**Changing Electronic Use Behavior in Adolescents While Studying: An Interventional Psychology Experiment**

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**SUMMARY**

In an increasingly technological world, electronic distractions are ubiquitous and make focused studying difficult. Students surround themselves with technology while studying, despite a plethora of evidence that cell phones, television, and social media negatively impact academic performance. Thus, it seems that theoretical knowledge of the negative effects of electronic distraction on academic performance alone is insufficient to change students’ study habits. In this paper, we hypothesized that if high school students witnessed the change in their academic performance due to electronic distractions first-hand, they would be more likely to change their study habits. We conducted an interventional psychology experiment to test the memory of high school students with various distractions present. The students performed these tests while listening to instrumental music, lyrical music, television, or in silence. A control group of students was instructed to read several facts about the negative effects of electronic distraction on academic performance from published papers, simulating second-hand learning. After the interventions, both groups were asked if they would change their study habits based on what they had learned. All students were then surveyed two weeks after the interventions to determine if they demonstrated changes in their study habits. Although more students in the treatment group were found to change their study habits, the results were not statistically significant, which prompts further exploration into this method of habit-breaking for students.

**INTRODUCTION**

Formalized, in-school education is one of the fundamental aspects of human development and a benchmark for societal development. The advent of new technologies has increased access to information in unprecedented ways and led to increasingly accessible education. Most American schools provide students with devices to supplement their education (1).

Through various websites and organizations, students can take online lessons or receive in-school credit for online courses (2, 3). At a higher level, many universities even offer entirely online programs for students interested in getting a college degree. During the COVID-19 pandemic, many schools and colleges moved to entirely online classes, with nearly 93% of American households with school-age children reporting some form of distance learning (4).

However, this increase in the presence of technology comes with downsides. Many students find it difficult to focus when surrounded by so many distractions, and cognitive function is shown to suffer in the presence of cell phones and laptops (5, 6). Texting in class has been shown to decrease comprehension of material by 10-20% (7). Research has also shown that multitasking in class (in the form of laptop use) leads to a decreased understanding of course material and classroom performance (8).

These are not the only sources of electronic distractions; for instance, many students in this study reported listening to music while working. The effect of music on focus, comprehension, and cognitive function is disputed. Some studies suggest that fast and loud music negatively impacts reading comprehension (9, 10). Other studies refute those findings, showing that music with a fast tempo increases the listener’s arousal and mood, increasing their awareness and cognitive performance (11). Further studies found that if the listener finds the music pleasant, it will increase their intellectual work performance (12). The impact of music can also depend on the listener. For those with a lower working memory capacity, music can serve as a “seductive detail” and a distraction (13, 14). Additionally, when listening to music, people classified as introverts have been shown to have worse reading comprehension than extroverts (15). Still, other studies argue that music does not affect recall or short-term memory, stating that listening to music provides neither assistance nor a handicap (16, 17).

Along with this conflicting research, students themselves hold a variety of personal opinions about the effects of electronic distractions. In order to better understand student perspectives, all students were given the opportunity to comment on how they felt electronics impacted their studying. Some students claimed that music was not a distraction but increased their focus and enhanced their performance by drowning out the extraneous noise of their environment. Some students also report that studying with music or social media present prevents them from getting bored while they work and stopping completely. Others use electronic distractions as an incentive for getting work done, allowing themselves a predetermined amount of screen time between completed assignments. Accordingly, there is research that shows the use of laptops in the classroom can improve student satisfaction and enhance academic achievement (18, 19). Most interestingly, many students in this study expressed sentiments along the lines of “It’s bad. I know it’s bad. But I can’t stop”, implying that they’re aware of the negative impact electronics have on their studying but can’t break the habit.

Habits are behaviors formed by the brain associating a cue or reward with a routine. For many students, their study routine is marked by opening a music or social media app (20). As electronic distractions incentivize studying, which may otherwise be an undesirable task, students may be unwilling to separate the two despite any negative effects from electronic distractions. This inability to break habits was at the core of this experiment. We formed this study around the idea that students would only be driven to change their habits if they directly witnessed how said habit was influencing them, regardless of what the effect was. This study hypothesized and found that if students witnessed first-hand the impact of electronic distractions on their cognitive function, they would be more likely to change their study habits than if they read statistics.

