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Math Magician: A Study on Distraction and Testing Ability

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The problem with distraction in schools today could be affecting student's learning. Our hypothesis is that students who are confronted with a distraction do not do as well as students who are not confronted with distractions while doing homework. There was a total of thirty five participants. The procedure was for participants in the experimental group would begin doing a math worksheet and a distraction (cell phone ring tone) would be introduced. For participants in the control group they would do the math worksheet in silence with out distraction. The results showed that the distraction did not affect the participant's scores on the math worksheet in comparison to the control group.

Mathematics is based on perfection. Distraction while doing math can decrease accuracy and sometimes add to math anxiety. Math anxiety can also occur when doing math on a timed scale. Decreasing distractions or awareness of possible distractions can be critical to accurately doing math in a public atmosphere. Determining what or how distraction affects the accuracy of completing task such as a math worksheet and other effects that could contribute to ineffectiveness of completing it accurately. Where you are comfortable studying can determine how effective you are while completing a task in a public atmosphere. The purpose of our study was to determine whether distraction had a negative effect on participants performance on a math worksheet in regards to number of correct problems and how long it took them to complete.

This study was important in that it could help reduce distraction in areas where students need silence to focus on task such as math. This can help the university also in

ways such as determining when grounds should be completed or any other activities should be handled based on lowering the distraction rate.

There is a wide variety of information regarding ideas that are used in our study. The main three are distraction, the student's place of residence, and math and its effects. Distraction can be correlated to "irrelevant sound effects might reflect attentional distraction"(Bell & Buchner, 2007,p 353) which "prospective memory is disrupted by increasing attentional demands of ongoing activities"(Guynn & McDaniel, 2007, p 484) such as homework. Distraction can affect everyone. In a study done by Nelson, Sabur, and Shaw they found that age effects how distracting background noise is. They found that children are more negatively affected than adults are (Nelson, Kohnert, Sabur, & Shaw, 2005, p. 219- 229). When people are in an academic setting distraction can be devastating to learning. Also in this study, they found that ventilation and heating and cooling systems were the most common form of background noise in schools, and that nearby highways were the second most common "distractor" (Nelson, Kohnert, Sabur, & Shaw, 2005, p. 219- 229). The distractions come from many different areas both in and around school. Distraction can come from many different areas such as auditory, sensory, and visual. "Sustained listening in natural settings (concerts or at home) may not necessarily require speed or accuracy, presumably for the purpose of pleasure or possibly distraction from other stimuli" (Flowers & O' Neill, 2005, p. 309). This idea is that at some moments a person might not even know if they are being distracted due to the normality of it. When you're comfortable you may be less likely to overlook things you a used to such as house noise. Other forms of distraction can be disorders that the person can not help. One of these problems is Chronic fatigue syndrome (CFS), and it effects

approximately one in every one thousand people. Some of the symptoms, as identified by Morris, Robson and Deakin, were fatigue, poor memory and concentration (Morris, Robson, & Deakin, 2001, p. 168). There was no part on our study asking for any health problems so as far as we know a participant could have had CFS and not reported it. This could have affected their data which affects the results of the study.

On the area of where a student lives while attending class has an effect on a students critical thinking which is needed while doing homework. "There is strong evidence that student interaction with faculty and peers had a positive impact on critical thinking" (Gellin, 2003, p. 747). This is important because students who live on campus are more apt to receive interaction and attention, sometimes unwanted, from both faculty and other peers which can sometimes distract the particular student. There is a relatively low rate of students going away to college and living at school. In a study done by Sessa, we learn that approximately one third of college students reside at their college (2005). More and more students are choosing to stay at home and commute to school for various reasons. That might not always be the best idea. "Housing arrangements, placement in sets of classes with the same students, and special academic, athletic, and interest groups can aid in developing social attachment to the school" (Bean; Jackson & Moore, 2006, p. 361). When a person becomes attached to something, in particular a school they become comfortable and the learning environment becomes much friendlier. This can play a role in how focused a student may be. When talking about differences in sex and how it affects their relationship with their school women have the bigger attachment. Two studies have found that sex may have something to do with how people adjust to college life. Both of them found that women depend more upon relationships and social support

than do men (Kenny & Rice, 1995; Enochs & Roland, 2006). Women may have a harder time adjusting to a new environment if they had gone away to college and are having a tough time making new friends. This could affect how they act and or think in particular events and situations.

