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Distractors and Short Term Memory

Abstract

According to the Merriam Webster Dictionary, short term memory is “memory that involves recall of information for a relatively short amount of time.” In general, distractors negatively impact short term memory. The study conducted investigates the impact of a distractor when memorizing sets of letters. A Scratch Program was created to test fifteen ninth grade female students’ ages fourteen and fifteen at Roland Park Country School ability to memorize sets of 3, 5, 7, and 9 letters with and without a moving visual distractor. The study concluded that a visual distractor negatively impacted the subject’s ability to remember a sequence of letters because the subject was able to retain a greater number of letters without a distractor. The study showed little impact, but the impact observed was negative.

Introduction

Memory is essential to a human’s ability to function from day to day.  Short term memory is the ability to recall and regenerate specific information in a small amount of time.  It is the ability to draw upon and put to use recent memories that have been stored in the brain.  This is a necessity in daily lives; it is needed for the completion of just about any project or activity.  According to [ww.simplypsycology.org](http://ww.simplypsycology.org), most people can temporarily store about 7 items in short term memory, in a part of the brain called the frontal lobe.  However, additional research shows retention in short term memory can be negatively impacted and manipulated by adding the presence of a distractor.  These distractors include auditory changes, visual color and/or different shapes, and the addition of a moving shape.  “The Facilitation and Distraction in Short-Term memory” (1973), described an experiment where the independent variable was the amount of time between when the students were shown cards and when they were forced to match them.  This study found that the older group of children were able to retain in short term memory and repeat the sequence of cards more correctly than the younger children. There was also an auditory experiment that was written called the Disruption of Short-Term Memory by Changing and Devait Sounds:  Support for a Duplex- Mechanism Account of Auditory Distraction.  It was decided that an experiment would be created to investigate whether or not an electronic bouncing ball would affect a person’s ability to remember an increasing number of randomly selected letters.

Methods

A Scratch program was created to conduct an experiment on whether a bouncing ball would impact a student’s ability to remember a series of predetermined letters. Scratch was used to program the ball and its movement. Fifteen girls in the ninth grade class ages fourteen and fifteen at Roland Park Country School completed the test. Before the test began, students were asked to answer the questions, “What is your grade?” “What is your age?” “Are you a visual learner?” and “Do you watch TV while doing your homework?” These questions were asked to understand if the student normally works well while distracted. The test began with a screen showing the instructions for the student, Image 1. The test consisted of memorizing three, five, seven, and nine randomly chosen letters and recording them on a sheet of paper once the letters disappeared. The test subjects were then given thirteen seconds to record the letters. After the thirteen seconds were finished, the test repeated with five letters, seven letters, and then nine letters. After the first part of the test was completed, the same test with sets of three, five, seven, and nine letters were once again displayed on the screen, however a ball also continuously bounced around the screen. An example screen can be referenced below in Image 2. The bouncing ball was used to distract the student while they attempted to memorize and record data in the test. The students were asked to record the letters they memorized on a white sheet of paper with numbers marking the trial numbers being completed and black lines for the answers to be recorded. The tests were taken in a quiet room. The tests were graded by adding a point for a correct answer and not adding nor taking away a point for a wrong answer.

Image 1: Instructions



Image 2: Example Screen from the Scratch Program



Results

In the trial with three letters, the subjects remembered an average of 3 letters without a distractor and an average of 2.867 letters with a distractor. In the trial with five letters, the subjects remembered an average of 4.933 letters without a distractor and 5 letters with a distractor. In the trial with seven letters, the subjects remembered an average of 5.6 letters without a distractor and 5 letters with a distractor. In the trial with seven letters, the subjects remembered 6.6 letters without a distractor and 6.6 letters without a distractor. To see the correlation between numbers of letters tested and percent correct, view Graph 1. The data was graphed to show a correlation between having a distractor and not having a distractor. A t-test was completed and p-values were calculated to determine whether the distractor had an impact on the data. An impact can be determined if the r2 value is greater than 0.5. The p-value for 3 items was 0.33428. The P-Value for 5 items was 0.33428. The p-value for 5 items was 0.29945. The p-value for 7 items was 1. See Table 1 to view the p-values. The r2 value for no distractor was 0.9068. The r2 value with a distractor was 0.691.  The subjects answered questions to demonstrate how they learn and work best. The results to these questions indicate thirteen out of the fifteen subjects are visual learners and eight out of the fifteen subjects watch TV while completing their homework.

Graph 1: Average Items Remembered Graph

Table 1: p-values compared to items needed to be remembered

|  |  |
| --- | --- |
| Items | P-Value |
| 3 | 0.3328 |
| 5 | 0.33428 |
| 7 | 0.29945 |
| 9 | 1 |

Discussion

In the trial with three letters, the subjects remembered an average of 0.233 more letters without the distractor.  This is due to the distractor presence, and the fact that they had not been told what the distractor would be, only that there would be one. In trial five, the subjects remembered an average of 0.067 more letters with the distractor than without.  This is because the person is now familiar with the distractor, and remembers most of the letters from the previous trial.  In the trial with seven letters, the test subjects remembered an average of the same letters, as seen in Graph 1.  This is because they have (on average) completely accepted the distractor and remember some of the letters from the previous time. The results conclude that distractors do not make a huge impact on short term memory. The p-values indicate that there is a difference between the data sets and that the distractors had an impact. The r2 value shows if the distractor impacted the data. If the r2 value is greater than 5, the distractor did impact one’s ability to recall a sequence.

Some more independent variables that could be experimented with are some of the senses: sight and hearing. Examples of the independent variables could include change in size, change in the font of the letters, and change in the presence or appearance of a distractor, change in the rate of movement of the distractor, or change in the color of the background or letters.  Additionally, the type of sound or lack thereof sound could be manipulated. Additional tests to be completed include how the different types of music affect the subject’s reaction to different types of sound, the consistency of the sound, or the volume at which it was played.  This could have a large effect on how the subject responds and performs on the test.

Bibliography:

Hagen, J. W., & Kail, R. V., Jr. (1973). Facilitation and Distraction in Short

    Term Memory. *Child Development*, *44*, 831-836.

John W. Hagen, J.H. & Robert V. Kalir, jr, R.K. (1973).  Facilitation and Distraction in Short Term Memory.  Child Development from University of Chicago, 44, 831-836.

Nicholson, C. (n.d.). Your Memory May Be Edited. Retrieved from Scientific

    American website: http://www.scientificamerican.com/podcast/episode/

    edited-memories/

Pablo Alvarez, P.A., Stuart Zola-Morgan, S.Z. & Larry R. Squire, L.S. (1994).  The Animal Model of Human Amnesia: Long-Term Memory Impaired and Short-Term Memory Intact.  91, 5637-5638

Preston, A. (2007, September 26). How does short term memory work in relation to

    long term memory? Are short term daily memories somehow transferred to long

    term storage while we sleep? Retrieved January 5, 2015, from Scientific

    American website: http://www.scientificamerican.com/article/

    experts-short-term-memory-to-long-term/

Robert W. Huges, R.H., Francous Vachon, F.V. & Dylan M. Jones, D.J. (2007).  Disruption of Short-term Memory by Changing and Devait Sounds:  Support for a Duplex-Mechanism Account of Auditory Distraction.  Journal of Experimental Physiology: Learning, Memory, and Cognition from Cadriff University, University of Laval, and University of Western Australia, 33, 1050-1061