**RESULTS**

This study intended to determine a better method for getting students to change their study habits around electronic use (**Figure 1**). Once all subjects took the informational pre-intervention survey and the treatment group subjects completed their interventions, there was a wealth of data that could provide information on the impact of electronic distractions on verbal and visual memory.

The treatment group’s intervention was designed to show subjects through first-hand experience that their verbal and visual memory performance changed while in the presence of distractions. The order of the distractions was randomized for every intervention to avoid any effect on the scores, which is why some distractions have fewer scores in certain positions. We used a series of ANOVAs to compare subjects’ scores and found that for verbal memory, there was no significance to the order of the instrumental music (p = 0.560), lyrical music (p = 0.109), television (p = 0.989), or silence (p = 0.485) (Figure 2A). With another set of ANOVAs, I found the same for visual memory: order had no significant effect on student scores for instrumental music (p = 0.541), lyrical music (p = 0.176), television (p = 0.649), or silence (p = 0.117) (Figure 2B).

To determine if distractions affected cognitive function, I compared subject scores between distractions. There was no significant difference between visual memory scores across distractions(p = 0.556), but there was a significant effect of one distraction on verbal memory scores (p = 0.00052) (Figure 2C, 2D). Student verbal memory scores when listening tosilence were significantly higher than when other distractions were present, suggesting that silence had a beneficial effect on verbal memory scores.

I also tested to see if there was any significant difference in scores across grade and gender demographics. I used T-tests to compare female and male scores in the presence of each distraction. For verbal memory, there was no significant difference between scores in silence (t = 0.168, p = 0.860), lyrical music (t = 0.414, p = 0.671), instrumental music (t = 1.162, p = 0.109), or television (t = 0.253, p = 0.791) based on participant gender (Figure 2E). For visual memory, there was a significant difference in male and female scores for instrumental music (t = 3.262, p = 0.002) but not for silence (t = 1.400, p = 0.152), lyrical music (t = 0.449, p = 0.641), or television (t = 1.301, p = 0.257) (Figure 2F).

For grade demographics, I conducted a similar set of tests using ANOVAs to see if, within each distraction, there was any significant difference in scores across subject grades. For verbal memory, there was no significant difference between grades when listening to silence (F = -4.757, p = 1.000), lyrical music (F = 0.862, p = 0.470), instrumental music (F = 1.184, p = 0.330), or television (F = 1.933, p = 0.143) (Figure 2G). Similarly, for visual memory, there were no significant differences between grades when listening to silence (F = 0.805, p = 0.500), lyrical music (F = 1.142, p = 0.346), instrumental music (F = 1.311, p = 0.286), and television scores (F = 2.320, p = 0.092) (Figure 2H).

I compared the results of the follow-up survey to subject commitments directly after their interventions to determine which intervention was more effective. Initially, 60% of the control group committed to changing their habits (Figure 3A). After two weeks, those 12 subjects (63.16% now due to changes in the number of subjects) reported having maintained some change in study habits (Figure 3B). In the treatment group, 41.03% of subjects (16 subjects) committed to changing their habits directly after the intervention (Figure 3A). In the follow-up survey, 55.56% of the treatment group (20 subjects) reported having changed their study habits, more than those who had committed two weeks before (Figure 3B). Despite the lower percentage of subjects in the treatment group who immediately committed to changing their habits, four treatment group subjects changed their minds at some point in the two weeks and changed their study habits.

To determine significance, I used a z-test to compare the proportion of subjects in each group who made initial commitments to the proportion who changed their habits. This had a non-significant p-value of 0.4956 (Figure 3C). While not statistically significant, the practical significance of the results, including the reversed opinions of treatment group subjects, warrants further exploration.

Throughout the study, the number of subjects decreased. By the end of the study, I noticed the gender and grade demographics of the remaining subjects were very different from the group who initially agreed to participate (Figure 4A, 4B). To determine if the change in demographic was significant, I used a series of chi-square tests. The expected counts for these tests were based on the proportion of subjects in each group who initially agreed to participate in the study.

There was no statistical significance to the change in grade demographics from agreeing to participate and signing the consent form (p = 0.199), to completing the pre-intervention survey (p = 0.128), to completing their interventions (p = 0.142), to completing the post-intervention survey (p = 0.09). However, the p-values are quickly approaching significance, and there is practical significance to the sharp decrease in participation of subjects in 11th and 12th grade (Figure 4C). Similarly to subject grades, there was no significance to the changing proportion of female and male subjects at each stage of the experiment, from agreeing to participate to signing the consent form (p = 0.977) to completing the pre-intervention survey (p = 0.628), to completing their intervention (p = 0.766), to completing the follow-up survey (p = 0.382) (Figure 4D).