A newer more updated problem is also affecting college students. In a study recently done by Seligman and Wuyek they have discovered that separation anxiety disorder could be diagnosed in college students. This disorder may also skew the results of a study done exclusively on the college population (Seligman & Wuyek, 2007). This disorder is becoming increasingly viewed on college campuses where students are used to being really close to their family and close friends. Lindenwood University is known as a smaller school on the rise and has a lot of students that come from small towns with close knit families as well as students who are local and are trying to stay close to home. This disorder could have affected some of our participants in various ways. Our participants were very diverse in t that they were from other countries then the United States. The distance between home and school can sometimes be too much for a student who may be alone while at school.

An important part of the experiment is based on math and different affects it has on people. In our study it will be taking place in a lab. The idea that "labs testing at the simpler levels or arithmetic need not worry about a confounding relationship between achievement and math anxiety" (Ashcraft & Krause, 2007, p 245-246) may have an effect on the participants. The experiment we are doing is based on math achievement while a distraction occurs. Distraction can increase math anxiety so there could be a correlation there. Also, in a study done by Tsui and Mazzocco, there is evidence that

timed math scores are worse than when a math test is not timed(Tsui & Mazzocco, 2007, 132), but since all participants were timed it shouldn't have affected one group more than another. Math has an effect on many different things. In some schools a math placement test is done to determine what class a particular student should be in. In a study done by Uysal it was shown that students that were accepted into schools without taking an introductory exam had lower scores than students who were tested (Uysal, 2007). The students who had been tested on math were more apt to success after school. At Lindenwood University there was no math entrance exam so the students that attend there may not be very well versed in mathematics. That could effect how they did on our math worksheet and more in general if they were in the distraction group. Sex differences in how people go about doing math can make a difference also. Several studies have shown evidence that there is a difference in the way men and women think. These studies have also shown that on average men solve problems using "abstract principles" and women do not (Lynn, 1969; Entwisle, Alexander, Olson, & Steffel, 1994). Math involves deep problem solving and the varying mental process used to do math can be complex. How a participant goes about getting there answer can affect the answer they may get at the end. On top of all these different variables, a growing problem called math anxiety has an affect on students. Math anxiety was described by Perry as being a condition where an perfectly normal person was incapable of going through the mental processes required to solve math problems (Perry, 2004). This problem could have a huge effect on participants who could have been involved with our study. There was a signup sheet that has a brief description saying the study had math involved but an individual may have not seen that and just signed up for an open slot. Math anxiety would have the great influence on our

study. There are varying degrees of math anxiety and they could all have an effect on the study.

Student involvement in extracurricular activities can differ from Greek life to athletics, and how that can resemble distraction is unclear but in some cases there is a link. Our study is an extension to prior research in that it wants to determine how influential distraction can be in certain settings such as school.

Our study has the purpose to help both student and schools determine how influential distraction can be in academic life. Students who live on campus are more able to work around distractions then students who live off campus and are not used to the everyday background noise of schools. Universities will benefit in that they will have a better understanding on how distraction can reduce the academic atmosphere witch can lead to unsuccessful students. The experimenter's predictions are that distraction will negatively affect performance on a math task. The study will be done by using a ringing cell phone as a distraction to a group and a different controlled group will be able to do the worksheet without the distracting ringing. Although, both groups will be given a five minute time limit this could increase some anxiety. Our research design relates to the theoretical issue that distraction is more influential then most people think. Students who are not used to a lot of background noise might experience increased anxiety and will not be able to concentrate on the task at hand.

Method

Participants

The participants were able to sign up for the experiment on a sign up sheet on the bulletin board across the hall from room 407 in Young Hall. There were 34 total

participants, nineteen male and fifteen female. The average age of the participants was 19 years old. The ages did range from 17 to 22. There was a diverse group of participants that were involved with the study. There were 17 people in each of the groups. Extra credit was awarded to the participants who participated in the study. All students were recruited through the Lindenwood Human Subject Pool and their extra credit went towards entry level Psychology, Sociology, and Anthropology classes. Seven of our participants were biology majors and five of them were undecided. These were the most common majors. 16 participants were in the control group (non-distraction) and 18 were in the experimental group. We had 20 men and 15 female participants. 7 of these participants were commuters and 28 were residents.

Materials

The materials used were a stopwatch, a ring tone off of a cellular phone, ink pen, three chairs (two for the experimenters and one for the participant), desk, and a table for the participant to work on. The cell phone was used to receive the calls made by an experimenter in hopes of producing a distraction to the participant. The stopwatch was used to time the individual on how look it too them to complete the math worksheet. The maximum amount of time allotted for the worksheet was five minutes. We also had all of the required forms from the HSP and instruction that were read to all participants.

