Reading and Distraction

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ABSTRACT

This study investigates the effects of distractions on researching a topic. In particular, the effects of the use of secondary sources along with the primary source of a piece of information. The use of a second hand source may be beneficial for a researcher for a simplistic understanding of a subject, but may lead to a tangential path of understanding if the secondary source does not remain parallel to the primary source. In this study, participants will be given a piece of primary source material and secondary source material that may or may not affect their understanding of the primary source material.

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1 INTRODUCTION

In an era dominated by digital interfaces, individuals across various sectors—from academia and personal endeavors to formal professional roles—strive for optimal efficiency in the face of constant distractions. These challenges manifest in numerous ways, but this study specifically addresses the influence of digital distractions on comprehension and productivity. A significant part of contemporary work occurs on computer screens; however, not all on-screen content enhances our productivity. Surprisingly, some elements pull our focus away, diminishing our ability to fully understand and engage with a given text, especially when devoid of its proper context. This research explores the nature, frequency, and impact of such digital interruptions, particularly on commonly used workspace devices. We put forth the hypothesis that specific on-screen elements or alerts can substantially disrupt concentration and efficiency. By examining how distractions influence individuals' ability to grasp text in varying contextual settings, this study seeks to identify strategies to cultivate a more streamlined and distraction-free digital workspace.

2 BACKGROUND

In the seminal work by Ellen Rozek and her team, an intricate experiment was designed utilizing eye-tracking technology to meticulously evaluate the behavior of both older and younger adults as they encountered distractors during reading tasks [Ellen Rozek and McDowd 2012]. Their objective was not merely to identify the presence of distraction but to understand the depth of its influence and the variations in response between different age groups. The outcomes of Rozek et al.'s investigation revealed insightful patterns. Younger adults demonstrated adaptability, gradually learning to ignore recurrent distractors as they processed the texts. In contrast, older adults consistently found these distractors more challenging, indicating potential age-related inhibitory deficits. Given the proliferation of digital distractions in our contemporary era—from smartphone notifications to multifaceted multimedia elements in online content—it becomes imperative to understand these fundamental behavioral patterns. The insights from Rozek et al.'s research provide a crucial baseline. As we progress further into the digital age, we can use this foundational knowledge to anticipate and understand how individuals might interact with and be influenced by modern digital distractions.

In the age of digital connectivity, attention spans are continually challenged by an array of distractions, particularly with the rise of social media platforms . Jia-Qiong Xie's seminal study, focusing on patterns of excessive social media use, has provided profound insights into how digital habits can influence our broader behavioral tendencies [Xie et al. 2021]. Xie's findings serve as a foundation to hypothesize that these patterns, particularly excessive social media interactions , can predict an individual's susceptibility to distractions in various scenarios . One such area of interest is reading; this research extension aims to explore the likelihood of a subject's attention diversion when engaged with text of appropriate length. The premise is to abstract and apply Qiong's results to gauge distraction tendencies in reading contexts.

In a comprehensive study led by Sihui Ma and colleagues at Virginia Tech, the research spotlighted the dual-role smartphones play in academic settings. While their primary investigation centered on the utilization of smartphones as "clickers " to boost classroom engagement, a startling discovery was made: post-instructional use of smartphones led to 42% of students veering off to non-academic activities almost immediately. This behavior lingered for 28% of the students even five minutes afterward. This data underscores the conundrum of smartphones being both invaluable tools and sources of distraction. Building on Ma's foundational work, the present research seeks to apply this understanding to diverse settings beyond the educational sphere. [Sihui Ma and Stewart 2020].This serves as a background for which this study is built on, extrapolating their findings to other environments other than just using clickers.

In Kaitlyn E. May's article, the effects of media multitasking on individuals, especially in settings where singular focus is expected, are meticulously examined [May and Elder 2018]. Delving into the implications of concurrent media usage on academic performance,

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the research paints a comprehensive picture of how modern consumption habits might influence cognitive outcomes. This study, drawing from May's findings, aims to discern an acceptable threshold for distraction, thereby offering insight into potential strategies for balanced media multitasking in academic and other focused environments.

