medium memory, that is, they can still remember a lot of information - the information they receive

are at the productive age, namely between the ages of 17 - 40 years, this is because at that age a person's memory receives a lot of information both audio and visual[18].

## METHOD

This research was conducted on respondents who were of productive age between 17 years - 30 years and had an education level between high school/equivalent (student) and university level (Bachelor's degree/equivalent). This research begins with identifying the problem, followed by conducting a case study of what occurred. The complete steps can be seen in Figure 1 below:

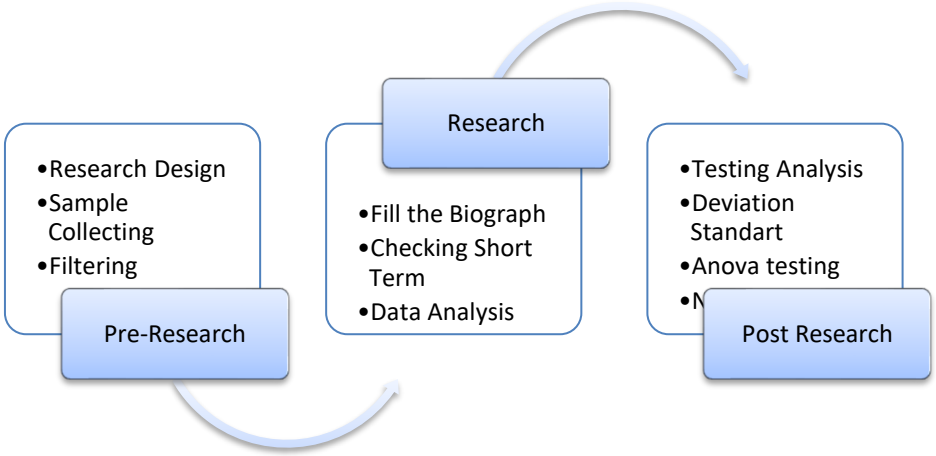


Figure 1, Steps to completing a case study.

First, the author collected data through interview techniques and questionnaires which were distributed to respondents with representatives as the object population. Respondents were taken from schools and universities in the Yogyakarta area. Each respondent was represented by at least 30 people each representative. The results that will be obtained from this data will be assessed using percentages from each category, namely high school and bachelor's degrees.

Next, the respondents filled in their respective biographies to determine the short-term and long-term memory they had. The short term and long-term values will be tested with the value of the audio-visual influence of each population.

Then, after the data was collected and validated, then a deviation analysis and ANOVA test was carried out to find out how much influence audio-visual had on long focus memory and short memory for the respondents. In data analysis before ANOVA the author uses a control chart. A control chart or control chart is a graph that includes maximum and minimum limits which are the boundaries of the control area. Control charts are also quality controls that are used to detect whether the process is in a statistically controlled condition or not. The purpose of drawing a control chart is to determine whether each point is on a normal graph or not from the data that has been collected.

## RESULT

In data collection, data was obtained using the following criteria. The first data is (1) the results of short term memory performance on audio visuals for high school level respondent objects. (2) results of short term memory performance on audio visuals for undergraduate level respondent objects. The results are as shown in the following table:

Table 1, Short Term Memory Performance on audio visuals at High School level.

| Data | Without Audio-Visual | With Audio-Visual | |
|---|---|---|---|
| | | Movie | Music |
| **Total** | 628,4 | 645,4 | 691,3 |
| **Mean** | 21 | 21,5 | 23 |
| **Deviation** | 11 | 13 | 17 |

Table 2, Short Term Memory Performance on audio visuals at Degree level.

| Data | Without Audio-Visual | With Audio-Visual | |
|---|---|---|---|
| | | Movie | Music |
| **Total** | 525,4 | 511,4 | 751,2 |
| **Mean** | 17,5 | 17 | 25 |
| **Deviation** | 13,5 | 17 | 18 |

From the data that has been collected, the average (X) is found. After getting the average from each experiment, the standard deviation (sd) is found using the equation (1):

$$Sd = \sqrt{\frac{\sum(Xi-\overline{X})^2}{n-1}}$$

$$\text{Sd untuk tingkat S1 tanpa musik} = \sqrt{\frac{\sum(5296,24)^2}{29}} = 13,5 \quad (1)$$

