Eye Movements While Zoning Out During Reading:
Implications for Mind Wandering and Metaconsciousness

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Abstract

This study analyzes eye movements while zoning out during reading in order to come to more general conclusions about the phenomenon of mind wandering. The eye movements of 15 participants were recorded as they read 300 sentences from a historic psychology text. Participants were prompted intermittently to report whether they were zoning out as they read. Focused participants exhibited shorter forward fixations, longer regressions, and a greater proportion of saccades to regressions than unfocused participants, and individuals aware that they were focused displayed longer saccades than unaware participants. These results indicate that zoning out while reading results in both high and low-level deficits for readers and that zoning out is both frequent and disruptive to the reading process.

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As you read this thesis, it is possible, or even likely, that you might find yourself interrupted by inner thoughts or feelings, distracted by involuntary memories, or diverted by unrelated ideas. This phenomenon, called *mind wandering*, is defined as a shift of attention away from a primary task toward internal information. Researchers have labeled mind wandering as the most ubiquitous and pervasive of all cognitive phenomena; it is thought to occupy 15% to 50% of the time for many of the things we do (Smallwood & Schooler, 2006).

Although mind wandering is a common phenomenon, it has remained virtually unexplored in psychological literature until recently. Studies have investigated associated concepts—such as task-unrelated thought (Smallwood, Baracaia, Lowe, & Obonsawin, 2003), task-related images and thoughts (Giambra, 1995), stimulus-independent thought (Antrobus, 1968), mind pops (Kvavilashvili & Mandler, 2004), and zone outs (Schooler, 2002)—but a 2006 paper by Jonathan Smallwood and Jonathan Schooler serves as the first attempt to present these elements under the broader category of mind wandering.

In this paper, Smallwood and Schooler posit that every kind of mind wandering can be integrated into the executive model of attention, which states that one frontal cortex-based system is responsible for the management of many cognitive processes. When mind wandering occurs, executive control involuntarily shifts away from a primary task to the processing of internal information, such as personal goals, fantasies, or other musings. This basic understanding represents the extent of scientific knowledge of the mind wandering process, however; many questions remain unanswered.

This thesis is primarily focused on two sets of these unanswered questions. First, what exactly happens when the mind wanders? What sorts of low-level and high-level cognitive processes are involved? Can this knowledge be used to predict when a person's mind might be

wandering? Second, do individuals display different levels, or even a continuum, of mind wandering? If so, how do these levels of attention differ?

Mind Wandering and Reading

Mind wandering is characterized by an involuntary shift of executive control from a primary task to a secondary task. As attentional resources are limited, allocation of resources toward internal information means fewer resources are available to complete the original task. If the task is cognitively demanding, performance will be decreased.

One activity that is frequently affected by mind wandering is reading, a process that is a common and critical part of our day-to-day lives. The work of many researchers has shown that reading is the key to academic and professional success (e.g., Carrell, 1989; Grabe, 1991; Stoller, 1994; and Hacquebord, 1994; as cited in Uljin & Salager-Meyer, 1998). Thus, individuals who regularly experience mind wandering during the reading process may encounter problems ranging from, among other things, inconvenience and frustration to a reduction in employment opportunities and compensation.

Schooler, Erik Reichle, and David Halpern (2004) call the specific phenomenon of mind wandering during the reading process "zoning out." Zoning out while reading is defined as a state during which "your eyes may continue moving across the page, the phonology of the words may continue sounding in your head, yet your mind may be elsewhere" (p. 203). Studies have shown that even talented readers are susceptible to zoning out on a regular basis (Glenberg, Wilkinson, & Epstein, 1982). Indeed, most readers are colloquially familiar with this phenomenon; individuals describe becoming suddenly aware that they have turned two or three pages of a textbook without processing the text, or staring blankly at a word for seconds or minutes without realizing they are doing so.

This thesis examines the phenomenon of zoning out while reading to answer questions about mind wandering. The frequency and importance of reading in everyday life means zoning

out while reading carries important implications for mind wandering and metaconsciousness, that is, awareness of one's own conscious state.

A Cognitive Perspective on Reading

Over the last 40 years, researchers have developed many different models to explain the complicated and necessary process of reading, but they have all agreed that reading is an interaction between processes of language and processes of thought (Ulijn & Salager-Meyer, 1998). A common model employed in the cognitive literature is a bottom-up approach that begins with the perception of meaningful lexical units which are integrated into more complex semantic representations.

The reading process begins when an individual fixates on a word (Cornelissen, 2005). As soon as the visual system records a string of letters, the word recognition system is switched on-line. Not all letters of a word are equally visible to the reader, however; the most visible letter is the one that is fixated upon. Other letters may or may not be seen depending on (a) the distance between the letters and fixation location, (b) whether the letters are outer or inner letters of the word, and (c) whether the letters lie to the right or the left of the fixation position. As a result, fixations on a word naturally fall on what is considered to be the optimal viewing position (OVP), located between the beginning and middle of the word (Brysbaert & Nazir, 2005).

Although researchers agree on how sentence elements are fixated, they disagree on how individual word-forming characters are recognized. A majority of investigators believes that the abstract identity of each individual character comprises the basic perceptual unit that underlies character recognition. Some researchers (e.g., Healy, 1981), however, emphasize a hierarchical feature test in which readers focus instead on the shape, or envelope, of the letters, followed by closer discrimination between additional features.

One model for understanding the processes following character perception is the *Unitization model* (Drewnowski & Healy, 1977). This model suggests that after individual

characters are perceived, subjects process text in parallel on a number of different levels, with familiarity facilitating the appropriate level of processing. Once a conceptual unit such as a word has been identified at a given level, readers proceed to the next unit without completing the processing of units at the lower levels of the hierarchy; for example, once the letters *t-h-e* have been perceived as the word *the*, the individual identities of the three characters that comprise this word are summarily ignored.

Further research by Uljin and colleagues (Uljin, 1981; Strother & Uljin, 1989; Uljin & Strother, 1995) builds upon this analysis by generalizing the reading process as three stages: (1) a reader makes a superficial syntactic analysis, (2) the reader focuses on a conceptual analysis supported by a lexical analysis, and (3) if their comprehension is not yet complete, the reader attempts a more thorough syntactic analysis.

In other words, assuming the lexicon and context, or "gist," of a sentence is clear, a sentence does not need appropriate syntax in order to be understood. For the most part, automatic processes are at work at the beginning of the sentence comprehension process, and more advanced cognitive control only comes into play when necessary to properly interpret the syntax of the prose (e.g., Potter & Lombardi, 1990, 1998).

For instance, in the sentence, “The young boy threw the tennis ball to the dog,” a reader is likely to observe the syntactic basics—a noun followed by a verb followed by a prepositional phrase, but overlook function (helper) words such as *the*. Then the reader utilizes cognitive control to identify the important words in the sentence (e.g., *boy*, *ball*, *dog*) and how they fit together. If the reader does not have complete comprehension of the sentence at this point, he or she will reevaluate those helper words to determine the sentence’s meaning.

As zoning out primarily affects tasks requiring executive control, this model implies that an individual zoning out will spend a longer period of time on the conceptual and lexical analysis step since fewer attention resources will be on hand to execute this analysis. The relative scarcity of

resources also suggests that the conceptual and lexical analysis is more likely to fail when an individual is zoning out, suggesting that these individuals are also more likely to engage in a syntactic reanalysis which might carry a significant time cost.

Eye Movements During the Reading Process

The linguistic and cognitive complexities of reading are evaluated by many different methodologies. Eye-tracking recording and modeling (e.g., E-Z Reader; Reichle, Pollatsek, & Rayner, 2006; or Yang, 2006) has been one useful tool for scientists seeking to analyze these issues (see Rayner, 1998, or Duchowski, 2002, for a review). Most individuals think that their eyes move smoothly across lines of text, with occasional pauses or movements backward, but eye-tracking studies have shown that this is far from the case-- the perceptual, cognitive, and motor processes that guide eye movements are both surprisingly coordinated and complex (Reichle, 2006; Schnitzer & Kowler, 2006).

Eye movement research is predicated on the assumption that a skilled reader has one primary goal as he or she reads: to take in as much information as possible while still retaining an adequate level of comprehension. The two primary factors that constrain a reader are: (a) the high visual acuity required to identify printed words on the fovea (e.g., Lee, Legge, & Ortiz, 2003); and (b) the considerable variability in the time required to identify different words (e.g., Rayner & Pollatsek, 1989; as cited in Reichle & Laurent, 2006). As a result, it is of particular interest to eye movement researchers to explore the eye movements that represent these two constraints.

Eye movements during reading are traditionally separated into two types of descriptions: *saccades* and *fixations*. A saccade is a rapid and ballistic movement, usually 20-35 ms long in duration, that shifts the eyes' focus from one position to another. The pauses at these different positions are called fixations, that generally range from 200-300 ms in duration. The fixations are responsible for extracting visual information from the page. Reichle and Laurent (2006) describe this process to be "like a slide show in which each slide (i.e., the information available from a given

viewing location) is visible for about a quarter of a second" (p. 390).

Both saccades and fixations are important because they represent two dissociable decision-making mechanisms. Saccades signify *where* attention is focused within a word or sentence, and are determined by lower-level processes occurring in the brain. Fixations, however, indicate *when* the reader wishes to move his or her focus to another area, and thus fall in the domain of higher cognitive control (Vainio, Hyönä, and Pajunen, 2009).

A regression is a particular type of saccade that moves the eyes back to earlier parts of the text and makes up around 15% of a reader's saccades (Mitchell, Shen, Green, & Hodgson, 2008). Frazier and Rayner (1982) have shown that regressions generally occur during problems with higher level linguistic processing. When a reader comes across a lexically ambiguous word or phrase, a regression is launched to reexamine already-perceived text.

Regressions are valuable in eye movement research because they are indicative of higher level processing. If an individual displays a large number of saccades, but a significant proportion of these saccades are regressions, this suggests that reading difficulties are occurring despite high-level systems being on-line.

Eye Movements During Zoning Out While Reading

Because different states in awareness could be reflected by changes in eye-movement saccades and fixations, research of eye movements during zoning out while reading can help us better understand mind wandering in general. Differences in eye movements can offer clues as to whether high or low-level cognitive processes are occurring during each state.