Dina Kanaan's research delves into the intricate dynamics of interruptions under varied workload conditions, emphasizing the pronounced decline in performance in multi-faceted, multitasking scenarios [Kanaan and Moacdieh 2022]. Kanaan employed eye-tracking techniques to understand the immediate aftermath of interruptions, particularly in tasks that demand vigilant monitoring and change detection. This work aligns seamlessly with our study's objectives, as we seek strategies to mitigate the impacts of distractors in professional settings. Recognizing that completely eliminating these distractors might inadvertently harm performance, Kanaan's insights provide a foundational understanding, enabling us to better navigate the challenges presented by interruptions and achieve optimal outcomes.

3 METHODOLOGY

3.1 Apparatus

The eye tracking data of each participant is collected via a Gazepoint GP3V2 pupil comeal reflection eye tracker mounted under a Dell P2422H with a 60 Hz refresh rate for both the eye tracker and monitor. The monitor has a resolution of 1920x1080 pixels. The eye tracker device has 0.5-1 degree of visual angle accuracy. The eye tracker is calibrated using a 5 point calibration process for each participant. The software for the computer used in this experiment are as follows: Windows 10, Gazepoint Control x64, and PsycoPy.

3.2 Stimuli

The experiment consists of 4 screenshots. All stimuli consist of 2 halves, one which is the target, and one which is the context. The target half consists of a piece of text of which the participant must interpret. The context half consists of a piece of text that may or may not contain context that is congruent with the target text. The context may be an explanation of the target text or a summary of the target text. Some stimuli will have the positions of the target and context flipped.

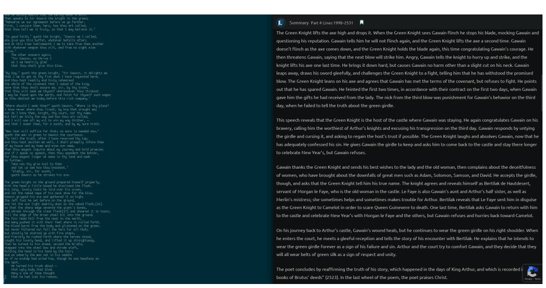

Figure 1: Sir Gawain and the Green Knight passage with incongruent context

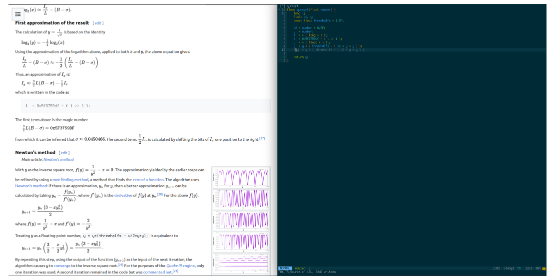

Figure 2: Section of code with congruent context

3.3 Subjects

The participants include 5 undergraduate students of Clemson University. None have any vision impairments other than the use of glasses. The Gazepoint GP3V2 is not affected by glasses or contacts.

3.4 Experimental Design

This is a 1x2 (Congruent/Incongruent) within-subject experiment. The experiment consists of six rounds of data collection. The participant will view each stimulus for 30 seconds and will be given 30 seconds to answer a multiple choice survey question after each round. The question will as the participant on what they saw on the stimuli. Each of the answers of the survey question will pertain to either a certain part of the stimuli, or be unrelated to the stimuli. For the answers that pertain to the stimuli, one will describe the target text and at least one will pertain to the context.

The participant may anticipate the location of the target text in the stimuli. This is mitigated for as the position of the stimuli is random for each trial.

3.5 Procedures

For each participant, the participant is briefed about the study, the time limits they have in each trial, and the survey question ad the end of each trial. The participants will be told about the Gazepoint GP3V2 eye tracker, the data collected for the experiment, and the question asked at the end of each trial. They are told that they will have 30 seconds to read the contents of the screen and what the target text will look like. They are then told that they will have 30 seconds to answer one question on the content that the saw, along with instructions on how to answer the question.

