Reading Comprehension Suffers Under the Effect of A Television Distraction

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Abstract

In a Bayesian meta-analysis on 65 previous studies, Vasilev, Kirkby, and Angele (2018) found a significant impact of auditory distractions on reading performance. My experiment investigates people's performance on a reading comprehension task with a TV show in the background, but unlike previous studies, I also track participants' comprehension of the show to see whether there is a tradeoff between performance in reading comprehension and show comprehension. Participants did not answer fewer comprehension questions correctly with the TV-show distractor, but participants with the distractor took much longer to complete the task. There was also not a significant correlation between reading comprehension score and TV-show comprehension score.

Television Distraction and Reading Comprehension Performance in University Students

The experiment conducted and explained in this paper explores whether reading comprehension scores and time are affected, if at all, by a constant auditory stimulus in the background in the form of a television show. Also, by asking the participants questions about the television show itself, it aims to see whether having to switch back and forth between the show and the reading passages brings about a negative correlation between the score of the reading comprehension test, and the score of the television show quiz.

Literature Review

In Furnham et al. (1994), designating between introverts and extroverts was done through the Eysenck Personality Questionnaire. A sample of 20 was chosen based on the results of this test, "10 introverts (mean = 7.4) and 10 extroverts (mean = 19.5)." (Furnham et al, 1994, p. 707) The reading comprehension tasks given in this experiment came from a Graduate Admission Test book, which gave 2 passages with 400 words and six multiple choice questions each. The participants were given 15 minutes to complete the test in the presence of a television show, and in silence. Afterwards, the participants self reflected on how distracted they felt the television show was on a scale of 1 through 5.

It was found that there was a significant effect in score that showed that both introverts and extroverts did better in silence. Furnham et al. (1994) state that "this experiment showed a

main effect for the treatment condition showing that subjects performed better on a reading comprehension task when it was done in silence than when it was done in the presence of a television programme." (pg. 709) The study makes further observations based upon this data, such as that "not only may television affect the quantity of intellectual activity carried out, but also the quality of that activity." (Furnham et al. 1994, pg. 709)

Ylias and Heaven (2003) had their participants complete "two Graduate Management Admissions reading comprehension passages, one in silence and one under conditions of television distraction" (pg. 1072) In a similar result to Furnham et al. It was found that "the comprehension of both Is (introverts) and Es (extroverts) was better in the silent than distracting condition." (Ylias and Heaven, 2003, pg. 1074)

Vasilev et al. (2018) note that while many studies have researched how exposure to various auditory stimuli may affect reading process, there have been "a fair number of inconsistent findings...that can explain how auditory distraction during reading occurs." (pg. 567) When it comes to background speech, Vasilev et al. (2018) explain that "background speech has specific acoustic properties that make it salient to listeners. In addition, if the background speech is intelligible, it also carries semantic meaning." (pg.568) Due to this semantic content, background speech is often thought of as more distracting than just meaningless noise. Background speech that is intelligible has been found to disrupt reading comprehension in "numerous experiments," such as Armstrong et al. (1997), Martin et al,. (1998), and Sörqvist, Halin, & Hygge, (2010) , to name a few. (Vasilev et al., 2018, pg. 568) These studies generally find that the processing of semantic meaning of the speech is what can possibly cause this disruption.

Vasilev et al. (2018) draw upon previous experiments to explain the semantic properties of speech, and how they can be disruptive. Martin et al. (1998) found that English speech was more distracting than Russian speech to English listeners, as well as that a stream of random words spoken was more distracting than a stream of random nonwords that was spoken. (pg. 571) Martin et al. (1998) explained that "reading comprehension requires understanding the meaning of the text. Therefore, the semantic properties of the irrelevant (English) speech can interfere with building the semantic representations of the text that is being read." (Vasilev et al., 2018, pg. 571) This is referred to as the semantic-interference hypothesis.