We know that during reading individuals make a superficial syntactic analysis that is then followed by a conceptual analysis and possibly a full syntactic analysis. If zoning out leaves fewer attentional resources to be devoted to a reading task, it is expected that individuals who are zoning out will take longer during the conceptual and lexical analysis step and potentially have difficulties during the initial syntactic analysis.

If this is the case, we would expect to see longer fixations during the reading process, because fewer attention resources are available to process sentences efficiently. Likewise, we would expect a greater number of saccades in zoning out individuals, representing additional resources being utilized during an initial syntactic analysis. Of course, we still need to distinguish what those attention states are and how to identify when they occur during reading.

Research on Zoning Out While Reading

We have only found two studies that experimentally examine zoning out while reading. Schooler, Reichle, and Halpern (2004) examine a person's awareness of zoning out and the impact of zoning out on reading performance. Participants read the opening chapters of *War and Peace* and indicated with a keypress every time they noticed themselves zoning out. Some participants signaled when they were zoning out with a button press, while the other half of participants were prompted randomly by the computer for their awareness level. Each time participants were found to be zoning out, they were asked whether or not they were aware of the fact that they were zoning out at that time.

Participants zoned out approximately 5.4 times on average per 45 minute reading period and were "caught" zoning out by the probe 1.6 times per session. This means that 13.2% of the time participants were zoning out, they were not aware that they were doing so to report it.

In a second experiment, Schooler et al. determine whether participants were genuinely zoning out when they reported doing so. An experiment similar to the first was conducted, but some participants were asked to answer a text recognition question every time they reported zoning out (other participants were asked these recognition questions at chance). In addition, in order to eliminate potential confounds introduced as a result of the probe schedules, Experiment 2 introduced six different conditions to vary interruption type.

The results of Experiment 2 corroborated the results of Experiment 1. Participants were found zoning out approximately 23% of the time. Participants provided significantly lower

comprehension levels when they were zoning out when compared to participants who were given text recognition probes at random. Schooler et al. suggest this indicates that a relationship exists between a report of zoning out and comprehension performance; in other words, individuals that report losing focus reliably seem to be doing so. In addition, this second experiment is important because it suggests that individuals' self-reports provide a reliable and valid experimental variable. When a participant indicates that he or she is unfocused, researchers can accept this judgment as accurate.

Schooler et al.'s research is important because it provides a methodology for examining zoning out during reading as well as evidence that zoning out can affect reading comprehension. More importantly for the current study, it also shows evidence for three discrete states of awareness: (1) focused, (2) unfocused but aware of this lack of focus, and (3) unfocused and unaware of this lack of focus.

Ball (2009) was interested in using the same methodology to determine if linguistic analysis and semantic analysis were possible during these three attention states. Participants in his study were intermittently interrupted to report the state of focus (as defined by Schooler et al., 2004). In addition, participants were required to recall the general gist or purpose of the sentence on half the prompts and to recite back as many words as they could remember from the sentence on the other half of the prompts.

Experimenters rated the accuracy of responses to the semantic gist questions from 0-10 and the responses to the lexical recitation questions on the proportion of correct sentence words recalled. Significant differences were found in responses to both gist recall and lexical recall questions for focused (not zoning out) and unfocused (zoning out, aware or unaware) levels of awareness. Readers were both more accurate on the verbatim (see Figure 1a) and gist (see Figure 1b) measures when focused. A significant difference was also discovered between unfocused and aware vs. unfocused and unaware responses for recitation recall. Participants' responses to each of

the prompts can be found in Figure 1c. Ball's results again support the distinction first proposed by Schooler et al. (2004) regarding three possible states of attention while reading. His research suggests that a linguistic analysis can suffer from zoning out but that conceptual understanding is most affected when the individual is unaware of this zoning out.

The Present Research

The aim of this study was to present a reading task similar to that used in Schooler et al. (2004) and Ball (2009) but that recorded participants' eye movements to obtain an implicit measure to accompany the explicit one (i.e., responses to the prompts) provided in their studies. This will allow us to further validate the three states identified in previous research.

Method

Participants

Sixteen undergraduate students (11 women and 5 men) participated in exchange for course credit. One participant was unable to complete the study in the allotted time and was excluded from subsequent analysis. All participants were treated in accordance with the "Ethical Principles of Psychologists and Code of Conduct" (American Psychological Association, 1992).

Apparatus

The eye-tracking machine used in this experiment was a Tobii x50 eye tracker, a standalone model from Tobii Technology AB, Stockholm, Sweden. The x50 eye tracker has 0.5-0.7 degree accuracy, 0.35 degree spatial resolution, and a framerate of 50 Hz. The eye tracker was connected to an Acer microcomputer with a 19" monitor displaying a 1280 x 1024 pixel resolution and situated beneath the monitor spatially. The experimenter sat on the other side of the computer monitor from the participant, watching a status indicator on a second monitor to ensure the eye tracker was successfully picking up the participant's eye movements. Figure 2 illustrates this setup.

The sentence corpus consisted of 300 consecutive sentences taken from Chapter 10 of William James' *The Principles of Psychology* (e.g., "The parts of our wealth most intimately ours are

those which are saturated with our labor"). We selected these sentences because of their appropriate level of readability for college-level subjects (Flesch-Kincaid Grade Level = 11.8) and because they had been successful at zoning out similar participants in a previous study (Ball, 2009). These sentences ranged from four to 63 words long (mean length = 30.9 words). Appendix A contains the full text of this selection.

These 300 sentences were displayed on the aforementioned monitor in 28 point Arial typeface to participants via the Tobii Studio software package, available from Tobii Technology AB.

Procedure

Participants were seated approximately 30" in front of the computer, one at a time, and familiarized with the eye-tracking machine. After a five point calibration procedure within Tobii Studio, participants left-clicked the mouse to advance through a series of instruction slides. Participants were instructed that they would be reading a number of sentences excerpted from a work of William James and would be occasionally prompted to report their level of focus while reading the preceding sentences. When prompted, participants would press one of three different keys: (1) if they were paying attention to the preceding sentence; (2) if they were zoning out but were aware of the fact that they were zoning out; and (3) if they were zoning out and were unaware of the fact that they were doing so.

Participants were also notified that they would be taking a brief comprehension examination following the sentences. This deception was included in order to encourage participants to approach the reading with a similar seriousness to that of reading for class or other assignment.

The 300 sentences were displayed one sentence at a time on the screen and the participant left-clicked the mouse to advance to the next sentence. At specified times during the sentence presentations, the word "Focus?" would appear in the center of the screen as an indicator to the participant to report his or her level of focus. This occurred 30 times during the presentation of the text and the prompts were spread after 5 to 15 sentences had passed so that the participant could

not accurately predict when each prompt would occur. The number of sentences per prompt was kept constant over across participants. The participants reported their level of focus by pressing the 1, 2, or 3 key on the numeric keypad or number keys of the keyboard. The number of sentences between each prompt was kept constant across participants; the sentences immediately preceding a prompt are indicated by an asterisk (*) within the Appendix.

The resulting raw eye-tracking data can be conceptualized as a series of *x* and *y* coordinates over time. Because the focus prompt most accurately corresponds with a participant's level of focus for the sentence immediately preceding the prompt, the following statistical analyses were performed on the 30 prompt-preceding sentences (hereafter "interest sentences").

The location and duration of each fixation occurring during the reading of each interest sentence was monitored. The length of each saccade was determined from the different fixation locations. At the sentence level, the number of words per sentence and participant's response to the following focus prompt was also recorded.

Results

The data from five participants were excluded from analysis because the quality of their eye-tracking recording was not reliable enough to be included in the statistical analysis. A 2-way ANCOVA was conducted on fixation duration with number of sentence words as a covariate and state as the independent variable. A significant state effect was obtained, $F(2, 6915) = 9.64$, $p < .001$. The results indicated that the average fixation duration was significantly lower in the focused condition (M = 273 ms, SD = 150 ms) than in either unfocused conditions unfocused and aware (M = 293 ms, SD = 192 ms) and unfocused and unaware (M = 294 ms, SD = 195 ms). Average fixation duration in the unfocused and aware condition was not found to be significantly different from the unfocused and unaware condition.

In order to determine whether this effect existed in the forward or backward fixations, all line-level fixations following a saccade to the left were eliminated from analysis and a 2-way

ANOVA was conducted on fixation duration with number of sentence words as a covariate. This analysis of variance showed that the state effect of participant response was significant, $F(2, 4370) = 8.72$, $p < .001$ for the forward fixations but not for the backward (regression) fixations, $p > .05$.

In addition, a 2-way ANCOVA was conducted on saccade length with number of sentence words as a covariate and state as the independent variable. Results indicated that the effect of participant response was significant, $F(2, 5682) = 15.92$, $p < .001$. Results indicated that the average saccade length was significantly different in the focused condition (M = 145 pixels, SD = 100 px) than either the unfocused and aware condition (M = 138 pixels, SD = 91 pixels). In addition, saccades in the unfocused and aware condition (M = 134 pixels, SD = 88 pixels), however, were significantly shorter than in the unfocused and unaware condition (M = 152 pixels, SD = 103 pixels). No difference was found between focused and unfocused and unaware conditions.

In order to determine whether this effect existed in forward or regressive saccades, all line-level saccades to the right were eliminated from the analysis and a 2-way ANCOVA was conducted on fixation duration with number of sentence words as a covariate and state as the independent variable. This analysis of variance showed that the effect of participant response was significant, $F(2, 1251) = 4.15$, $p = .016$ for regressions but normal left-to-right saccades, $p > .05$.

The proportion of regressive eye movements to saccades was then calculated by dividing the number of regressions per sentence by the total number of saccades for each sentence. An ANOVA was conducted on the proportions of regressions to saccades for the three attention states. Results indicated that the proportion of regressions was higher for focused states (M = 24.13%, SD = 7.53%) than unfocused and aware (M = 18.09%, SD = 5.67%) and unfocused and unaware (M = 19.5%, SD = 7.05%) states, $F(2, 10) = 5.42$, $p = .025$. There was no difference between the two unfocused states.

Discussion

The results to this study support and clarify the original hypothesis. Individuals reporting

focus (i.e., were not zoning out) during the reading task exhibited: (a) shorter forward fixations (as seen in Fig. 4); (b) longer saccades (Fig. 5); and (c) a greater proportion of saccades to general regressions (Fig. 6). Additionally, individuals aware that they were zoning out exhibited, on average, shorter saccades than individuals who were not aware that they were zoning out. The distribution of responses to the focus prompts in this study (as shown in Fig. 5) are very similar to those found in Ball (2009) and displayed in Figure 1c, emphasizing the reliability of this methodology and suggesting that the eye tracker did not affect an individual's focus.