Procedure

The study would start when the participant walked into the lab room. The participant was first asked to fill out informed consent forms and the extra credit sheet. Once the participant finished that the main experimenter read the participant the instructions regarding the study. After the directions were read to the participant the main

experimenter ask the participant if they were ready to start the math worksheet. Following that the participant started the worksheet. Immediately when the participant started the secondary experimenter started the stopwatch. In intervals of every 45 seconds the ring tone was then activated for experimenter group. The switch between the control group and experimenter group was every other participant. This was the best way to keep all of the subject variables even with regard to the number of participants involved each day and as a total per group. If the participant was in the control group the room remained quiet for up to a minimum time of five minutes. If the participant finished the worksheet early the time on the stop watch was immediately stopped and recorded. Once the participant finished he/she were asked to fill out a follow up questionnaire and debriefed in that, he/she were told what the study was about and notified the reasoning of the ring tone if he/she were in the experimenter group. As a conclusion the participants were asked if they had any questions; if they did they were answered and were free to leave at their leisure.

Results

Our hypothesis was that the experimental group (which was the group who experienced the distraction) would take longer to finish the test, on average. Our results, however, show that both groups had the same mean which was 200 seconds (3 minutes and 20 seconds). Additionally, we hypothesized that the control group would get more questions correct on the math worksheet. Again, we were wrong as the experimental (distraction) group got an average of 27.83 questions correct and the control group got 27.25 questions correct. These two averages where obtained by using an independent t-test at a p level of .05 and the degrees of freedom being 32 for each of the two tests. The

t-value for the time variable was only t(35)=.004, p=.05 which is very bad and the t-value for the number of questions answered correctly was a phenomenal t(35)=-.626, p=.05. This means that there was no to our data, which would reinforce the fact that the independent variable of distraction had little to no effect on the study.

Discussion

The original hypothesis stated that we expected to see the distraction group do worse in reference to time it took them to finish and the number of questions they got right. Unfortunately the means of the distraction group were better than the means of the control group on both the time and number correct categories. There are several factors that could have influenced these results. For one, the distraction provided might not have been loud enough or aversive enough. In a study conducted by Walters (2006), he reported that the "volume of the distraction had more of an effect than anything else", which means that if the distraction was not loud enough it would not have had an effect on the differences between groups (which is what we found).

Though this effect was not measured, it was observed that some of the subjects seemed to experience signs of what may be described as urgency whenever the distraction was introduced. They appeared to work more quickly and focus a bit more which may have affected their times. This would also lead you to believe that their number of correctly answered questions would be lower, but this was not the case. Subject variables might have also had something to do with the results. This study could have been done with a within subjects design or at least a matched subject design. We suspect that the independent variable was not potent enough to affect the outcome of the results for the experimental group did not do significantly better than the control group.

In addition, the control group often experienced distractions of their own including the extraneous variable of noisy water works and a flickering ceiling light. A completely silent lab would have been good and a larger subject sample would have helped as well, but we had a strict deadline for when we had to start data analysis for the end of the project.

Another problem that we had with the study is that we encountered a ceiling effect. The test may have been too easy, because all but two of the participants finished the test completely and we didn't want them to complete it at all. This affected our dependent variable of number of correctly answered questions by a lot. If we were to redo this study we would make a harder math test with at least 50 questions on it. Since the average time for both groups was 200 seconds I think that 50 or 60 questions would make at least half of the participants not be able to finish, but if we added 100 questions none of them would finish with all questions correct. With none of the tests being finished we could just measure how many questions were correctly answered.