**DISCUSSION**

This experiment aimed to determine whether students would be more likely to change their electronic use behavior while studying if they witnessed its effects first-hand or learned by reading about them through an intervention. Two weeks after their interventions, subjects were then re-surveyed to determine if they had changed their studying habits.

The results show a statistically significant effect of electronic distractions on verbal memory following the seductive detail effectW. However, there was no effect on visual memory, discouraging the theory that electronic distractions, specifically music, negatively impact memory.

Additionally, neither the grade nor gender of the subject had a significant impact on their verbal and visual memory, with one exception. Male participants had significantly higher visual memory scores than females when listening to instrumental music. Further experiments would have to be done to determine the exact cause of this difference. However, it does not seem to be related to the actual gender demographics of the subjects – it isn’t occurring because there aren’t an equal number of female and male subjects. The chi-square analysis of the change in demographics throughout the experiment showed no significant difference in the number of male and female subjects at that stage in the study (p = 0.766) (Figure 4D).

While the change in grade demographics of subjects was not found to be significant, it is approaching significance, and the low number of subjects in grades 11 and 12 is worth noting. This may be an artifact of our relationship with the subjects. The study was multi-staged and required nearly a month of participation, and those subjects I knew personally (who I shared classes and spent time with) may have been incentivized to complete the study. To avoid this in future experiments, the study’s proctor and contact could be a non-student party.

The follow-up survey showed that the number of subjects in the treatment group who changed their study habits was greater than that of the control group. While the difference was not statistically significant, the results should be further explored with a larger sample size. The follow-up survey also showed that there were a number of subjects in the treatment group who, despite not having immediately committed to changing their habits, reported changing their habits in the long term. This implies those subjects reflected on their interventions and ultimately changed their minds, which may have been because the physical experience of the intervention was more memorable than a single online survey, which is what the control group did. Further surveying of the subjects about why they changed their habits could be informative, as well as surveying at various time benchmarks, such as one week, three weeks, and a month post-intervention.

Another study redesign could also help address discrepancies between the control and treatment groups’ interventions. The control group’s intervention was composed solely of facts about the negative effects of electronic distractions (Supp Fig 3). However, there were no measures to ensure the same in the treatment group; it is possible that the treatment group subjects could have seen an increase in their distraction scores compared to silence. This was the case for some subjects in the study (Table 1). This results in unbalanced interventions that could impact the short- and long-term results. For instance, 13 subjects in the treatment group saw lyrical music benefit their scores. In contrast, those in the control group were told that listening to lyrical music negatively impacts mental math skills, which could result in opposite initial commitments, not because of differences in the style of their interventions but because of quirks in the study design (Table 1). In order to address this difference, a fixed test that showed only negative results for certain distractions could be used to control more variables and decrease uncertainty. Additionally, including positive and negative facts about the effects of various electronic distractions could simulate a more realistic experience but would increase uncertainty around what influenced students’ decisions to change their study habits..

There were a few possible causes of error in this experiment. Due to the difficulty of simulating a standardized presence of social media or text message notifications for all subjects, cell phones were eliminated as a distraction for the treatment group, despite being the most common distraction reported. However, the effect of cell phones was still included in the control group’s survey (Supp Fig 3). This may have impacted the number of subjects who agreed to change their habits in each group because they learned about different distractions.

Another potential source of error was the decrease in participation throughout the study. While the chi-square tests showed that the changes in gender and grade demographics were not significant, they still could have biased the results. For instance, because there were more female subjects, and males did significantly better in visual memory, it may be that fewer treatment group subjects committed to changing their habits because fewer subjects saw the impact of distraction on visual memory (Figure 4B, 2F).

This project has the potential to discover more information about how to change the study habits of students. Conducting this study again with a larger sample size and correcting for any shifts in subject demographics would reduce gender or grade bias. Quantifying the “tipping point” at which subjects in the treatment group decide to change their habits would be interesting to investigate further. Subjects’ scores are numeric, so I could create a scale that shows the relationship between subjects’ scores and habit changes.