Research by Vainio, Hyönä, and Pajunen (2009) indicates saccades represent low-level cognitive processes, whereas fixations are indicative of high-level functioning. Regressions, unlike standard saccades, are more frequently exhibited during higher level linguistic processing. This research, applied to the results of this study, suggests that focused participants are spending less time each sentence on higher-level processing and are engaging in longer, more efficient saccades. The greater proportion of regressions to saccades indicates that processing is occurring at a higher linguistic level. For unfocused participants, longer forward fixations correspond to longer high-level processing times, and shorter saccades suggest less efficient low-level processing.

Uljin et al. (1981) characterize the reading process as comprising three steps: (a) a superficial syntactic analysis, followed by (b) a conceptual analysis supported by a lexical analysis, followed by (c) a full syntactic analysis only if the sentence is not yet comprehended. As focused participants display shorter forward fixations and longer regressions, it is likely that they are engaging in the reading process with relative ease; they are able to quickly comprehend the syntactic framework of the sentence at a low level, and are applying adequate attentional resources to analyze the sentence conceptually and lexically. The greater percentage of regressions indicates that when processing errors do occur during lexical analysis, the individual is able to quickly and efficiently backtrack to troublesome spots within the sentence.

Likewise, the longer forward fixations and shorter regressions of unfocused participants

indicate inefficiencies throughout the reading process. Longer fixation times indicate one of two things: (a) that the availability of fewer attentional resources necessitates longer processing times, or (b) the system is more likely to engage in the full syntactic analysis step due to incomplete comprehension of the sentence. The smaller percentage of regressions suggests less frequent higher linguistic processing.

The finding that unfocused and aware individuals display longer saccades than unfocused and unaware individuals is more difficult to integrate into this model. It is possible that the longer saccades in zoned out and unaware individuals represent a failure to emerge from the superficial syntactic analysis step of Uljin et al.'s model.

Although the shorter forward fixations and longer regressions of focused individuals suggest the availability of attentional resources, alternative explanations for these eye movements exist. If Uljin et al.'s model does not completely describe the reading process, it is possible that the fixation, saccade, and regression lengths and frequencies may correspond to a cognitive process unrelated or marginally related to executive functioning, such as working memory encoding or retrieval. As any sort of successful reading necessitates adequate cognitive control, however, it is unlikely this is the case.

These findings have greater implications for the topic of mind wandering and metaconsciousness, as well. First, these results reinforce the notion that mind wandering primarily impacts high-level cognitive processes. Nevertheless, as Smallwood and Schooler (2006) observe, mind wandering is more likely to occur when a primary task is simple or automatic, but when mind wandering occurs in demanding tasks, it is associated with deficits in performance. Reading for comprehension, though, fits both of these categories—it is both highly familiar and automated, but is also of moderate difficulty due to the load it puts on working memory. This means that mind wandering during reading is both likely and costly.

When the mind wanders, it experiences additional difficulty completing tasks that would

ordinarily be simple or automatic. As evidenced by the eye movements during reading, even cursory steps, such as the superficial syntactic analysis executed during the reading process, can experience less efficient functioning.

The implications this study poses for different states of attention are less clear. Although differences were found in saccade length between zoning out and aware vs. zoning out and unaware conditions, additional research is necessary in order to distinguish the differences between these possible different states. As zoning out and unaware was the least frequent attentional state, however, it is possible that this study did not have the necessary statistical power to observe significant results.

The primary limitation to this study is that it does not include any specific semantic or linguistic analyses—all analyses run were on a spatial or temporal level. A full understanding of eye movements during the reading process may require an examination at the sentence, word, or even character level. As virtually no research has been done on eye movements during zoning out or mind wandering, though, such semantic or linguistic analyses was outside the scope of this thesis; it is recommended that future studies on this topic examine these variables for a more detailed picture of the mind wandering phenomenon.

Additionally, eye movements that were out of the range of the eye tracker (i.e., when the participant fixated off the computer screen) were eliminated from analysis. It is possible that looking away from the sentences might signify some manner of focus or lack thereof, similar to how an individual might break eye contact during a conversation in order to recall or consider pertinent information. It is recommended that further analysis take these fixations into account.

It is recommended as well that further studies examine the reading process on a paragraph by paragraph basis in addition to the word level. Although Schooler et al. (2004) did not note a difference between word and paragraph conditions, eye movements may differ between these two conditions even though participants' responses are the same. Research by Mitchell, Shen, Green,

and Hodgson (2008) suggests that low level spatial characteristics (e.g., the way the text is organized or displayed) can have robust effects on regressive eye movements, so a word vs. paragraph display may exhibit pervasive differences.

The fact that eye movements can predict different attention states means that, with the help of further research, eye tracking methodology can provide a noninvasive method to determine awareness. Because any interruption (e.g., the probe) is inherently disruptive to a participant's focus, being able to predict subsequent levels of focus from eye-tracking data alone would enhance the accuracy of measuring the frequency and likelihood of mind wandering. The development of such a system could lead to applied advancements such as electronic books that can estimate a reader's attention and automatically correct for it, in-car focus monitoring systems, and more.

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Appendix

The 300 sentences taken from Chapter 10 of William James' *Principles of Psychology*. An asterisk (*) indicates a sentence immediately preceding a focus prompt.

1. The Empirical Self of each of us is all that he is tempted to call by the name of me.
2. But it is clear that between what a man calls me and what he simply calls mine the line is difficult to draw.
3. We feel and act about certain things that are ours very much as we feel and act about ourselves.
4. Our fame, our children, the work of our hands, may be as dear to us as our bodies are, and arouse the same feelings and the same acts of reprisal if attacked.
5. And our bodies themselves, are they simply ours, or are they us?
6. Certainly men have been ready to disown their very bodies and to regard them as mere vestures, or even as prisons of clay from which they should some day be glad to escape.
7. We see then that we are dealing with a fluctuating material.
8. The same object being sometimes treated as a part of me, at other times as simply mine, and then again as if I had nothing to do with it at all.
9. In its widest possible sense, however, a man's Self is the sum total of all that he CAN call his, not only his body and his psychic powers, but his clothes and his house, his wife and children, his ancestors and friends, his reputation and works, his lands and horses, and yacht and bank-account.
10. *All these things give him the same emotions.
11. If they wax and prosper, he feels triumphant; if they dwindle and die away, he feels cast down, - not necessarily in the same degree for each thing, but in much the same way for all.
12. Understanding the Self in this widest sense, we may begin by dividing the history of it into three parts, relating respectively to-- (1) Its constituents; (2) The feelings and emotions they arouse, -- Self-feelings; (3) The actions to which they prompt, -- Self-seeking and Self-preservation.
13. The constituents of the Self may be divided into two classes, those which make up respectively-- (a) The material Self; (b) The social Self; (c) The spiritual Self; and (d) The pure Ego.
14. The body is the innermost part of the material Self in each of us; and certain parts of the body seem more intimately ours than the rest.
15. The clothes come next.
16. The old saying that the human person is composed of three parts --soul, body, and clothes-- is more than a joke.
17. We so appropriate our clothes and identify ourselves with them that there are few of us who, if asked to choose between having a beautiful body clad in raiment perpetually shabby and unclean, and having an ugly and blemished form always spotlessly attired, would not hesitate a moment before making a decisive reply.
18. Next, our immediate family is a part of ourselves.
19. Our father and mother, our wife and babes, are bone of our bone and flesh of our flesh.
20. When they die, a part of our very selves is gone.
21. If they do anything wrong, it is our shame.
22. *If they are insulted, our anger flashes forth as readily as if we stood in their place.
23. Our home comes next.
24. Its scenes are part of our life; its aspects awaken the tenderest feelings of affection; and we do not easily forgive the stranger who, in visiting it, finds fault with its arrangements or treats it with contempt.
25. All these different things are the objects of instinctive preferences coupled with the most important practical interests of life.
26. We all have a blind impulse to watch over our body, to deck it with clothing of an ornamental sort, to cherish parents, wife, and babes, and to find for ourselves a home of our own which we may live in and 'improve.'
27. An equally instinctive impulse drives us to collect property; and the collections thus made become,

with different degrees of intimacy, parts of our empirical selves.
28. The parts of our wealth most intimately ours are those which are saturated with our labor.
29. There are few men who would not feel personally annihilated if a life-long construction of their hands or brains--say an entomological collection or an extensive work in manuscript-- were suddenly swept away.
30. The miser feels similarly towards his gold, and although it is true that a part of our depression at the loss of possessions is due to our feeling that we must now go without certain goods that we expected the possessions to bring in their train,
31. yet in very case there remains, over and above this, a sense of the shrinkage of our personality, a partial conversation of ourselves to nothingness, which is a psychological phenomenon by itself.
32. We are all at once assimilated to the tramps and poor devils whom we so despise,
33. and at the same time removed farther than ever away from the happy sons of earth who lord it over land and sea and men in the full-blown lustihood that wealth and power can give, and before whom, stiffen ourselves as we will by appealing to an anti-snobbish first principles,
34. we cannot escape an emotion, open or sneaking, of respect and dread.
35. A man's Social Self is the recognition which he gets from his mates.
36. *We are not only gregarious animals, liking to be in sight of our fellows, but we have an innate propensity to get ourselves noticed, and noticed favorably, by our kind.
37. No more fiendish punishment could be devised, were such a thing physically possible, than that one should be turned loose in society and remain absolutely unnoticed by all the members thereof.
38. If no one turned round when we entered, answered when we spoke, or minded what we did, but if every person we met 'cut us dead,' and acted as if we were non-existing things, a kind of rage and impotent despair would ere long well up in us, from which the cruelest bodily tortures would be a relief;
39. for these would make us feel that, however bad might be our plight, we had not sunk to such a depth as to be unworthy of attention at all.
40. Properly speaking, a man has as many social selves as there are individuals who recognize him and carry an image of him in their mind.
41. To wound any one of these his images is to wound him.
42. But as the individuals who carry the images fall naturally into classes, we may practically say that he has as many different social selves as there are distinct groups of persons about whose opinion he cares.
43. He generally shows a different side of himself to each of these different groups.
44. *Many a youth who is demure enough before his parents and teachers, swears and swaggers like a pirate among his 'tough' young friends.
45. We do not show ourselves to our children as to our club-companions, to our customers as to the laborers we employ, to our own masters and employers as to our intimate friends.
46. From this there results what practically is a division of the man into several selves;
47. and this may be a discordant splitting, as where one is afraid to let one set of his acquaintances know him as he is elsewhere; or it may be a perfectly harmonious division of labor, as where one tender to his children is stern to the soldiers or prisoners under his command.
48. The most peculiar social self which one is apt to have is in the mind of the person one is in love with.
49. The good or bad fortunes of this self cause the most intense elation and dejection-- unreasonable enough as measured by every other standard than that of the organic feeling of the individual.
50. To his own consciousness he is not, so long as this particular social self fails to get recognition, and when it is recognized his contentment passes all bounds.
51. A man's fame, good or bad, and his honor or dishonor, are names for one of his social selves.
52. The particular social self of a man called his honor is usually the result of one of those splittings of which we have spoken.
53. It is his image in the eyes of his own 'set,' which exalts or condemns him as he conforms or not to certain requirements that may not be made of one in another walk of life.
54. *Thus a layman may abandon a city infected with cholera; but a priest or a doctor would think such an act incompatible with his honor.