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Figure 1

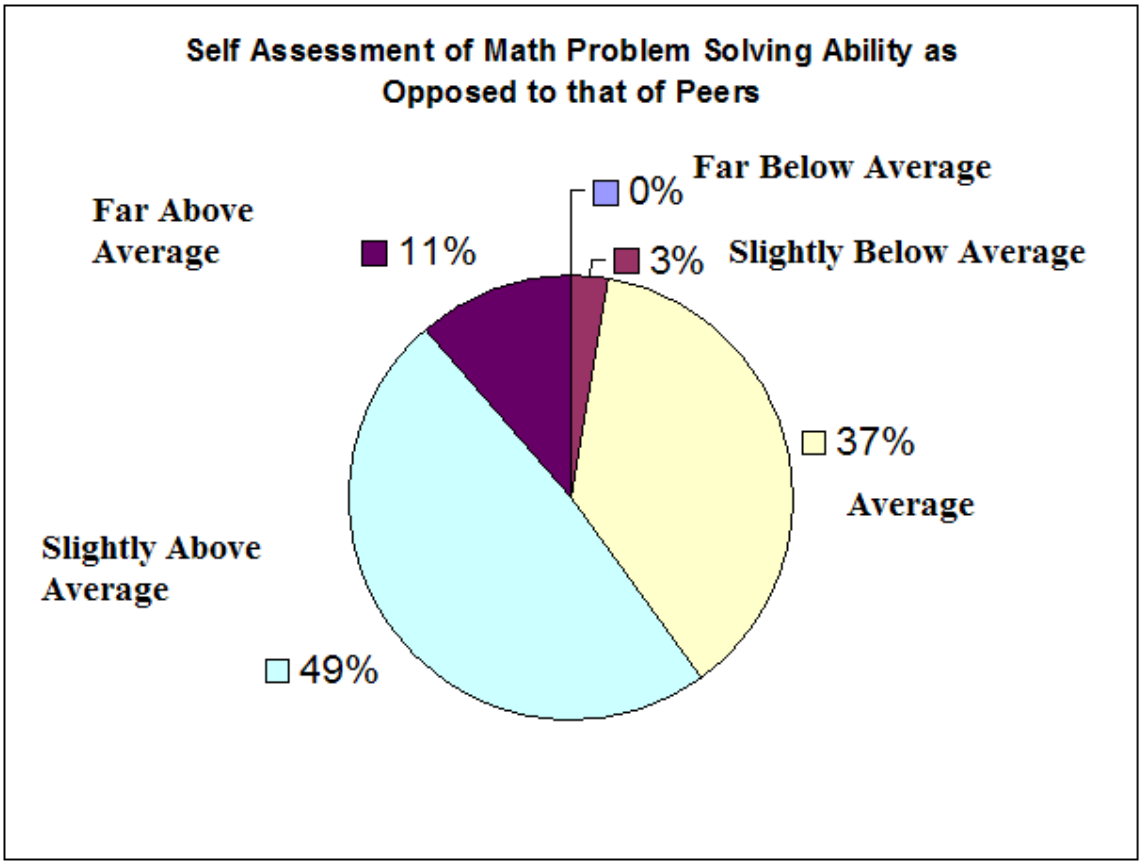
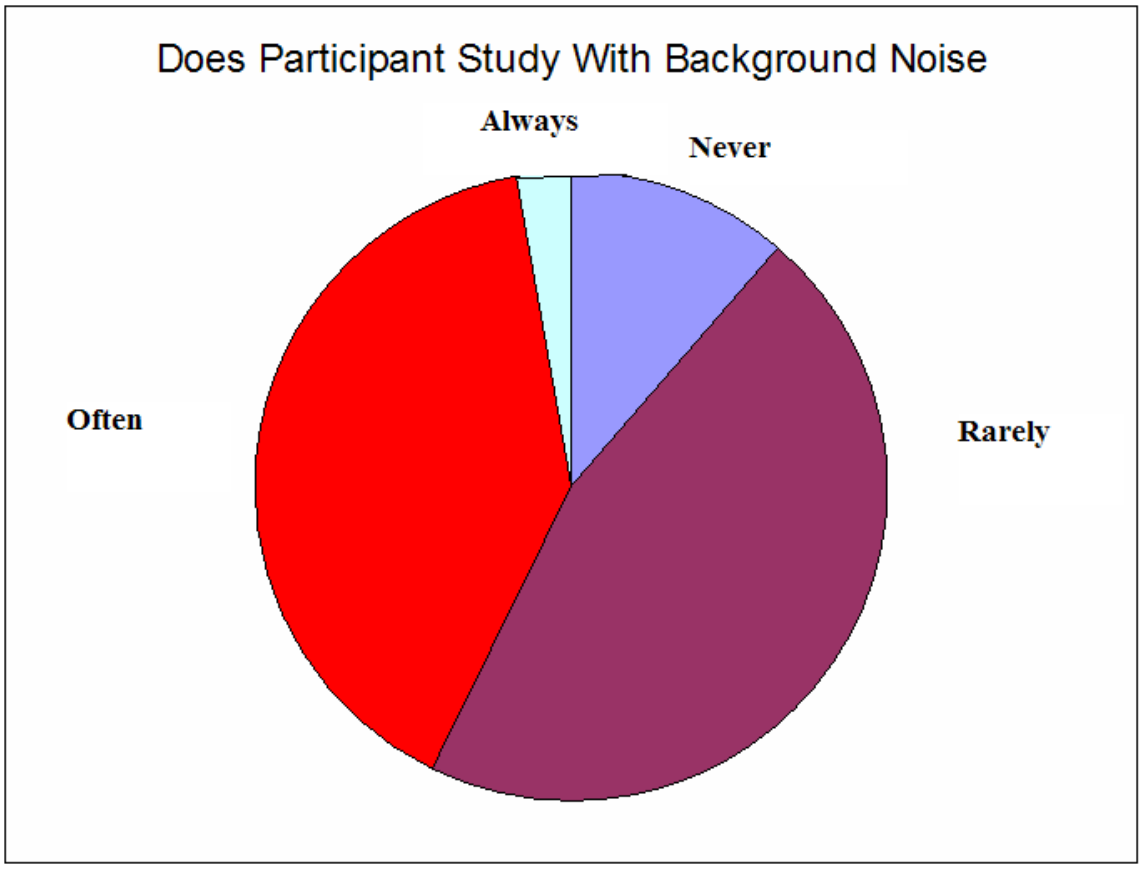