I’d also like to investigate both the longer-term effects of the intervention and how the age of the subject impacts their habits. The study only surveyed a change in study habits after two weeks, but subjects may forget or revert to old habits over time. I’d also like to investigate the effect of the intervention on different age groups of students because it is likely that the intervention will have a different effect on students who have had the habit of studying with electronic distractions for different amounts of time. This could provide key information on the optimal time to break detrimental study habits that seem inevitable.

I’d also like to use a wider variety of electronic distractions during these interventions. As mentioned earlier, I could not replicate the presence of a cell phone for each subject, but I’d like to simulate those conditions, along with other, more specific types of electronic distractions. For instance, are students more likely to change their habits around studying with music if the music they listen to is unfamiliar? Of a certain genre? How will their scores be impacted? Additionally, due to design constraints, the treatment group’s intervention tested subjects in the presence of just one distraction. However, the pre-survey of subjects showed that most studied with an average of two distractions present (Figure 5). This is an inconsistency with the real-world studying conditions of students, and I’d like to investigate if adjusting the treatment to include this would have any impact on the results.

**MATERIALS AND METHODS**

Every student at Mount Desert Island High School was contacted by email and asked for volunteers to participate in this experiment. Participants were given the details of the time commitment for the study. If interested, participants were told to reply via email, so participation was based on availability. The Maine State Science Fair’s Ethics Guidelines required every human subject for an experiment (and their parents if they were underage) to sign a Human Informed Consent Form before further participating (Supp Fig 1).

All subjects who filled out the consent form were then asked to fill out a pre-intervention survey online that provided background information on their study habits that informed the control and treatment interventions (Supp Fig 2). As they completed the survey, they were randomly divided into a “treatment” or “control” group.

Subjects in the control group were surveyed with a questionnaire that presented them with several facts about the impacts of smartphones on their cognitive function (Supp Fig 3). Every fact came with the question, “Did you already know this?” to ensure subjects read each one. The answer did not change the recording of their responses. At the end of the list, the subjects were asked, “After reading these facts, do you plan to change how you study in any way?”.

Subjects in the treatment group underwent an intervention where they completed verbal and visual memory tests (Human Benchmark) under different conditions. The verbal memory test assessed how many words the subject could remember over time. The visual memory test displayed an increasingly large pattern and then asked the user to recreate them. The conditions were determined based on the most commonly reported electronic distractions from the pre-intervention survey of all study subjects (Figure 5). The use of a cell phone was eliminated as a distraction because simulated experiences on social media or with text messaging were not standardizable (Figure 5). The finalized conditions were television (episode one of the TV show The Office), lyrical music (a mashup of 2000’s pop hits), and instrumental music (a Betawaves simulation from Spotify). Additionally, the tests were completed once in silence. The order of distractions was randomized to avoid an impact on scores.

Treatment group subjects scheduled their interventions an hour either before school, after school, or during the lunch block, based on availability, and used their school laptops. The intervention was carried out in an empty classroom. Subjects had 10 minutes per condition to complete both tests and record their scores on paper. After completing all tests, subjects often discussed their scores with each other. The proctor did not instigate or prevent discussion. Subjects were then asked, “After looking at your results, do you plan to change how you study in any way?”. They recorded their responses on their score sheets to avoid subjects influencing each other. Exactly two weeks after each intervention, both the treatment and control groups completed a final questionnaire asking to see if they had changed their habits (Supp Fig 4).

All surveys were created and distributed with Google Forms, and all results were linked to a Google spreadsheet. Scores and commitments were transcribed from paper score sheets to the Google spreadsheet by hand. Graphs and tables were created in Google Sheets and RStudio (using the ggplot2 package). T-tests, Z-tests, ANOVAs, and chi-square tests were completed in Google Sheets (ANOVA required the Google Sheets add-on XLMiner Analysis Toolpak).