55. A soldier's honor requires him to fight or to die under circumstances where another man can apologize or run away with no stain upon his social self.
56. A judge, a statesman, are in like manner debarred by the honor of their cloth from entering into pecuniary relations perfectly honorable to persons in private life.
57. Nothing is commoner than to hear people discriminate between their different selves of this sort: As a man I pity you, but as an official I must show you no mercy; as a politician I regard him as an ally, but as a moralist I loathe him;-- etc., etc.
58. What may be called 'club-opinion' is one of the very strongest forces in life.
59. The thief must not steal from other thieves; the gambler must bay his gambling-debts, though he pay no other debts to the world.
60. *The code of honor of fashionable society has throughout history been full of permissions as well as of vetoes, the only reason for following either of which is that so we best serve one of our social selves.
61. You must not lie in general, but you may lie as much as you please if asked about your relations with a lady;
62. you must accept a challenge from an equal, but if challenged by an inferior you may laugh him to scorn: these are examples of what is meant.
63. By the Spiritual Self, so far as it belongs to the Empirical Me, I mean a man's inner or subjective being, his psychic faculties or dispositions, taken concretely; not the bare principle of personal Unity, or 'pure' Ego, which remains still to be discussed.
64. These psychic dispositions are the most enduring and intimate part of the self, that which we most verily seem to be.
65. We take a purer self-satisfaction when we think of our ability to argue and discriminate, of our moral sensibility and conscience, of our indomitable will, than when we survey any of our other posessions.
66. Only when these are altered is a man said to be alienatus a se.
67. Now this spiritual self may be considered in various ways.
68. We may divide it into faculties, as just instanced, isolating them from one another, and identifying ourselves with either in turn.
69. This is an abstract way of dealing with consciousness, in which, as it actually presents itself, a plurality of such faculties are always to be simultaneously found;
70. or we may insist on a concrete view, and then the spiritual self in us will be either the entire stream of our personal consciousness,
71. or the present 'segment' or 'section' of that stream, according as we take a broader or a narrower view-- both the stream and the section being concrete existences in time, and each being a unity after its own peculiar kind.
72. But whether we take it abstractly or concretely, our considered the spiritual self at all is a reflective process, is the result of our abandoning the outward-looking point of view, and of our having become able to think of subjectivity as such, to think ourselves as thinkers.
73. This attention to thought as such, and the identification of ourselves with it rather than with any of the objects which it reveals, is a momentous and in some respects a rather mysterious operation, of which we need here only say that as a matter of fact it exists;
74. *and that in everyone, at an early age, the distinction between thought as such, and what it is 'of' or 'about,' has become familiar to the mind.
75. The deeper grounds for this discrimination may possibly be hard to find; but superficial grounds are plenty and near at hand.
76. Almost anyone will tell us that thought is a different sort of existence from things, because many sorts of thought are of no things-- e.g., pleasures, pains, and emotions;
77. others are of non-existent things-- errors and fictions; others again of existent things, but in a form that is symbolic and does not resemble them-- abstract ideas and concepts;
78. whilst in the thoughts that do resemble the things they are 'of' (percepts, sensations), we can feel, alongside of the thing known, the thought of it going on as an altogether separate act and operation in the mind.
79. Now this subjective life of ours, distinguished as so much clearly from the objects known by its

means, may, as aforesaid, be taken by us in a concrete or in an abstract way.

80. Of the concrete way I will say nothing just now, except that the actual 'section' of the stream will ere long, in our discussion of the nature of the principle of unity in consciousness, play a very important part.
81. The abstract way claims our attention first.
82. *If the stream as a whole is identified with the Self far more than any outward thing, a certain portion of the stream abstracted from the rest is so identified in an altogether peculiar degree, and is felt by all men as a sort of innermost centre within the circle, of sanctuary within the citadel, constituted by the subjective life as a whole.
83. Compared with this element of the stream, the other parts, even of the subjective life, seem transient external possessions, of which each in turn can be disowned, whilst that which disowns them remains.
84. Now, what is this self of all the other selves?
85. Probably all men would describe it in much the same way up to a certain point.
86. They would call it the active element in all consciousness;
87. saying that whatever qualities a man's feelings may possess, or whatever content his thought may include, there is a spiritual something in hims which seems to go our to meet these qualities and contents, whilst they seem to come in to be received by it.

88. It is what welcomes or rejects.
89. It presides over the perception of sensations, and by giving or withholding its assent it influences the movements they tend to arouse.
90. It is the home of interest, - not the pleasant or the painful, not even pleasure or pain, as such, but that within us to which pleasure and pain, the pleasant and the painful, speak.
91. It is the source of effort and attention, and the place from which appear to emanate the fiats of the will.
92. A physiologist who should reflect upon it in his own person could hardly help, I should think, connecting it more or less vaguely with the process by which ideas or incoming sensations are 'reflected' or pass over into outward acts.
93. Not necessarily that it should be this process or the mere feeling of this process, but that it should be in some close way related to this process;
94. *for it plays a part analogous to it in the psychic life, being a sort of junction at which sensory ideas terminate and from which motor ideas proceed, and forming a kind of link between the two.
95. Being more incessantly there than any other single element of the mental life, the other elements end by seeming to accrete round it and to belong to it.
96. It becomes opposed to them as the permanent is opposed to the changing and inconstant.
97. One may, I think, without fear of being upset by any future Galtonian circulars, believe that all men must single out from the rest of what they call themselves some central principle of which each would recognize the foregoing to be a fair general description,
98. accurate enough, at any rate, to denote what is meant, and keep it unconfused with other things.
99. The moment, however, they came to closer quarters with it, trying to define more accurately its precise nature, we should find opinions beginning to diverge.
100. Some would say that it is a simple active substance, the soul, of which they are thus conscious;
101. others, that it is nothing but a fiction, the imaginary being denoted by the pronoun I; and between these extremes of opinions all sorts of intermediaries would be found.
102. Later we must ourselves discuss them all, and sufficient to that day will be the evil thereof.
103. Now, let us try to settle for ourselves as definitely as we can, just how this central nucleus of the Self may feel, no matter whether it be a spiritual substance or only a delusive word.
104. For this central part of the Self is felt.
105. It may be that Transcendentalists say it is, and that all Empiricists say it is into the bargain, but it is at any rate no mere ens rationis, cognized only in an intellectual way, and no mere summation of memories or mere sound of a word in our ears.
106. *It is something with which we also have direct sensible acquaintance, and which is as fully present at any moment of consciousness in which it is present, as in a whole lifetime of such moments.

107. When, just now, it was called an abstraction, that did not mean that, like some general notion, it could not be presented in a particular experience.
108. It only meant that in the stream of consciousness it was found all alone.
109. But when it is found, it is felt; just as the body is felt, the feeling of which is also an abstraction, because never is the body felt all alone, but always together with other things.
110. Now can we tell more precisely in what the feeling of this central active self consists, - not necessarily as yet what the active self is, as a being or principle, but what we feel when we become aware of its existence?
111. I think I can in my own case; and as what I say will be likely to meet with opposition if generalized (as indeed it may be in part inapplicable to other individuals),
112. I had better continue in the first person, leaving my description to be accepted by those to whose introspection it may commend itself as true, and confessing my inability to meet the demands of others, if others there be.
113. First of all, I am aware of a constant play of furtherances and hindrances in my thinking, tendencies which run with desire, and tendencies which run the other way.
114. Among the matters I think of, some range themselves on the side of the thought's interest, whilst others play an unfriendly part thereto.
115. *The mutual inconsistencies and agreements, reinforcements and obstructions, which obtain amongst these objective matters reverberate backwards and produce what seem to be incessant reactions of my spontaneity upon them, welcoming or opposing, appropriating or disowning, striving with or against, saying yes or no.
116. This palpitating inward life is, in me, that central nucleus which I just tried to describe in terms that all men might use.
117. But when I forsake such general descriptions and grapple with particulars, coming to the closest possible quarters with the facts, it is difficult for me to detect in the activity any purely spiritual element at all.
118. Whenever my introspective glance succeeds in turning round quickly enough to catch one of these manifestations of spontaneity in the act, all it can ever feel distinctly is some bodily process, for the most part taking place within the head.
119. Omitting for a moment what is obscure in these introspective results, let me try to state those particulars which to my own consciousness seem indubitable and distinct.
120. In the first place, the acts of attending, assenting, negating, making an effort, are felt as movements of something in the head.
121. In many cases it is possible to describe these movements quite exactly.
122. In attending to either an idea or a sensation belonging to a particular sense-sphere, the movement is the adjustment of the sense-organ, felt as it occurs.
123. I cannot think in visual terms, for example, without feeling a fluctuating play of pressures, convergences, divergences, and accommodations in my eyeballs.
124. The direction in which the object is conceived to lie determines the character of these movements, the feeling of which becomes, for my consciousness, identified with the manner in which I make myself ready to receive the visible thing.
125. My brain appears to me as if all shot across with lines of direction, of which I have become conscious as my attention has shifted from one sense-organ to another, in passing to successive outer things, or in following trains of varying sense-ideas.
126. When I try to remember or reflect, the movements in question, instead of being directed towards the periphery, seem to come from the periphery inwards and feel like a sort of withdrawal from the outer world.
127. As far as I can detect these feelings are due to an actual rolling outwards and upwards of the eyeballs, such as I believe occurs in me in sleep, and it is the exact opposite of their action in fixating a physical thing.
128. In reasoning, I find that I am apt to have a kind of vaguely localized diagram in my mind, with the various fractional objects of the thought disposed at particular points thereof; and the oscillations of my attention from one of them to another are most distinctly felt as alternations of direction in movements occurring inside the head.