Similarly to Martin et al. (1998), the interference by process theory was developed by Marsh et al. (2008) The semantic-interference theory suggests that the semantic properties of speech cause interference in reading comprehension tasks, and the interference by process theory states that "distraction occurs because processing the meaning of the background speech depends on the same process used for extracting the meaning of the text that is being read." (Vasilev et al., 2018, pg. 571)

The results of the meta analysis done by (Vasilev et al., 2018) showed that there was a small negative effect on reading comprehension when looking at previous studies tests for background noise, background speech, and background music. However, background speech had a stronger negative impact on reading comprehension than the other two background distractions. (Vasilev et al., 2018)

The papers referenced above focus on the effect of a background speech distraction on reading comprehension score. In the experiment I conducted, I wanted to expand on this by not only testing reading comprehension score while distracted, but also how a television distraction

affects the time taken to complete said test. On top of this, I wanted to find a way to test the participants to see if they could focus on the test and the show at the same time, by testing for a correlation between score while distracted versus the television show quiz. My hypotheses are as follows:

1. Participants will score significantly lower on a reading comprehension test when distracted.
2. Participants will take a significantly longer amount of time to complete the reading comprehension test when they are distracted.
3. There will be a significant negative correlation of the amount of questions answered correctly on the reading comprehension test versus the number of questions answered correctly about the television show they were watching.

Method

Subjects

The subjects were six unique males in the age range of 19 to 23 years old.

Materials

Each of the subjects completed two reading comprehension tests that were put together. One in silence, and one while being distracted. The reading comprehension tests were taken from an online GRE Verbal Reasoning example test. The tests were found on https://gre.graduateshotline.com/reading_comprehension_practice.html. "Test 1" was made by using the two example passages from example test 1, and the first example passage from example test 2. "Test 2" was made by using the two example passages from example test 3, and the first example passage from example test 4. This was to ensure similar difficulty between

both combined tests. Each test included 3 short reading passages which had 3 resulting questions each, totaling 9 questions for each test. When testing with a distraction, a computer playing the television show and a pair of headphones were provided.

Procedure

Subjects were tested one at a time. Either they tested in silence, or they were tested while wearing headphones in front of a computer playing the television show. The show used in this study was Season 8, Episode 10 of "It's Always Sunny in Philadelphia," titled "Reynolds vs. Reynolds: The Cereal Defense." This episode was chosen due to its lack of reliance on previous episodes, and because many plot important events occur within the first few minutes of the episode. Which test the participants would be provided for each trial would be randomized. There was no time limit on the test, subjects were allowed to take as much time as they needed. However, if they finished before 9 minutes while taking the distracted test, they were required to watch until that time so they would be able to answer the plot related questions. During the distraction test, the television show was started at the beginning of the test, and was kept on at the same volume until the subject had finished the test. Responses were written on a provided piece of paper. Following completion of both tests, participants were asked 7 plot related questions about the television show they had watched, as well as to give their own opinion on how they felt the show distracted them, if at all. Subjects were also asked to give their preference for background noise when working on their own assigned work.

Results

Name	Distraction	Reading Score	Reading Time	Show Accuracy
A	noShow	5	7:57	5
A	Show	4	9:23	5
B	noShow	4	7:17	4
B	Show	6	9:04	4
C	noShow	8	8:40	1
C	Show	5	7:40	1
D	noShow	6	8:16	5
D	Show	1	12:59	5
E	noShow	2	13:46	5
E	Show	4	16:05	5
F	noShow	6	7:02	4
F	Show	7	8:23	4

Table 1. Data from the six participants tested in the study

The mean number of answers correct when testing without a distraction was 5.16 out of 9 whereas the mean for testing with a distraction was 4.5. However, a paired t-test did not find this difference to close to significant, $p = .59$

