An Incentives Effect on Short Term Memory

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Abstract

Short-term memory is the ability to remember information for a period of time before it is forgotten or moved into long term memory.  The study shows if the incentive of getting a Kit-Kat has an effect on a ninth grade student’s short-term memory.  The students were shown a series of letters and asked them to write them down after they left the screen.  This program is called SCRATCH. If the subjects did better on the second portion of the letters, they would receive a Kit-Kat.  It was concluded that the incentive of getting candy does not have an effect on a ninth grade student’s short-term memory according to the information in the p-values and the r2 values. The reason for this is not known and future research would need to be done to determine why.

Introduction

According to Gale Encyclopedia, short term memory is the process by which information is forwarded into long term memory or is discarded after a short period of time. Short term memory holds information as long as it is thought about or repeated. To retain information, it must be routinely repeated, or else it will be lost. Haines and Torgesen (1979) conducted a study to see if incentives on short term memory in children with reading problems could increase their ability to recall numbers. In their study, a proctor gave disabled and nondisabled children pictures to remember. Then, the proctor turned the page and asked the subject child to indicate the order in which the pictures were shown. For each of the trials, the sequence was different from the last, but the subject child was told how many pictures he or she would be asked to remember. A separate group was similarly tested to assess the effect of time on recall. The subject child wore blacked out goggles (to avoid any distraction) for 15 seconds, then was asked to point out the pictures in the correct order. The blacked out goggles were goggles spray painted black so the child could not see anything. Half the group was given the incentive of a penny for every response they recalled correctly, together with positive feedback (“That’s very good, you got that right!”). It was concluded that incentives, like pennies and encouragement, help improve disabled and non-disabled children in short term memory.

In another study, Tarpy, Glucksberg, and Lytle (1969), determined if incentives could affect the way short term memory is accomplished. Specifically, they were interested in comparing a covert rehearsal method (remembering by repeating to themselves), or by the arousal mechanism (being excited/having anxiety by having to analyze/remember additional information). For this study, 97 college students were asked to remember a series of 3 letters, and a series of 20 numbers. Each letter and number was spoken at a rate of 2 per second.  Subjects had to remember how many times they heard the first number in the series of 20 numbers. Sometimes, the first number would occur one or two times in the series of 20; other times the first number would appear many more times. The more frequently that number appeared, the more difficult it would be to count it correctly, meaning increased arousal. Subjects were then graded on their ability to remember the letters and numbers. The incentives of either 1 cent or 10 cents were provided to encourage short term memory. It was concluded that incentive effects were more apparent with increased arousal mechanism was present given that it would be more difficult to repeat the sequence of numbers in a person’s head. This means that in this study, college students were more motivated by the higher incentive, 10 cents, when they were more challenged to remember.

Finally, in a third experiment, Quinn and Smith (1975), researched if college students determine ahead of time how complicated it will be to remember something, and as a result, commit the information to either short or long term memory. They were incentivized to participate in the experiment with a course credit for participation. Quinn and Smith’s methods in this study were different in each experiment. The subject was asked to memorize lists of words of varying lengths, depending upon the experiment. In some cases they knew the length of the assignment, in some cases, they did not.  For example, the students were shown groupings of a series of 18 words, each of which were shown for 2 seconds. Before the test started, they were told that they had to recall the list of 18 words twice orally. They had a 30 second interval between each trial. Differences were consistently seen in how correctly the participants remembered the words depending upon if the words were introduced early in the experiment vs. later in the experiment. This first experiment showed that students shifted from long term memory processing to short term memory processing during the course of the test. Many subjects anticipated the end of the list which shifted memory to short term memory earlier in the process. However, in experiment two, the length of the lists were unknown to the subjects. The results showed better long term recall when the length of the lists were unknown to the subjects. In experiment three, Quinn and Smith told the students that the lengths would be the same, but the lists actually varied in lengths. Results showed that the length of the lists did not impact their ability to retain information (because they thought it would all be the same) and suggested that long term processing was responsible similar to experiment one. Overall, the study indicated that participants were incentivized by knowing that they were approaching the end of the list, causing them to remember more of the final words using short term memory.

Students are required to memorize a large amount of information, particularly in preparation for tests. From the information stated above, the use of incentives could possibly improve a student’s ability to learn material and better prepare for tests. This study seeks to determine if the incentive of receiving a piece of candy, if the person gets the correct answer, can improve a ninth grade student’s ability to remember an increasing sequence of lower case letters. This following experiment investigates the effects of incentives on short term memory, and the degree to which it can improve a person’s ability to remember a piece of information.