129. *In consenting and negating, and in making a mental effort, the movements seem more complex, and I find them harder to describe.
130. The opening and closing of the glottis play a great part of these operations, and, less distinctly, the movements of the soft palate, etc., shutting off the posterior nares of the mouth.
131. My glottis is like a sensitive valve, intercepting my breath instantaneously at every mental hesitation or felt aversion to the objects of my thought, and as quickly opening, to let the air pass through my throat and nose, the moment the repugnance is overcome.
132. The feeling of the movement of this air is, in me, one strong ingredient of the feeling of assent.
133. The movements of hte muscles of the brow and eyelids also respond very sensitively to every fluctuation in the agreeableness or disagreeableness of what comes before my mind.
134. In effort of any sort, contractions of the jaw-muscles and of those of respiration are added to those of the brow and glottis, and thus the feeling passes out of the head properly so called.
135. *It passes out of the head whenever the welcoming or rejecting of the object is strongly felt.
136. Then a set of feelings pour in from many bodily parts, all 'expressive' of my emotion, and the head-feelings proper are swallowed up in this larger mass.
137. In a sense, then, it may be truly said that, in one person at least, the 'Self of selves,' when carefully examined, is found to consist mainly of the collection of these peculiar motions in the head or between the head and throat.
138. I do not for a moment say that this is all it consists of, for I fully realize how desperately hard is introspection in this field.
139. But I feel quite sure that these cephalic motions are the portions of my innermost activity of which I am most distinctly aware.
140. If the dim portions which I cannot yet define should prove to be like unto these distinct portions in me, and I like other men, it would follow that our entire feeling of spiritual activity, or what commonly passes by that name, is really a feeling of bodily activities whose exact nature is by most men overlooked.
141. Now, without pledging ourselves in any way to adopt this hypothesis, let us dally with it for a while to see to what consequences it might lead if it were true.
142. In the first place, the nuclear part of the Self, intermediary between ideas and overt acts, would be a collection of activities physiologically in no essential way different from the overt acts themselves.
143. If we divide all possible physiological acts into adjustments and executions, the nuclear self would be the adjustments collectively considered; and the less intimate, more shifting self, so far as it was active, would be the executions.
144. But both adjustments and executions would obey the reflex type. Both would be the result of sensorial and ideational processes discharging either into each other within the brain, or into muscles and other parts outside.
145. The peculiarity of the adjustments would be that they are minimial reflexes, few in number, incessantly repeated, constant admid great fluctuations in the rest of the mind's content, and entirely unimportant and uninteresting except through their uses in furthering or inhibiting the presence of various things, and actions before consciousness.
146. These characters would naturally keep us from introspectively paying much attention to them in detail, whilst they would at the same time make us aware of them as a coherent group of processes, strongly contrasted with all the other things consciousness contained, - even with the other constituents of the 'Self,' material, social, or spiritual, as the case might be.
147. They are reactions, and they are primary reactions.
148. Everything arouses them; for objects which have no other effects will for a moment contract the brow and make the glottis close.
149. *It is as if all that visited the mind had to stand an entrance-examination, and just show its face so as to be either approved or sent back.
150. These primary reactions are like the opening or the closing of the door.
151. In the midst of psychic change they are the permanent core of turnings from, of yieldings and arrests, which naturally seem central and interior in comparison with the foreign matters, apropos to which they occur, and hold a sort of arbitrating, decisive position, quite unlike that held by any

of the other constituents of the Me.

152. It would not be surprising, then, if we were to feel them as the birthpace of conclusions and the starting point of acts, or if they came to appear as what we called a while back the 'sanctuary within the citadel' of our personal life.
153. If they really were the innermost sanctuary, the ultimate one of all the selves whose being we can ever directly experience, it would follow that all is experienced is, strictly considered, objective;
154. that this Objective falls asunder into two contrasted parts, one realized as 'Self,' the other as 'not-Self;' and that over and above these parts there is nothing save the fact that they are known, the fact of the stream of thought being there as the indispensable subjective condition of their being experienced at all.
155. But this condition of the experience is not one of hte things experienced at the moment; this knowing is not immediately known.
156. It is only known in subsequent reflection.
157. *Instead, then, of the stream of thought being one of con-sciousness, "thinking its own existence along with whatever else it thinks," (as Ferrier says) it might be better called a stream of Sciousness pure and simple thinking objects of some of which it makes what it calls a 'Me,' and only aware of its 'pure' Self in an abstract, hypothetic or conceptual way.
158. Each 'section' of the stream would then be a bit of sciousness or knowledge of this sort, including and contemplating its 'me' and its 'not-me' as objects which work out their drama together, but not yet including or contemplating its own subjective being.
159. The sciousness in question would be the Thinker, and the existence of this thinker would be given to us rather as a logical postulate than as that direct inner perception of spiritual activity which we naturally believe ourselves to have.
160. 'Matter,' as something behind physical phenomena, is a postuate of this sort. Between the postulated Matter and the postulated Thinker, the sheet of phenomena would then swing, some of them (the 'realities') pertaining more to the matter, others (the fictions, opinions, and errors) pertaining more to the Thinker.
161. But who the Thinker would be, or how many distinct Thinkers we ought to suppose in the universe, would all be subjects for an ulterior metaphysical inquiry.
162. Speculations like this traverse common-sense; and not only do they traverse common sense (which in philosophy is no insuperable objection) but they contradict the fundamental assumption of every philosophic school.
163. Spiritualists, transcendentalists, and empiricists alike admit in us a continual direct perception of the thinking activity in the concrete.
164. However they may otherwise disagree, they vie with each other in the cordiality of their recognition of our thoughts as the one sort of existent which skepticism cannot touch.
165. *I will therefore treat the last few pages as a parenthetical digression, and from now to the end of the volume revert to the path of common-sense again.
166. I mean by this that I will continue to assume (as I have assumed all along) a direct awareness of the process of our thinking as such, simply insisting on the fact that it is an even more inward and subtle phenomenon than most of us suppose.
167. At the conclusion of the volume, however, I may permit myself to revert again to the doubts here provisionally mooted, and will indulge in some metaphysical reflections suggested by them.
168. At present, then, the only conclusion I come to is the following: That (in some persons at least) the part of the innermost Self which is most vividly felt turns out to consist for the most part of a collection of cephalic movements of 'adjustments' which, for want of attention and reflection, usually fail to be perceived and classified as what they are;
169. that over and above these there is an obscurer feeling of something more;
170. but whether it be of fainter physiological processes, or of nothing objective at all, but rather of subjectivity as such, of thought become 'its own object,' must at present remain an open question, - like the question whether it be an indivisible active soul-substance, or the question whether it be a personification of the pronoun I, or any other of the guesses as to what its nature may be.
171. Farther than this we cannot as yet go clearly in our analysis of the Self's constituents.
172. So let us proceed to the emotions of the Self which they arouse.

173. These are primarily self-complacency and self-dissatisfaction.
174. Of what is called 'self-love,' I will treat a little farther on.
175. *Language has synonyms emough for both primary feelings.
176. Thus pride, conceit, vanity, self-esteem, arrogance, vainglory, on the one hand; and on the other modesty, humility, confusion, diffidence, shame, mortification, contrition, the sense of obloquy and personal despair.
177. These two opposite classes of affection seem to be direct and elementary endowments of our nature.
178. Associationists would have it that they are, on the other hand, secondary phenomena arising from a rapid computation of the sensible pleasures or pains to which our prosperous or debased personal predicament is likely to lead, the sum of the represented pleasures forming the self-satisfaction, and the sum of the represented pains forming the opposite feeling of shame.
179. No doubt, when we are self-satisfied, we do fondly rehearse all possible rewards for our dessert, and when in a fit of self-despair we forbode evil.
180. But the mere expectation of reward is not the self-satisfaction, and the mere apprehension of the evil is not the self-despair, for there is a certain average tone of self-feeling which each one of us carries about with him, and which is independent of the objective reasons we may have for satisfaction or discontent.
181. *That is, a very meanly-conditioned man may abound in unfaltering conceit, and one whose success in life is secure and who is esteemed by all may remain diffident of his powers to the end.
182. One may say, however, that the normal provocative of self-feeling is one's actual success or failure, and the good or bad actual position one holds in the world.
183. "He put in his thumb and pulled out a plum, and said what a good boy am I."
184. A man with a broadly extended empirical Ego, with powers that have uniformly brought him success, with place and wealth and friends and fame, is not likely to be visited by the morbid diffidences and doubts about himself he had when he was a boy.
185. "Is not this great Babylon, which I have planted?"
186. Whereas he who has made one blunder after another, and still lies in middle life among the failures at the foot of the hill, is liable to grow all sicklied o'er with self-distrust, and to shrink from trials with which his powers can really cope.
187. The emotions themselves of self-satisfaction and abasement are of a unique sort, each as worthy to be classed as a primitive emotional species as are, for example, rage or pain.
188. Each has its own peculiar physiognomical expression.
189. In self-satisfaction the extensor muscles are innervated, the eye is strong and glorious, the gait rolling and elastic, the nostril dilated, and a peculiar smile plays upon the lips.
190. The whole complex of symptoms is seen in an exquisite way in lunatic asylums, which always contain some patients who are literally made with conceit, and whose fatuous expression and absurdly strutting or swaggering gait is in tragic contrast with their lack of any valuable personal quality.
191. It is in these same castles of despair that we find the strongest examples of the opposite physiognomy, in good people who think they have committed 'the unpardonable sin' and are list forever, who crouch and cringe and slink from notice and are unable to speak aloud or look us in the eye.
192. Like fear and like anger, in similar morbid conditions, these opposite feelings of Self may be aroused with no adequate exciting cause.
193. *And in fact we ourselves know how the barometer of our self-esteem and confidence rises and falls from one day to another through causes that seem to be visceral and organic rather than rational, and which certainly answer to no corresponding variations in the esteem in which we are held by our friends.
194. Of the origin of these emotions in the race, we can speak better when we have treated of - Self-Seeking and Self-Preservation.
195. These words cover a large number of our fundamental instinctive impulses.
196. We have those of bodily self-seeking, those of social self-seeking, and those of spiritual self-seeking.
197. All the ordinary useful reflex actions and movements of alimentation and defence are acts of bodily