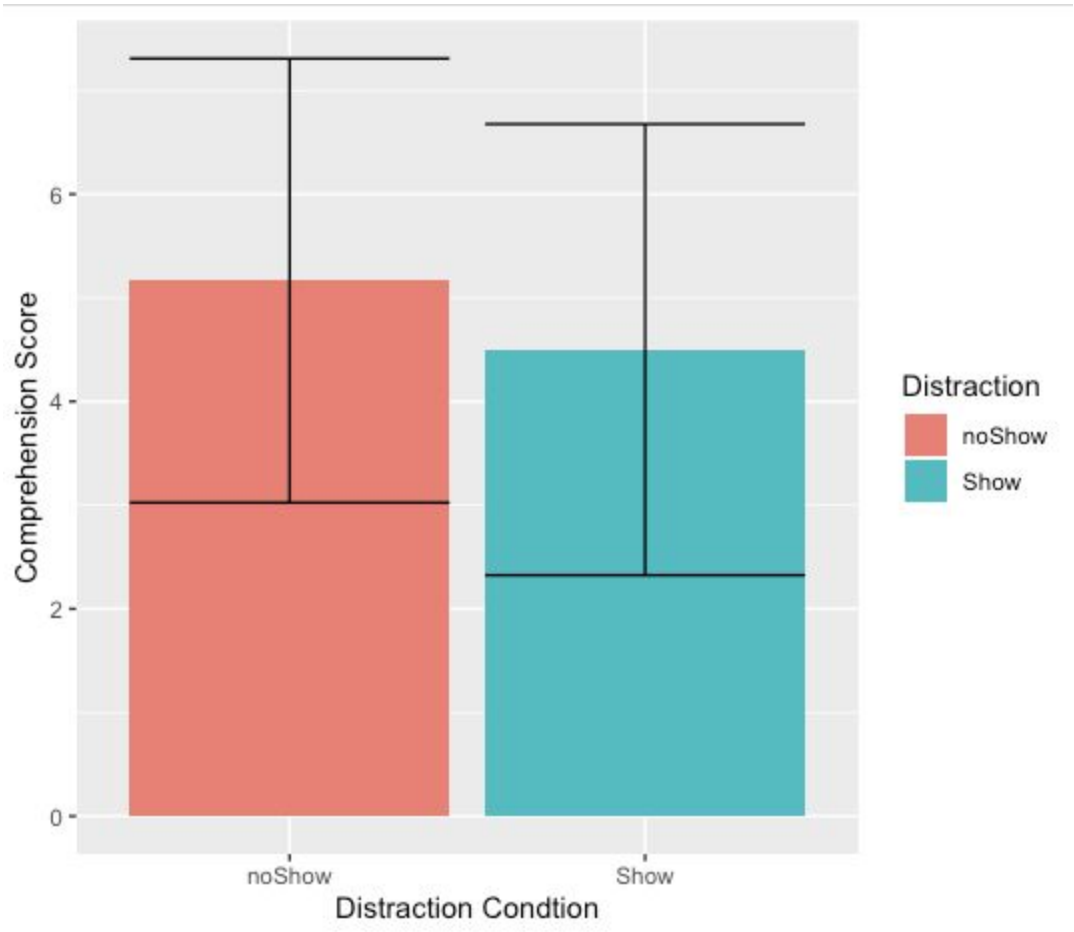

Figure 1. Comprehension score by Distraction Condition

After doing a within subjects t-test, the p-value of reading score by distraction came out to be p=0.5946, which is well above the p-value needed to show significance. In this case, there was not a statistically significant difference in comprehension score while being distracted.

When looking at the data for the amount of time taken to complete the test, the mean amount of time taken when not distracted was 8.83 minutes, as opposed to 10.59 minutes while distracted.