Methods

Twenty female ninth grade students from Roland Park Country School were asked to complete this short-term memory test.  The program Scratch was used to create the entire short-term memory program.

The first slide students saw was a slide of instructions (figure 1). They were asked to read all the instructions on the slide.  After they were done reading the instructions slide, they were told to press the spacebar to move onto the first set of letters.  They were asked to remember the first set of letters.  After the five seconds were over, they were asked to write the letters down on a piece of paper that was provided. Between slides, students would have as much time as they needed to complete the previous slide and they would see figure two appear. They were asked to press the space bar when they were finished the project.

 The first set of letters the students were asked to remember had two letters, the second set of letters had five letters, the third set of letters had seven letters, the fourth set of letters had eight letters (figure 3), the fifth set of letters had nine letters, and sixth set of letters had ten letters.  After the first set of letters was finished, there was a second set of letters that was chosen at random.   After the first set of letters the students were told they would receive a Kit-Kat if their scores improved on the second half of the test. A student would have a greater incentive to do better if she knew there was a chance she could get her favorite candy. 50 students were asked what their favorite candy was out of Kit-Kats, Jolly Ranchers, and mini Hershey bars.  23 students out of 50 students favorite candy was a Kit-Kat. In order to have accurate data, the test was performed in a very quiet area.  After the quiz the students were asked to answer questions about their age, grade, favorite, and least favorite type of candy. The students were asked about their favorite candy after the test, so they were not wondering if they could get candy in the first part of the test. It was important that the students did not know they would get candy if their results improved, because they might try to do worse in the first half to make it easier to do better in the second half. The student might also be distracted in the first half, if they knew there was a possibility they could get candy. It was also asked if they had ever taken a short term memory test before. If they had taken a short-term memory test in the past they might have known what to do and skipped the directions. This could have also made a difference in the data, but it did not.

Results

The findings in this study suggest that as subjects were asked to remember more information, the less information they got correct. Surprisingly, the rate of change of one’s ability to remember a short (two letter series) or long (ten letter series) is low. More specifically, the difference in the number of words correctly remembered varied slightly (a two letter difference) regardless of the series length.

            The experiment also assessed the effect of distraction on one’s ability to correctly remember information. Throughout the experiment there were many variables that helped assess if the distractor had an impact as well as the validity of the results.

Graph 1: Short Term Memory Average Letter Recall With or Without Distractor

 The r2 values show that distraction had little to no effect, as proven by the low r2 values shown in the graph (without distractor 0.0535, with distractor 0.0921). The r2 value shows the connection the points on the graph have to line of best fit. The closer the r2 values are to 1, the more consistent the data is.

 The t- test further supports the fact that distraction had no significant effect on people’s ability to remember, given that the p-values are higher than 0.05, except for seven letters asked to recall. In this t-test, it determines whether there is a statistical difference between the letter recall with the distractor, or without the distractor. If the p-value was from 0.1 to 0.05 than the distractor did have an impact. If the p- value was more than 0.05, than the distractor did not have an effect.

Table 1: P-Values Calculated from T-Test

|  |  |
| --- | --- |
| Number of Letters asked to Recall | P-Value |
| 2 | 1.0 |
| 5 | 0.329 |
| 7 | 0.008 |
| 8 | 0.176 |
| 9 | 0.324 |
| 10 | 0.329 |

Discussion

The p-values and r2 values specifically show that the incentive of getting a Kit-Kat does not have an impact on how well a ninth grade student remembers a series of letters.  The data shows that students do not remember letters better when they are asked to remember more numbers, because they were easily able to remember two letters, but when asked to remember nine letters they were unable to recall the first two.  Except for when they are asked to remember seven letters (figure 4). When remembering seven letters, the Kit-Kat had an effect on students.  This might be, because seven letters is not too difficult, or too hard to remember. The average amount of letters people can remember is seven to eleven. Seven letters might have also been different the others, seven letters aren’t difficult to remember.  For further research on this, more sets of letters might be used. For example there might do a one set of letters with one letter, one set of letters with two letters, one set of letters with three letters, one set of letters with four letters, and one set of letters with five letters, etc. all the way up to twelve letter. For further research, more people might be tested, and a larger range of ages rather than just ninth-grade girls.  During this study many students were distracted, because they were so excited they would get a Kit-Kat that they couldn't focus.  When comparing the two lines on the graph, students did better without the distractor, because the line the line of best fit without the distractor is above the line of best fit with the distractor.  This indicates that the distractor did not have an impact.

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