self-preservation.
198. Fear and anger prompt us to acts that are useful in the same way.
199. *Whilst if by self-seeking we mean the providing for the future as distinguished from maintaining the present, we must class both anger and fear with the hunting, the acquisitive, the home-constructing and the tool-constructing instincts, as impulses to self-seeking of the bodily kind.
200. Really, however, these latter instincts, with amativeness, parental fondness, curiosity and emulation, seek not only the development of the bodily Self, but that of the material Self in the widest possible sense of the word.
201. Our social self-seeking, in turn, is carried on directly through our amativeness and friendliness, our desire to please and attract notice and admiration, our emulation and jealousy, or love of glory, influence, and power, and indirectly through whichever of the material self-seeking impulses prove serviceable as means to social ends.
202. That the direct social self-seeking impulses are probably pure instincts is easily seen.
203. The noteworthy thing about the desire to be 'recognized' by others is that its strength has so little to do with the worth of the recognition computed in sensational or rational terms.
204. We are crazy to get a visiting-list which shall be large, to be able to say when any one is mentioned, "Oh! I know him well," and to be bowed to in the street by half the people we meet.
205. Of course distinguished friends and admiring recognition are the most desirable - Thackeray somewhere asks his readers to confess whether it would not give each of them an exquisite pleasure to be met walking down Pall Mall with a duke on either arm.
206. But in default of dukes and envious salutations almost anything will do for some of us;
207. and there is a whole race of beings to-day whose passion is to keep their names in the newspapers, no matter under what heading, 'arrivals and departures,' 'personal paragraphs,' 'interviews,' - gossip, even scandal, will suit them if nothing better is to be had.
208. Guiteau, Garfields' assassin, is an example of the extremity to which this sort of craving for the notoriety of print may go in a pathological case.
209. *The newspapers bounded his mental horizon; and in the poor wretch's prayer on the scaffold, one of the most heartfelt expressions was: "The newspaper press of this land has a big bill to settle with thee, O Lord!"
210. Not only the people but the places and things I know enlarge my Self in a sort of metaphoric social way.
211. 'Ca me connaÃ®t,' as the French workman says of the implement he can use well.
212. So that is comes about that persons for whose opinion we care nothing are nevertheless persons whose notice we woo; and that many a man truly great, many a woman truly fastidious in most respects, will take a deal of trouble to dazzle some insignificant cad whose whole personality they heartily despise.
213. Under the head of spiritual self-seeking ought to be included every impulse towards psychic progress, whether intellectual, moral, or spiritual in the narrow sense of the term.
214. It must be admitted, however, that much that commonly passes for spiritual self-seeking in this narrow sense is only material and social self-seeking beyond the grave.
215. In the Mohammedan desire for paradise and the Christian aspiration not to be damned in hell, the materiality of the goods sought is undisguised.
216. In the more positive and refined view of heaven many of its goods, the fellowship of the saints and of our dead ones, and the presence of God, are but social goods of the most exalted kind.
217. It is only the search of the redeemed inward nature, the spotlessness from sin, whether here or hereafter, that can count as spiritual self-seeking pure and undefiled.
218. But this broad external review of the facts of the life of the Self will be incomplete without some account of the Rivalry and Conflict of the Different Selves.
219. With most objects of desire, physical nature restricts our choice to but one of many represented goods, and even so it is here.
220. I am often confronted by the necessity of standing by one of my empirical selves and relinquishing the rest.
221. *Not that I would not, if I could, be both handsome and fat and well dressed, and a great athlete, and make a million a year, be a wit, a bon-vivant, and a lady-killer, as well as a philosopher; a

philanthropist, statesman, warrior, and African explorer, as well as a 'tone-poet' and saint.
222. But the thing is simply impossible.
223. The millionaire's work would run counter to the saint's; the bon-vivant and the philanthropist would trip each other up; the philosopher and the lady-killer could not well keep house in the same tenement of clay.
224. Such different characters may conceivably at the outset of life be alike possible to a man.
225. But to make any one of them actual, the rest much more or less be suppressed.
226. So the seeker of his truest, strongest, deepest self must review the list carefully, and pick out the one on which to stake his salvation.
227. All other selves thereupon become unreal, but the fortunes of this self are real.
228. Its failures are real failures, its triumphs real triumphs, carrying shame and gladness with them.
229. *This is as strong an example as there is of that selective industry of the mind on which I insisted some pages back.
230. Our thought, incessantly deciding, among many things of a kind, which ones for it shall be realities, here chooses one of many possible selves or characters, and forthwhith reckons it no shame to fail in any of those not adopted expressly as its own.
231. I, who for the time have staked my all on being a psychologist, am mortified if others know much more psychology than I.
232. But I am contented to wallow in the grossest ignorance of Greek. My deficiencies there give me no sense of personal humiliation at all.
233. Had I 'pretensions' to be a linguist, it would have been just the reverse.
234. So we have the paradox of a man shamed to death because he is only the second pugilist or the second oarsman in the world.
235. That he is able to beat the whole population of the globe minus one is nothing; he has 'pitted' himself to beat that one; and as long as he doesn't do that nothing else counts.
236. He is to his own regard as if he were not, indeed he is not.
237. Yonder puny fellow, however, whom every one can beat, suffers no chagrin about it, for he has long ago abandoned the attempt to 'carry that line,' as the merchants say, of self at all.
238. With no attempt there can be no failure; with no failure no humiliation.
239. So our self-feeling in this world depends entirely on what we back ourselves to be and do.
240. It is determined by the ratio of our actualities to our supposed potentialities; a fraction of which our pretensions are the denominator and the numerator our success: thus, Self-esteem = Success / Pretensions.
241. *Such a fraction may be increased as well by diminishing the denominator as by increasing the numerator.
242. To give up pretensions is as blessed a relief as to get them gratified; and where disappointment is incessant and the struggle unending, this is what men will always do.
243. The history of evangelical theology, with its conviction of sin, its self-despair, and its abandonment of salvation by works, is the deepest of possible examples, but we meet others in every walk of life.
244. There is the strangest lightness about the heart when one's nothingness in a particular line is once accepted in good faith.
245. All is not bitterness in the lot of the lover sent away by the final inexorable 'No.'
246. Many Bostonians, crede experto (and inhabitants of other cities, too, I fear), would be happier women and men to-day, if they could once for all abandon the notion of keeping up a Musical Self, and without shame let people here them call a symphony a nuisance.
247. *How pleasant is the day when we give up trying to be young, - or slender! Thank God! we say, those illusions are gone.
248. Everything added to the Self is a burden as well as a pride.
249. A certain man who lost every penny during our civil war went and actually rolled in the dust, saying he had not felt so free and happy since he was born.
250. Once more, then, our self-feeling is in our power.
251. As Carlyle says: "Make thy claim of wages a zero, then hast thou the world under thy feet. Well did the wisest of our time write, it is only with renunciation that life, properly speaking, can be said to begin."

252. Neither threats nor pleadings can move a man unless they touch some of his potential or actual selves.
253. Only thus can we, as a rule, get a 'purchase' on another's will.
254. The first care of diplomatists and monarchs and all who wish to rule our influence is, accordingly, to find out their victim's strongest principle of self-regard, so as to make that the fulcrum of all appeals.
255. But if a man has given up those things which are subject to foreign fate, and ceased to regard them as parts of himself at all, we are well-nigh powerless over him.
256. The Stoic receipt for contentment was to dispossess yourself in advance of all that was out of your own power, - then fortune's shocks might rain down unfelt.
257. Epictetus exhorts us, by thus narrowing and at the same time solidifying our Self to make it invulnerable: "I must die; well, but I must die groaning too?
258. I will speak what appears to be right, and if the despot says, then I will put you to death, I will rpely, 'When did I ever tell you that I was immortal?
259. You will do your part and I mine; it is yours to kill and mine to die intrepid, yours to banish, mine to depart untroubled.'
260. How do we act in a voyage? We choose the pilot, the sailors, the hour.
261. *Afterwards comes a storm.
262. What have I to care for? My part is performed.
263. This matter belongs to the pilot.
264. But the ship is sinking; what then have I to do? That which alone I can do - submit to being drowned without fear, without clamor or accusing of God, but as one who knows that what is born must likewise die."
265. This Stoic fashion, though efficacious and heroic enough in its place and time, is, it must be confessed, only possible as an habitual mood of the soul to narrow and unsympathetic characters.
266. It proceeds altogether by exclusion.
267. If I am a Stoic, the goods I cannot appropriately cease to be my goods, and the temptation lies very near to deny that they are goods at all.
268. We find this mode of protecting the Self by exclusion and denial very common among people who are in other respects not Stoics.
269. All narrow people intrench their Me, they retract it, - from the region of what they cannot securely possess.
270. People who don't resemble them, or who treat them with indifference, people over whom they gain no influence, are people on whose existence, however meritorious it may intrinsically be, they look with chill negation, if not with positive hate.
271. Who will not be mine I will exclude from existence altogether; that is, as far as I can make it so, such people shall they be as if they were not.
272. Thus may a certain absoluteness and definiteness in the outline of my Me console me for the smallness of its content.
273. Sympathetic people, on the contrary, proceed by the entirely opposite way of expansion and inclusion.
274. The outline of their self often gets uncertain enough, but for this the spread of its content more than atones. Nil humani a me alienum.
275. *Let them despise this little person of mine, and treat me like a dog, I shall not negate them so long as I have a soul in my body.
276. They are realities as much as I am.
277. What positive good is in them shall be mine too, etc., etc.
278. The magnanimity of these expansive natures is often touching indeed.
279. Such persons can feel a sort of delicate rapture in thinking that, however sick, ill-favored, mean-conditioned, and generally forsaken they may be, they yet are integral parts of the whole of this brave world.
280. They have a fellow's share in the strength of the dray-horses, the happiness of the young people, the wisdom of the wise ones, and are not altogether without part or lot in the good fortunes of the Vanderbilts and the Hohenzollerns themselves.