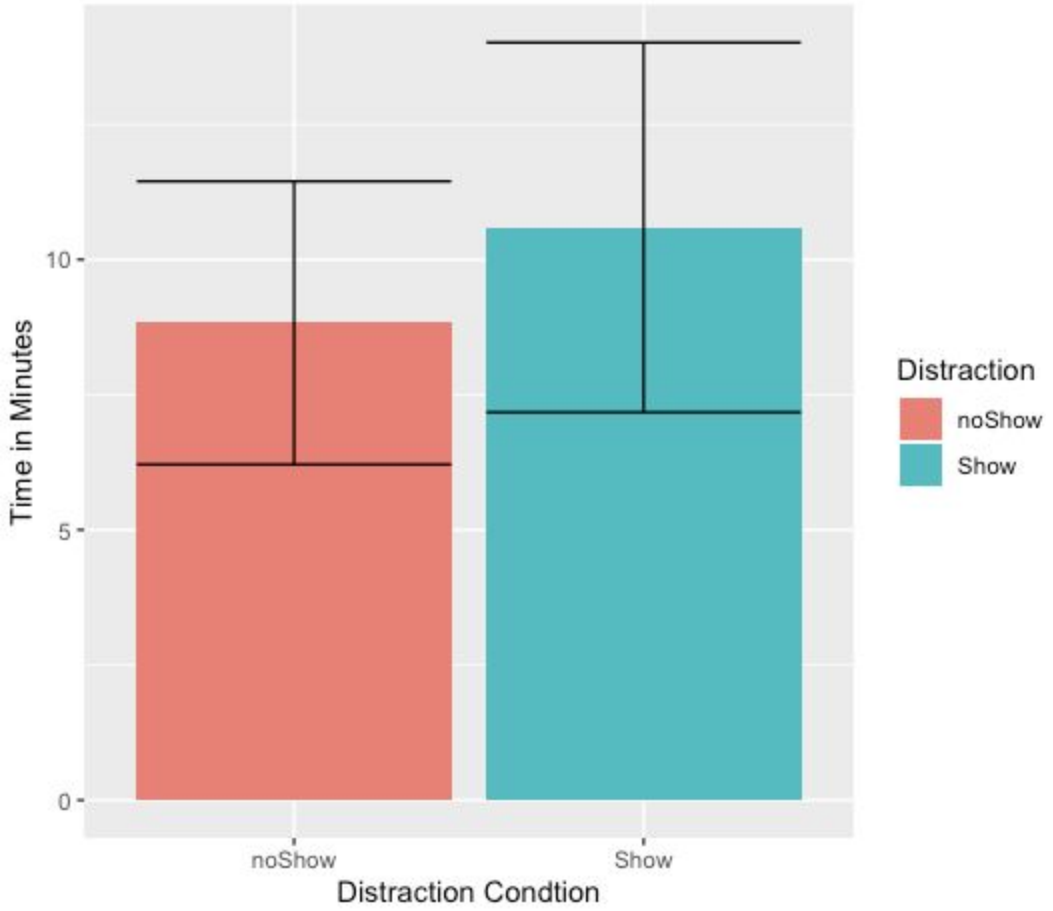

Figure 2. Time in minutes to complete the test by distraction condition

After a within subjects t-test was done, the p-value for this test was p=0.0655, which is once again not statistically significant. However, despite this I can say there was a noticeable difference in the amount of time taken to complete the test while distracted. In this case, it's highly probable I'll find a difference with a study of greater statistical power.

When doing a correlation test for the distracted reading score compared with the show accuracy score, I got a correlation of -0.37 with a p-value of p=0.4657. So, while it may be a strong correlation, it was not a significant correlation between the number of questions answered correctly in the comprehension test, vs the number of questions answered correctly about the

show. This correlation may not be confirmed, but this can be attributed to the small number of participants.

Discussion

Looking at the data collected from the t-tests, we can see that the distraction of the television show had a noticeable effect on the amount of time it took to complete the test, but it was not significant. There was also not a significant effect on the number of questions answered correctly. A strong correlation was found between the reading comprehension score when distracted and the score of the television quiz, but it was also not significant.

What is interesting to note is that by looking at the data, we can see that some participants were able to score better while being distracted, while some participants did much worse. It seems that while there may be a general trend in terms of score, the effects seem to vary individually. When I asked the participants their preferred work situations on their own time, most of them answered that they at the very least, liked to listen to instrumental music, while others preferred listening to familiar music, or have a familiar television show in the background. This lines up with the theories brought up in Vasilev et al., (2018). When listening to instrumental music, the semantic properties of English are not present, potentially allowing for better focus. The idea of listening to music or a television show that is already familiar to the person may also have an effect of less distraction as compared to a television show that is completely new to the viewer.

An outlier I wanted to specifically point to is participant C, who was the only person to complete their test while distracted sooner than they did while not being distracted. However, if

we look at their results, we can see that they did worse on the test while being distracted, and more importantly, were only able to answer 1 out of the 7 questions about the show itself. When I asked this participant about their experience, they noted that they completely tuned to show out, and tried to focus entirely on the test, resulting in a poorer score while distracted and simultaneously not knowing what happened during the show.

Possible limitations of this experiment include the small number of participants, as well as no strict testing place. Ways to improve this test can include accounting for gender and age differences, as well as giving a longer test to clearer results. Having a small number of participants likely affected the significance of the results, as we found noticeable differences in time spent while distracted as well as a strong correlation between testing while distracted and trying to focus on the television distraction.

Another test I could add to this is a correlation test between the television show accuracy compared with the time taken to complete the test while distracted. It would be interesting to see if the participants who took longer to complete the test were paying attention to the show more, and thus would be able to answer more questions correctly on the television show quiz.

In conclusion, this research did appear to find substantial support for the idea that it will take longer to complete a reading comprehension test while distracted, but it did not find support for the idea that the score will be lower while distracted.

References

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