After the participant agrees to the experiment, the participant is then guided through a 5-point calibration process in order to track their eye movements with the eye tracker. After calibration, they are reminded to hold still for the eye tracker in order to not lose calibration. Once the participant is ready, the experiment will start, moving through all stimuli. The stimuli will immediately be shown for 30 seconds. After 30 seconds, the stimuli will be removed from the display and multiple answer choices will be shown for 30 seconds before the next trial begins. Once the participants are finished, they will be asked to leave while the data is compiled.

3.6 RESULTS

We collected the data generated by Psychopy for analysis. We ran an ANOVA calculation on the correctness of the answers of the

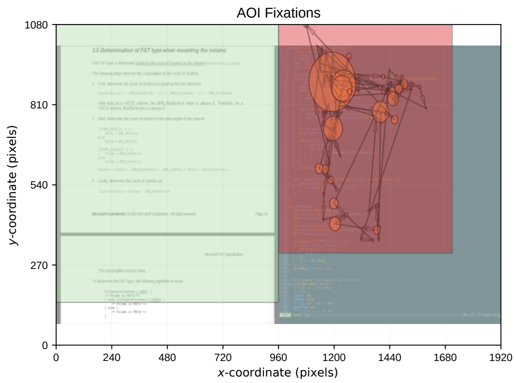

Figure 3: Stimulus 02 Area of Interests and Fixation of a participant focused on the assigned task

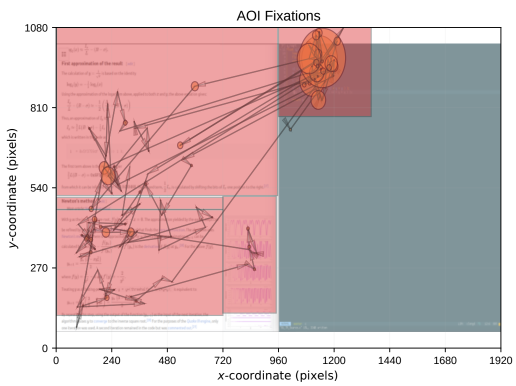

Figure 4: Stimulus 01 Area of Interests and Fixation of a participant wandering between context and target

participants, akin to grades on a quiz, and the total fixations on either the target or context piect. All participants seem to have a decent amount of appreciation of the context piece when told to focus on the target piece with the mean amount of fixations for the context piece being 65.8 and the mean target fixations being 225.2. The variance for the respective types of images being 951.7 and 48037.7. The resulting grading average came out to be 80% with a variance of 4.72% variance. Even with their appreciation of our efforts to distract each participant, they seem to be not affected by the

3.7 Discussion

In our original hypothesis, we assumed that the presence of a distracting element in a task driven environment, or a work environment, would have a significant effect on how a subject would perform at their given task. It seems we were wrong. The result of our analysis did not show significant performance hits to a subject's productivity. We theorize that it may be due to the difficulty of the tasks we devised or due to the contents of the context images being too closely related to the target information. Another variable, although uncontrollable, would be a participant's prior knowledge, or background, on the topics covered in the stimuli. This factor would most likely skew the performance figures of this experiment. We recommend that future research of this subject to control the participant pool more tightly in order to eliminate the chances of subjects having prior experience of the stimuli's content.

3.8 Conclusion

From the data we have gathered from this study, we reject the null hypothesis of our study (where the context image would have a significant impact of the performance of the participant). At the significance level of $a = 0.05$ with the p-value of $p = 0.044427$, $p < a$. Our team has concluded that there is insufficient evidence that distractors, as described in this study, have little to no effect on the performance of people in a task driven environment.

Although the results of this study may not be satisfactory, as per our original hypothesis. The work put into this study will serve as a foundation for future studies that may use eye-tracking technologies to study the effects of the massive amount of stimulation that is to come in the 21^{st} century.

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