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**REFERENCES**

1. Evans, Julie. “Project Tomorrow | Speak Up.” *Project Tomorrow*, 2020, [tomorrow.org/speakup/2020CB-Digital-Learning-during-the-Pandemic.html](https://tomorrow.org/speakup/2020CB-Digital-Learning-during-the-Pandemic.html).
2. Khan Academy. “About | Khan Academy.” *Khan Academy.*, 2021, [www.khanacademy.org/\_render](https://www.khanacademy.org/_render).
3. Virtual High School. “About Us.” *About Us*, 2021, [www.vhslearning.org/about-us](https://www.vhslearning.org/about-us).
4. McElrath, Kevin. “Nearly 93% of Households With School-Age Children Report Some Form of Distance Learning During COVID-19.” *The United States Census Bureau*, 26 Aug. 2020, [www.census.gov/library/stories/2020/08/schooling-during-the-covid-19-pandemic.html](https://www.census.gov/library/stories/2020/08/schooling-during-the-covid-19-pandemic.html).
5. Trafton, J. Gregory, et al. “Preparing to Resume an Interrupted Task: Effects of Prospective Goal Encoding and Retrospective Rehearsal.” *International Journal of Human-Computer Studies*, vol. 58, no. 5, May 2003, pp. 583–603. ScienceDirect, [doi.org/10.1016/S1071-5819(03)00023-5](https://doi.org/10.1016/S1071-5819(03)00023-5).
6. Shelton, Jill T., et al. “The Distracting Effects of a Ringing Cell Phone: An Investigation of the Laboratory and the Classroom Setting.” *Journal of Environmental Psychology*, vol. 29, no. 4, Dec. 2009, pp. 513–21. PubMed, [doi.org/10.1016/j.jenvp.2009.03.001](https://doi.org/10.1016/j.jenvp.2009.03.001).
7. Lawson, Dakota, and Bruce B. Henderson. “The Costs of Texting in the Classroom.” *College Teaching*, vol. 63, no. 3, July 2015, pp. 119–24. [doi.org/10.1080/87567555.2015.1019826](https://doi.org/10.1080/87567555.2015.1019826).
8. Fried, Carrie B. “In-Class Laptop Use and Its Effects on Student Learning.” *Computers & Education*, vol. 50, no. 3, Apr. 2008, pp. 906–14. ScienceDirect, [doi.org/10.1016/j.compedu.2006.09.006](https://doi.org/10.1016/j.compedu.2006.09.006).
9. Thompson, William, et al. “Fast and Loud Background Music Disrupts Reading Comprehension.” *Psychology of Music*, vol. 40, Nov. 2012, pp. 700–08. ResearchGate, [doi.org/10.1177/0305735611400173](https://doi.org/10.1177/0305735611400173).
10. Perham, Nick, and Harriet Currie. “Does Listening to Preferred Music Improve Reading Comprehension Performance?” *Applied Cognitive Psychology*, vol. 28, Mar. 2014. ResearchGate, [doi.org/10.1002/acp.2994](https://doi.org/10.1002/acp.2994).
11. Husain, Gabriela, et al. “Effects of Musical Tempo and Mode on Arousal, Mood, and Spatial Abilities.” *Music Perception: An Interdisciplinary Journal*, vol. 20, no. 2, 2002, pp. 151–71. JSTOR, [doi.org/10.1525/mp.2002.20.2.151](https://doi.org/10.1525/mp.2002.20.2.151).
12. Hiwa, Satoru, et al. “Functional Near-Infrared Spectroscopy Study of the Neural Correlates between Auditory Environments and Intellectual Work Performance.” *Brain and Behavior*, vol. 8, no. 10, 2018, p. e01104. Wiley Online Library, [doi.org/10.1002/brb3.1104](https://doi.org/10.1002/brb3.1104).
13. Sanchez, Christopher A., and Jennifer Wiley. “An Examination of the Seductive Details Effect in Terms of Working Memory Capacity.” *Memory & Cognition*, vol. 34, no. 2, Mar. 2006, pp. 344–55.Crossref, [doi.org/10.3758/BF03193412](https://doi.org/10.3758/BF03193412).
14. Rey, Günter Daniel. “A Review of Research and a Meta-Analysis of the Seductive Detail Effect.” *Educational Research Review*, vol. 7, Dec. 2012, pp. 216–37. ResearchGate, [doi.org/10.1016/j.edurev.2012.05.003](https://doi.org/10.1016/j.edurev.2012.05.003).
15. Furnham, Adrian, and Lisa Strbac. “Music Is as Distracting as Noise: The Differential Distraction of Background Music and Noise on the Cognitive Test Performance of Introverts and Extraverts.” *Ergonomics*, vol. 45, no. 3, Feb. 2002, pp. 203–17. PubMed, [doi.org/10.1080/00140130210121932](https://doi.org/10.1080/00140130210121932).
16. Rauscher, Frances H., et al. “Music and Spatial Task Performance.” *Nature*, vol. 365, no. 6447, 6447, Oct. 1993, pp. 611–611. Nature, [doi.org/10.1038/365611a0](https://doi.org/10.1038/365611a0).
17. Lehmann, Janina A. M., and Tina Seufert. “Can Music Foster Learning – Effects of Different Text Modalities on Learning and Information Retrieval.” *Frontiers in Psychology*, vol. 8, Jan. 2018, p. 2305. PubMed Central, [doi.org/10.3389/fpsyg.2017.02305](https://doi.org/10.3389/fpsyg.2017.02305).
18. Driver, Michaela. “Exploring Student Perceptions of Group Interaction and Class Satisfaction in the Web-Enhanced Classroom.” *The Internet and Higher Education*, vol. 5, no. 1, Jan. 2002, pp. 35–45. ScienceDirect, [doi.org/10.1016/S1096-7516(01)00076-8](https://doi.org/10.1016/S1096-7516(01)00076-8).
19. Stephens, Benjamin R. “Laptops in Psychology: Conducting Flexible In-Class Research and Writing Laboratories.” *New Directions for Teaching and Learning*, vol. 101, 2005, pp. 15–26. LearnTechLib [www.learntechlib.org/p/100673/](https://www.learntechlib.org/p/100673/).
20. Gardner, Benjamin, et al. “Making Health Habitual: The Psychology of ‘Habit-Formation’ and General Practice.” *The British Journal of General Practice*, vol. 62, no. 605, Dec. 2012, pp. 664–66. *PubMed Central*, [doi.org/10.3399/bjgp12X659466](C:\\Users\\hrher\\Downloads\\doi.org\\10.3399\\bjgp12X659466).

