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Two birds with one stone: The use of screen-time multitasking and its effect on attention and
comprehension scores in college students

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Abstract

In today's world, the use of media outlets has become an essential facet of daily life. One of the largest forms of media is distributed through the television streaming company Netflix. Netflix has become the world's central line for screen-time entertainment, with over 62 million subscribers utilizing its streaming services (Mander, 2015). The present study asked whether screen-time multitasking affects attention and retention abilities in academic performance. In order to examine the main effect of media multitasking, I conducted a randomly assigned, single blind between groups study that manipulated the use of media multitasking and comprehension testing. An experimental group of undergraduate students (N=10) were told to complete a reading passage and follow-up comprehension questions while having a comedic five minute segment of "The Office" play in the background. The control group of undergraduate students (N=10) read the passage and took the comprehension test in a silent setting, without media influence. The results indicated that the experimental group required significantly longer times to complete the reading and comprehension questions ($p < .013$) In addition, the group exposed to media multitasking scored significantly lower on the comprehension questions ($p < .035$) and reported lower levels of confidence in relation to overall comprehension of the reading passage ($p < .04$).

Keywords: multitasking, media, comprehension, attention

Two birds with one stone: The use of screen-time multitasking and its effect on attention and comprehension scores in college students

In today's world, the use of media outlets has become an essential facet of daily life. One of the largest forms of media is distributed through the television streaming company Netflix. Netflix has become the world's central line for screen-time entertainment, with over 62 million subscribers and 65% of Americans from age 16-24 utilizing its streaming services (Mander, 2015). Netflix is commonly used as a leisure activity; however, recent concerns of binge-watching has occurred. According to Wallenstein (2013), reports showed that approximately 10% of viewers made it through an entire season of *Arrested Development* in 24 hours once the new season was released. Because Netflix is such a popular form of media consumption among college-aged students, the link between screen time and academic performance has become a topic of interest. Students have been recorded using Netflix as a background activity while studying or completing homework assignments. The present study investigated whether Netflix use multitasked with completing a reading comprehension test affected attention, measured in amount of time needed to read the passage, and comprehension scores in college students

Past research has observed the direct influence of media use on academic tasks. Levine, Waite, and Bowman (2007) studied the association between more time spent instant messaging and difficulty in concentration on less stimulating tasks—such as academic reading. The results of the study indicated that the amount of time spent instant messaging was significantly associated with higher ratings of distractibility in academic tasks. Whereas, the amount of time reading books was negatively associated with distractibility. Lee, Lin, and Robertson (2010), researched college students' abilities to obtain information in multitasking conditions with television programming. In this study, participants were given a timed reading comprehension

test in three conditions: Silence (only reading), Background multitasking (reading with a non-tested video shown simultaneously, a documentary), and Test multitasking (reading with a tested video shown simultaneously, a sitcom) conditions. Students in the Background multitasking group was told they would be tested only on the reading comprehension questions, not the video. However, six questions about the video were given to the students afterward. The Test multitasking group was informed that they would be receiving a test on the reading and video. The findings found that participants in the Background condition performed as well as those in the Silence condition. In addition, when participants were tested on their video comprehension, the group in the Test condition performed significantly better than Background condition group. Therefore, results of this study illustrated that cognitive load functions as an important role in relation to how much information is retained while multitasking.

Working memory is part of the short-term memory, concerned with the perceptual and linguistic processing. Consequentially, working memory skills can often affect learning and retention in various subjects such as reading and math. Therefore, the study presented by Uncapher, Thieu, and Wagner (2015) relates to the present study of media multi-tasking and comprehension. The researchers investigated the relationship between media multitaskers, working memory, and long-term memory. Two working memory tasks were presented to participants with randomly assigned distractor loads (shapes and objects that did not fit a pattern). It was found that those who had reported being heavy media multitaskers displayed lower working memory performance, despite whether an external distraction was present or absent. The results also indicated that lower working memory performance predicted lower long-term memory performance. In addition, those with higher multitasking behaviors had a significant association with wider attention scope and higher attention impulsivity.

Consequently, these subjects had a weakened ability to draw on the past because of the wider attentional scope, combined with their performance, propagates forward to yield lower LTM performance. The study concluded that media multitasking is associated with diminished cognitive abilities such as retaining information in the mind and retrieving information from memory.