281. Thus either by negating or by embracing, the Ego may seek to establish itself in reality.
282. He who, with Marcus Aurelius, can truly say, "O Universe, I wish all that thou wishest," has a self from which every trace of negativeness and obstructiveness has been removed - no wind can blow except to fill its sails.
283. *A tolerably unanimous opinion ranges the different selves of which a man may be 'seized and possessed,' and the consequent different orders of his self-regard, in an hierarchical scale, with the bodily Self at the bottom, the spiritual Self at the top, and the extracorporeal material selves and the various social selves between.
284. Our merely natural self-seeking would lead us to aggrandize all these selves; we give up deliberately only those among them which we find we cannot keep.
285. Our unselfishness is thus apt to be a 'virtue of necessity'; and it is not without all show of reason that cynics quote the fable of the fox and the grapes in describing our progress therein.
286. But this is the moral education of the race; and if we agree in the result that on the whole the selves we can keep are the intrinsically best, we need not complain of being led to the knowledge of their superior worth in such a torturous way.
287. Of course this is not the only way in which we learn to subordinate our lower selves to our higher.
288. A direct ethical judgment unquestionably also plays its part, and last, not least, we apply to our own persons judgments originally called forth by the acts of others.
289. *It is one of the strangest laws of our nature that many things which we are well satisifed with in ourselves disgust us when seen in others.
290. It is one of the strangest laws of our nature that many things which we are well satisified with in ourselves disgust us when seen in others.
291. With another man's bodily 'hoggishness' hardly anyone has any sympathy; - almost as little with his cupidity, his social vanity and eagerness, his jealousy, his despotism, and his pride.
292. Left absolutely to myself I should probably allow all these spontaneous tendencies to luxuriate in me unchecked, and it would be long before I formed a distinct notion of the order of their subordination.
293. But having constantly to pass judgment on my associates, I come ere long to see, as Herr Horwicz says, my own lusts in the mirrior of the lusts of others, and to think about them in a very different way from that in which I simply feel.
294. Of course, the moral generalities which from childhood have been instilled into me accelerate enormously the advent of this reflective judgment on myself.
295. So it comes to pass that, as aforesaid, men have arranged the various selves which they may seek in a hierarchical scale according to their worth.
296. A certain amount of bodily selfishness is required as a basis for all the other selves.
297. But too much sensuality is despised, or at best condoned on account of the other qualities of the individual.
298. The wider material selves are regarded as higher than the immediate body.
299. He is esteemed a poor creature who is unable to forego a little meat and drink and warmth and sleep for the sake of getting on in the world.
300. *The social self as a whole, again, ranks higher than the material self as a whole.

Author Note

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Figure Captions

Figure 1a. Mean semantic score (0-10) for focused, unfocused and aware, and unfocused and unaware participants in Ball (2009).

Figure 1b. Mean proportion of words recalled for focused, unfocused and aware, and unfocused and unaware participants in Ball (2009).

Figure 1c. Participants' response to the focus prompt for each of the 30 interest sentences in Ball (2009).

Figure 2. The setup and positioning of eye tracker and participant.

Figure 3. Participants' response to the focus prompt for each of the 30 interest sentences.

Figure 4. Mean fixation durations for focused, unfocused and aware, and unfocused and unaware participants.

Figure 5. Mean saccade length for focused, unfocused and aware, and unfocused and unaware participants.

Figure 6. Mean proportion of regressions to total number of saccades for focused, unfocused and aware, and unfocused and unaware participants.

Figure 1a

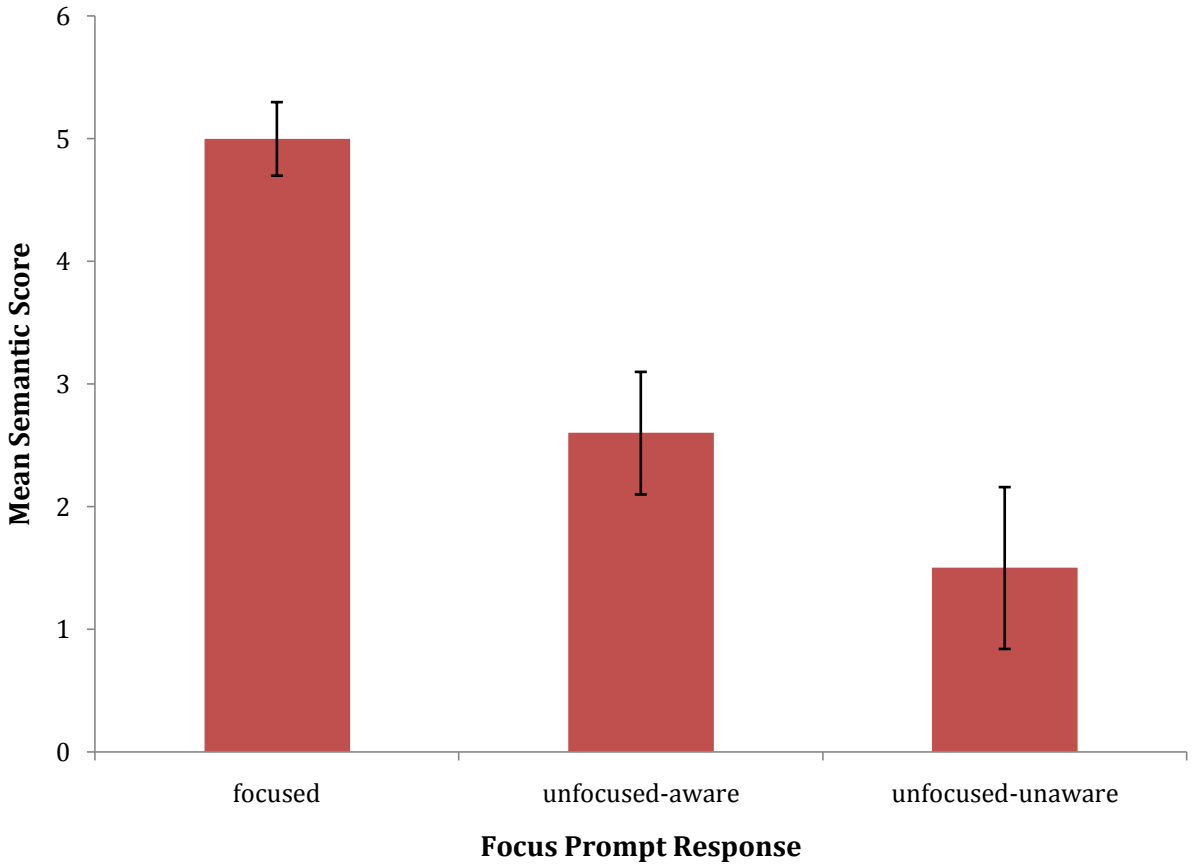

6
5
4
3
2
1
0
Mean Semantic Score
focused
unfocused-aware
unfocused-unaware
Focus Prompt Response

Figure 1b

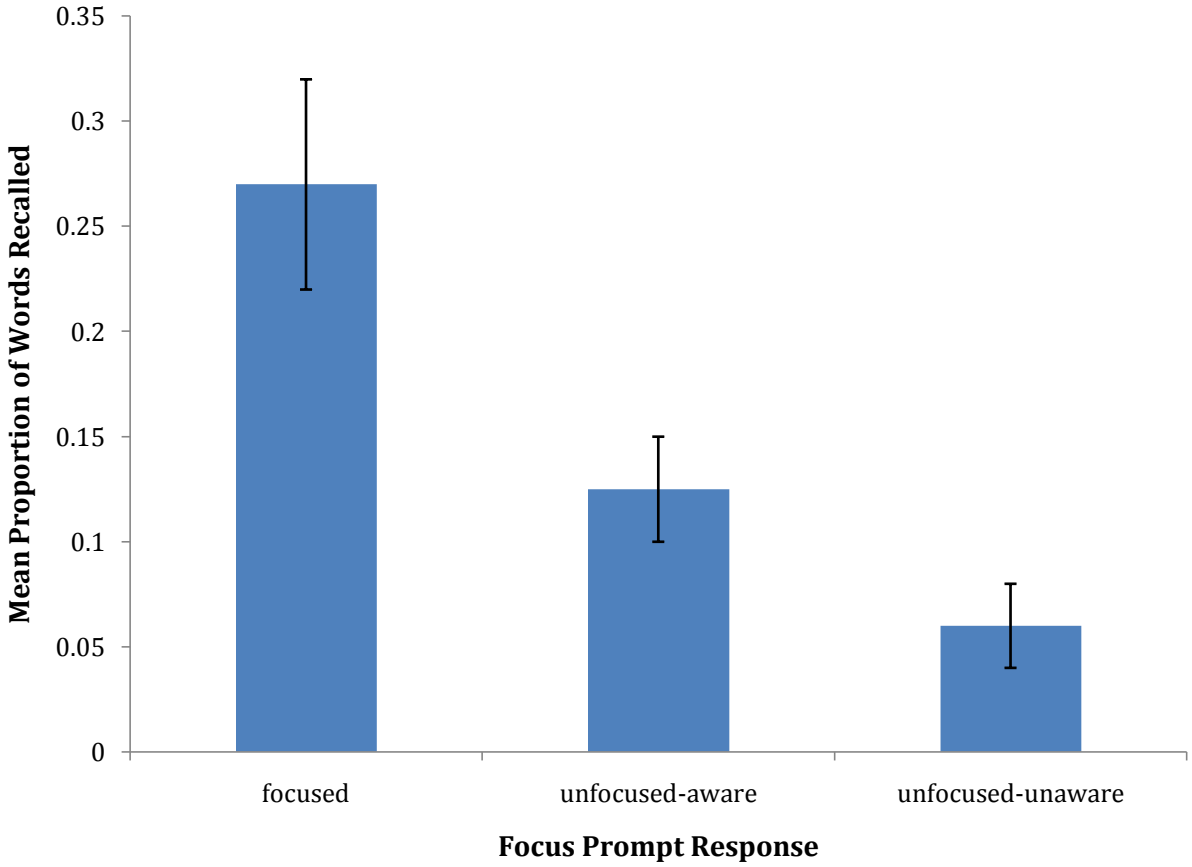

0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Mean Proportion of Words Recalled
focused
unfocused-aware
unfocused-unaware
Focus Prompt Response