Diagram

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Figure 1. Experiment overview, approved by the Maine State Science Fair Institutional Review Board.

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**Figure 2. Analysis of the results from the treatment group**. (A) Boxplots showing the effect of the order of distractions on verbal memory scores, the p-value for instrumental music = 0.560, lyrical music = 0.109, television = 0.989, silence = 0.485. (B) Boxplots showing the effect of the order of distractions on visual memory scores, the p-value for instrumental music = 0.541, lyrical music = 0.176, television = 0.649, silence = 0.117. (C) Boxplots showing the effect of distractions on visual memory scores, p-value = 0.556. (D) Boxplots showing the effect of distractions on verbal memory scores, p-value = 0.00052. (E) Chart comparing verbal memory scores between genders, the p-value for silence = 0.860, lyrical music = 0.414, instrumental music = 0.109, television = 0.791. (F) Chart comparing visual memory scores between genders, the p-value for silence = 0.152, lyrical music = 0.641, instrumental music = 0.002, television = 0.257. (G) Chart comparing verbal memory scores between subject grades, the p-value for silence = 1.000, lyrical music = 0.470, instrumental music = 0.330, television = 0.143. (H) Chart comparing visual memory scores between subject grades, the p-value for silence = 0.500, lyrical music = 0.346, instrumental music = 0.286, television = 0.092.

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**Figure 3. Analysis of the post-intervention surveys of all**. (A) A chart comparing the percentage of subjects in each group who committed to changing their habits directly after their intervention. (B) A chart comparing the percentage of subjects in each group who reported having changed their habits two weeks after interventions. (C) A chart comparing the number of subjects in each group who initially committed to habit change and who carried out some habit change over the next two weeks. Significance (p = 0.4956) was determined using a z-test.

Table

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**Figure 4. Meta-analysis of subject participation**. (A) A chart showing the number of subjects in the experiment by grade. (B) A chart showing the number of subjects in the experiment by gender. (C) A table showing chi-square values from changes in grade demographics throughout the study. (D) A table showing the chi-square values from a change in gender demographics throughout the study.

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**Figure 5. Results of the pre-intervention survey**. (A) A histogram showing the number of electronic distractions subjects self-reported having present while studying. (B) Chart showing the most common electronic distractions subjects reported having present while studying.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Instrumental music | | Lyrical music | | Television | |
| Benefit | Harm | Benefit | Harm | Benefit | Harm |
| Verbal Memory | 17 | 52 | 13 | 56 | 11 | 58 |
| Visual Memory | 23 | 46 | 21 | 48 | 24 | 45 |

**Table 1**. A table showing the number of subjects in the treatment group who saw a benefit or harm to their verbal and visual memory scores under other conditions, as compared to silence.