Researchers have also strived to observe the possible connection between distractibility and attention problems in relation to media-multitasking behavior. Moisala et al. (2016) assessed young adults (age 13-24 years) in self-reported daily media multitasking (MMT), speech-listening and reading task performance, and brain activity during task performance. Both tasks required maintained attention with the presence of a distracting stimuli, and brain activity was recorded during the task performance using an fMRI. The results illustrated that a higher MMT score was significantly associated with worse performance on the task performance and increased prefrontal brain activity. The results of the study indicated that daily media multitasking is associated with distractibility and requires more involvement of brain areas involved in attention-processing. In addition, frequent media multitasking in real life did not create any advantages in multitasking in the research setting.

While several studies have observed the associations between media multitasking, attention, memory, and retention, few studies have examined the casual relationship between media multitasking and academic performance, through experimental design. The present study asked whether screen-time multitasking (in the form of watching Netflix while completing a reading assignment) affects attention and comprehension abilities in academic performance (RQ1). In order to examine the main effect of media multitasking, I conducted a single blind between-groups study that manipulated the use of media multitasking and comprehension

testing. An experimental group was told to complete a reading passage and follow-up comprehension questions while having a five minute segment of “The Office” play in the background. The control group read the passage and took the comprehension test in a silent setting, without media influence. Because Netflix episodes are typically used for entertainment purposes, I hypothesized that having Netflix on while completing the comprehension test would create higher distractibility and less attention dedicated to the reading passage, resulting in a longer period of time needed to complete the passage (H1). In addition, I hypothesized that media multitasking in general would result in less retention of the information in the reading passage, resulting in lower reading comprehension scores (H2).

Method

Design

I conducted a simple between-groups experimental study. The independent variable was the presence, or absence of, media stimulus while completing a reading comprehension test. The dependent variables of the study was attention, retention, and comprehension of the reading passage. These factors were measured by the amount of time needed to complete the reading passage, and the amount of correct responses.

Participants

There was a total number of 20 participants, 14 females and 6 males, from a small midwestern liberal arts college. Participants had an age range of 18-22 with the average age being 20.25. This was a single-blind study in which the participants were unaware of the study’s hypotheses. The participants voluntarily agreed to participate in the sample through convenience sampling.

Materials

The reading passage and comprehension questions were developed by the American College Testing organization and distributed on a paper copy. Those in the control group had a blank desktop image on the laptop screen in front of them. The experimental group was constituted by completing the same reading passage and comprehension questions, while having a five minute segment of “The Office” playing. The television episode was played on a laptop screen in front of the participant.

Procedure

A pilot study was conducted before the experiment ensued. This was used to test the effectiveness of the manipulation and to ensure that there would not be floor or ceiling effects. Two participants, separate from the final study, were randomly assigned to one of the conditions and completed the experiment. Both participants were able to fully complete the experiment in the time allotted and scored in the middle range for comprehension scores and confidence levels, ensuring the absence of floor or ceiling effects. After this, the participants (n=20) were randomly assigned by block randomization to either the control condition (no media stimulus) or the experimental condition (including media stimulus). After randomly assigning each participant to a control or experimental group, I distributed the reading comprehension test. The participants in the control group were told they had up to 5 minutes to complete the reading passage and complete five reading comprehension questions. The time needed to complete the assignment and the number of correct responses was recorded. The participants in the experimental group completed the same reading passage and answering the reading comprehension questions while watching an episode of “The Office”. The experimental group was also given up to 5 minutes to complete this task. The time needed to complete the assignment and the number of correct

responses was recorded. After the comprehension test, participants were asked to rate how confident they felt they had comprehended the reading passage on a 5 point Likert-scale (1= Not at all, 5= Completely). The data for both conditions were recorded and analyzed using SPSS.

Results

In order to determine the possible effect of multitasking on attention and reading comprehension, I conducted four independent sample t-tests involving time needed to read the passage, total time required to complete the reading passage and comprehension questions, number of questions correct, and confidence ratings. The data concluded that there was a large effect size with statistically significant differences between the two conditions in relation to time needed to read the passage [$t(18)=2.551$, $p<.02$, $d=1.1257$] with a 95% CI of [8.164, 84.356] and total time required to complete the reading passage and comprehension questions [$t(18)=2.747$, $p<.013$, $d=1.1407$] with a 95% CI of [6.211, 46.589]. Participants in the experimental group took an average of three minutes and seven seconds to read the passage and four minutes and 49 seconds to complete the entire experiment. In contrast, participants in the control group took an average of two minutes and 21 seconds to read the passage and four minutes and 21 seconds to complete the entire experiment.