Self Assessment of Math Problem Solving Ability as Opposed to that of Peers
Far Below Average
0%
Far Above Average
11%
3%
Slightly Below Average
37%
Average
Slightly Above Average
49%

Figure 2


Does Participant Study With Background Noise
Always
Never
Often
Rarely

Appendix A

Answer the following questions to the best of your ability.

1.) 17 +55	2.) 77 - 9	3.) 7 x 9	4.) 44 - 16	5.) 33 + 17
6.) 71 -28	7.) 17 x 6	8.) 96 -30	9.) 100 - 25	10.) 8 x 7
11.) 62 -14	12.) 96 + 2	13.) 17 x 4	14.) 82 x 3	15.) 69 - 55
16.) 39 -11	17.) 71 +35	18.) 95 x 3	19.) 57 - 19	20.) 24 +84
21.) 89 +18	22.) 34 - 13	23.) 7 x 5	24.) 78 - 42	25.3 x 34
26.) 67 x 5	27.) 42 +56	28.) 130 x 5	29.) 24 - 9	30.) 57 - 5

Appendix B

Informed Consent Form

I, _____ (print name), understand that I will be taking part in a research project that requires me to complete a short questionnaire asking about simple questions regarding history, math and science. I am aware that my participation in this study is strictly voluntary and that I may choose to withdraw from the study at any time without any penalty or prejudice. Furthermore I was able to hear everything the instructor said to me and can communicate without the use of sign language or any hearing device. If I need a hearing device I assert that I have it in at this time and it is functioning as normal. I should not incur any penalty or prejudice because I cannot complete the study. I understand that the information obtained from my responses will be analyzed only as part of results as a whole and that all identifying information will be absent from the data in order to ensure anonymity. I am also aware that my responses will be kept confidential and that data obtained from this study will only be available for research and educational purposes. I understand that any questions I may have regarding this study shall be answered by the researcher(s) involved to my satisfaction. Finally, I verify that I am at least 18 years of age and am legally able to give consent or that I am under the age of 18 but have on file with the HSP office, a completed parental consent form that allows me to give consent as a minor.

_____ Date: _____

(Signature of participant)

_____ Date: _____

(Signature of researcher obtaining consent)

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Appendix C

Demographic Questionnaire

1. Age:
2. Sex:
3. Do you commute or are you a resident at Lindenwood University:
4. What is your major?:
5. How would you rate your math skills on a scale of 1 to 10? 1 being the worst and 10 being the best.

   (**1)** I-----I-----I-----I-----I-----I-----I-----I-----I-----I (**10)**

6. Do you study in silence or with background noise? Circle one best response.

   Never ----- Sometimes ----- Always

7. If circled "sometimes" or "always" what is the background noise?

Appendix D

Instructions

1. Fill out informed consent form, participant receipt, and demographic survey.
2. After those are completed you will be given the math worksheet.
3. You will have 5 minutes to complete the worksheet.
4. After you are either finished with the worksheet or the 5 minutes are up, give the worksheet back to the experimenters.
5. You will then be given a feedback letter and you may ask any questions you have regarding this study.

Appendix E

Feedback Letter

Thank you for participating in our study. The questionnaire was used in order to determine whether distractions negatively effected people's performance in simple tasks. If you were in the experimental group then you obviously heard two people talking in the room. This two people were a part of the study and were there only to provide you with a mild distraction.

Please note that we are not interested in your individual results; rather, we are only interested in the results of a large group of people, of which you are now a part of. No identifying information about you will be associated with any of the findings.

If you have any questions or concerns regarding any portion of this study, please do not hesitate to bring them up now or in the future. Our contact information is found at the bottom of this letter. If you are interested in obtaining a summary of the findings of this study at a later date, please contact us and we will make it available to you at the completion of this project.

Thank you again for your valuable contribution to this study.

Sincerely,

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