To find the upper limit / UCL and lower limit of LCL for those without using Audio-Visual and those using Audio-Visual in the Movie genre and those in the Music genre, use the formula from equation (2):

$$\bar{X} - K \,.\, sd < X < \bar{X} + K \,.\, sd$$
$$UCL = 17,5 + 2 \times 13,5 = 44,5$$
$$LCL = 17,5 - 2 \times 13,5 = -9,5 \quad (2)$$

So from the overall calculation the results obtained from each trial are in table 3 below:

Table 3, UCL and LCL conditions.

| # | | Without Audio-Visual | With Audio-Visual | |
|---|---|---|---|---|
| | | | Movie | Music |
| **High School** | Mean | 21 | 21,5 | 23 |
| | Deviation | 11 | 13 | 17 |
| | UCL | 43 | 47,5 | 57 |
| | LCL | -1 | -4,5 | -11 |
| **Degree** | Mean | 17,5 | 17 | 25 |
| | Deviation | 13,5 | 17 | 18 |
| | UCL | 44,5 | 41 | 61 |
| | LCL | -9,5 | -17 | -11 |

From the test data that has been obtained, the data adequacy test calculation using equation (3) uses a confidence level of 95% (α = 0.05):

$$N' = \left[\frac{40\sqrt{N.\sum Xi^2 - (\sum Xi)^2}}{\sum Xi}\right]^2, N' < N = \textbf{Value Fulfilled}$$
$$N' = \left[\frac{40\sqrt{30.26078{,}63 - 564301{,}44}}{751{,}2}\right]^2 = 25 \quad \textbf{Fulfilled} \qquad (3)$$

Complete data is in the table 4,

Table 4, Recapitulation of Data Sufficiency Test Results.

| **High school/equivalent condition** | **Minimum amount of data** | **Number of actual data** | **Conclution** |
|---|---|---|---|
| Without Audio-Visual | 20 | 30 | sufficient |
| Movie | 22 | 30 | sufficient |
| Music | 30 | 30 | sufficient |
| **Bachelor's/equivalent condition** | **Minimum amount of data** | **Number of actual data** | **Conclution** |
| Without Audio-Visual | 30 | 30 | sufficient |
| Movie | 31 | 30 | sufficient |
| Music | 25 | 30 | sufficient |

Next is the Anova test. Once it is known that the data is normally distributed, the resulting data from the experiment is entered into the variable table for each experiment. Of all the experiments, both without movies and using music, there were a total of 90 experiments.

Table 5, ANOVA results based on high school level and undergraduate level.

| | | | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|---|
| Between Groups | (Combined) | | 70,580 | 2 | 35,290 | ,179 | ,837 |
| | Linear Term | Contrast | 65,940 | 1 | 65,940 | ,334 | ,565 |
| | | Deviation | 4,640 | 1 | 4,640 | ,024 | ,879 |
| Within Groups | | | 17174,463 | 87 | 197,408 | | |
| Total | | | 17245,043 | 89 | | | |

| | | | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|---|
| Between Groups | (Combined) | | 1207,619 | 2 | 603,809 | 2,308 | ,105 |
| | Linear Term | Contrast | 849,761 | 1 | 849,761 | 3,248 | ,075 |
| | | Deviation | 357,858 | 1 | 357,858 | 1,368 | ,245 |
| Within Groups | | | 22758,601 | 87 | 261,593 | | |
| Total | | | 23966,220 | 89 | | | |

From calculations in data processing and analysis of the results obtained, the error rate in short-term memory trials at productive ages at high school and undergraduate education levels was highest in trials using music. The error rate in short-term memory tests in the productive ages between high school and bachelor's degrees has a greater influence on students/undergraduates, compared to high school/equivalent students,

because the main factor is that the older one is, the weaker a person's memory ability, especially short-term memory. This type of research trial category made more errors in trials that used music. This is due to lack of concentration due to noisy music. The situation in the trial using Movies is different, this affects the sense of sight where if someone observes it will be easier to remember.

## CONCLUTIONS

By testing short-term memory abilities using the Design Tools Methods Standard and Work Design program, it was found that the influence of audio-visual on the level of short-term memory errors was very influential in Bachelor/equivalent education compared to the level of short-term memory errors at high school level which had no effect.

The most significant influence based on the test results lies in the Movie mode because it involves 2 five senses at once seeing and hearing, in contrast to the music mode test which only involves 1 sense, namely hearing. The test error in music lies in the noise level.

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