In addition, the t-tests revealed a large effect size and significant differences between number of comprehension answers correct [$t(18)= -2.209$, $p<.035$, $d=1.0209$] with a 95% CI of [-2.112, -.088] and confidence ratings [$t(18)= -2.209$, $p<.04$, $d=.9881$] with a 95% CI of [-1.561, -.039]. On average, participants in the experimental condition scored an average of three questions correct out of five, and rated their comprehension of the passage as 3.1 out of five (1=Not at all, 5=Completely). Participants in the control condition scored an average of 4.1 questions correctly and rated their comprehension confidence as 3.9 out of five.

Lastly, I examined the bivariate relationship between number of comprehension questions correct and comprehension ratings in order to determine if there is an existing association. The results concluded a large effect size with a statistically significant positive association between these two variables ($r=.771$, $p=.000$). Participants who rated their confidence of comprehension high tended to score higher on the reading comprehension, while those with lower confidence scores tended to score lower on the reading comprehension questions.

Discussion

Because media outlets such as Netflix are particularly stimulating, I hypothesized that having Netflix on while completing the comprehension test would create higher distractibility and less attention dedicated to the reading passage, resulting in a longer period of time needed to complete the passage and comprehension questions (H1). My results supported this hypothesis because participants exposed to media while completing the task required significantly longer amounts of time to read the passage and answer the comprehension questions. These results mirror past research showing that the use of media, while completing a task, results in longer time periods needed to complete the academic, less stimulating task (Levine, Waite, & Bowman, 2007). In addition, I hypothesized that media multitasking would result in less retention of the information in the reading passage, resulting in lower reading comprehension scores (H2). The results also supported this hypothesis, illustrating that those in the experimental condition received significantly lower scores on the reading comprehension questions, in comparison to the control condition. The study also revealed that there was a significant association between confidence levels of overall comprehension and number of correct responses. Demonstrating that those who felt less confident about their overall comprehension of the passage typically scored lower than those confident with their overall comprehension. This is especially interesting

because the experimental condition reported significantly lower levels of comprehension confidence than the control condition.

The internal validity in this study possessed various strengths and weaknesses. Because I conducted a between-groups study with random assignment into the two conditions, the chances of selection effect was reduced. In addition, having a control group helped establish covariance and eliminate potential confounds, such as inherently gifted readers being concentrated in one condition. The study also establishes temporal precedence, because the manipulation was presented before the dependent measurements were recorded. However, a potential confound that could have affected the results of the study are demand characteristics. It is possible that those in the experimental group were able to assume the study's hypothesis, resulting in the participants changing his or her behavior in either accordance to or against the study's hypothesis.

The present study did not have strong external validity. This is because participants were recruited through a convenience sample, rather than random sampling. The motivation to complete this experiment may have altered the attitudes of the participants, affecting the end results. In addition, the sample is not particularly generalizable past college-aged students because ages ranged only from 18-22. The sample size was also relatively small (N=20). This makes the sample, overall, not very representative or generalizable to a wider population.

The construct validity of the experiment was rather strong. A pilot study was conducted before the actual experiment to test the effectiveness of the manipulation and to avoid floor or ceiling effects. The reading passage and comprehension questions were standardized through the American College Testing organization. In addition, each of the participants in the experimental group was exposed to the same five-minute episode of "The Office". In order to test

distractibility, the time recorded to complete the reading passage and questions was measured with a reliable stopwatch and a consistent method of starting and stopping the time. Construct reliability may have been compromised because the Likert-Scale used to measure the confidence of comprehension (“On a scale from 1-5, 1 being ‘Not at All’ and 5 being ‘Completely’, how well do you feel you comprehended the passage”) was not a standardized scale proven with a Cronbach’s Alpha score.

The statistical validity was decently strong in this study. I utilized SPSS to gather descriptive, bivariate, and difference of means calculations. In relation to a Type I error, the study produced p-values indicating a low probability of a false positives and large effect sizes. The statistical data could be strengthened with a larger sample size, possibly helping create more concise, accurate data and reduce the chances of Type II error.

A future study could examine the possible effect of the types of media influence on multitasking. This could include observing whether different genres of television (i.e. comedy, action, or educational) produce different levels of distractibility. Because comedies and action material tend to be fast-paced and loud, I would hypothesize that the condition watching comedies and action episodes would demonstrate higher distractibility outcomes (longer time spent reading a passage and less comprehension) than the condition exposed to educational material. However, I would also hypothesize that having educational material playing in the background would still produce negative effects on attention and comprehension, in comparison to the control group.

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