Figure 1c

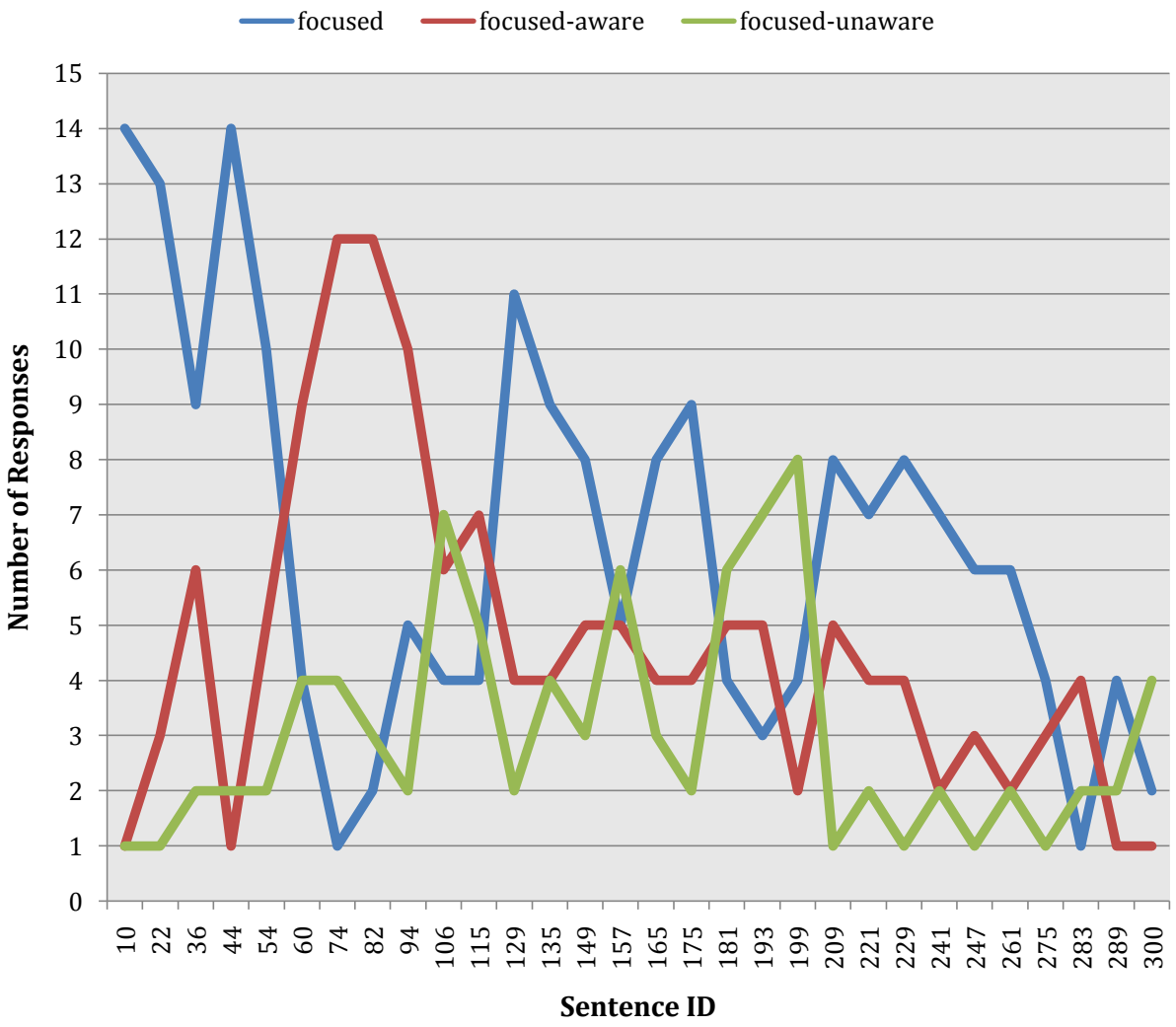

focused
focused-aware
focused-unaware
Number of Responses
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
10
22
36
44
54
60
74
82
94
106
115
129
135
149
157
165
175
181
193
199
209
221
229
241
247
261
275
283
289
300
Sentence ID

Figure 2

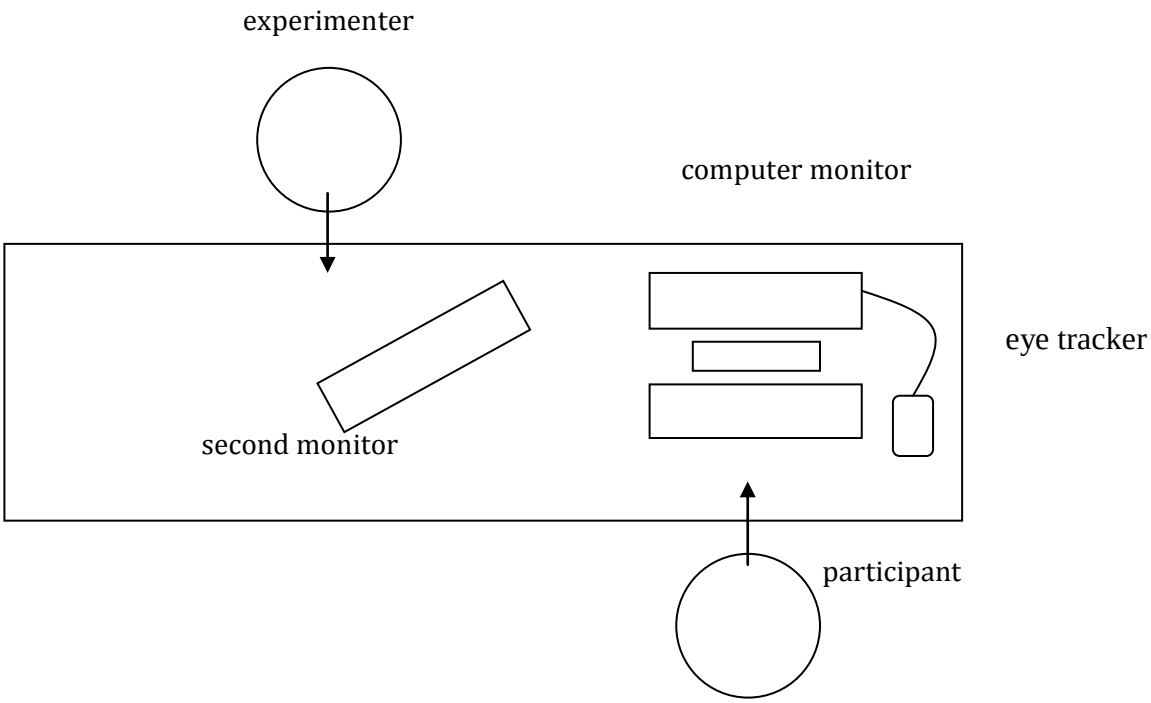
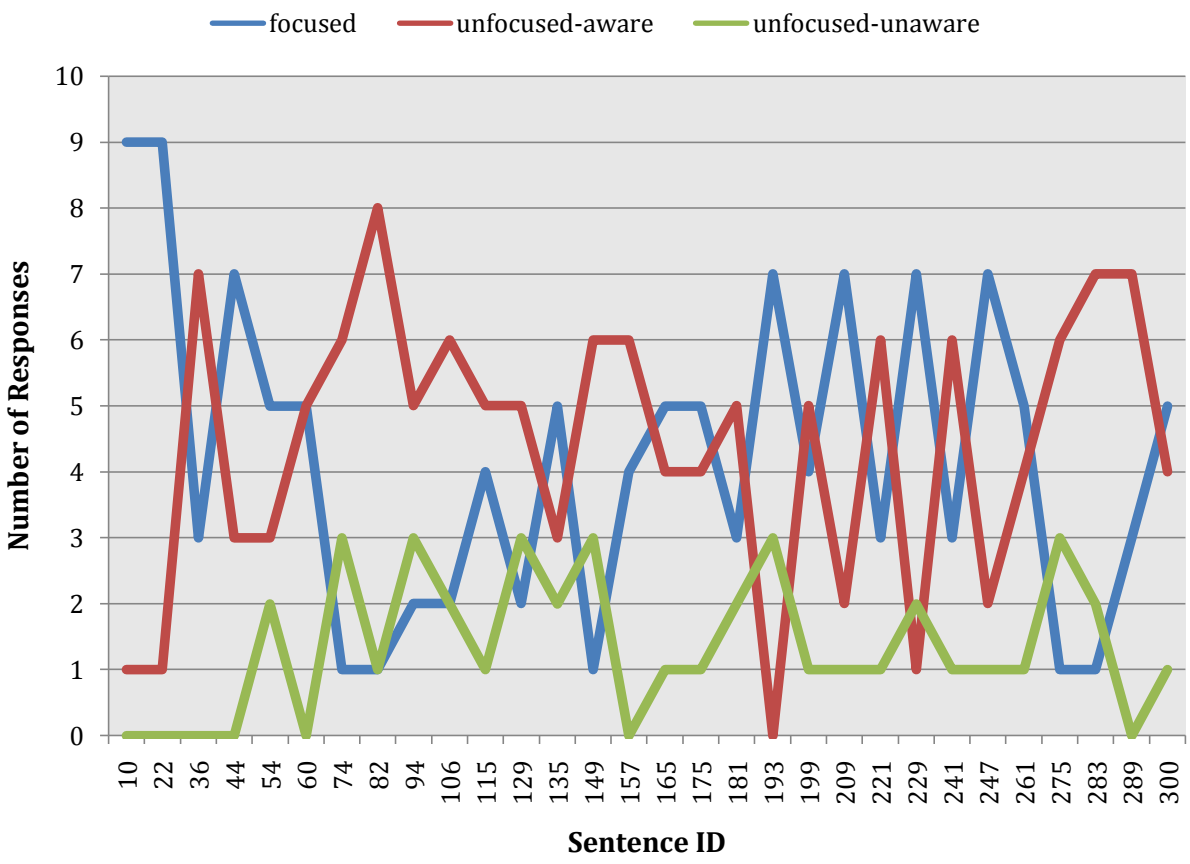

experimenter
computer monitor
eye tracker
second monitor
participant

Figure 3


focused
unfocused-aware
unfocused-unaware
Number of Responses
0
1
2
3
4
5
6
7
8
9
10
10
22
36
44
54
60
74
82
94
106
115
129
135
149
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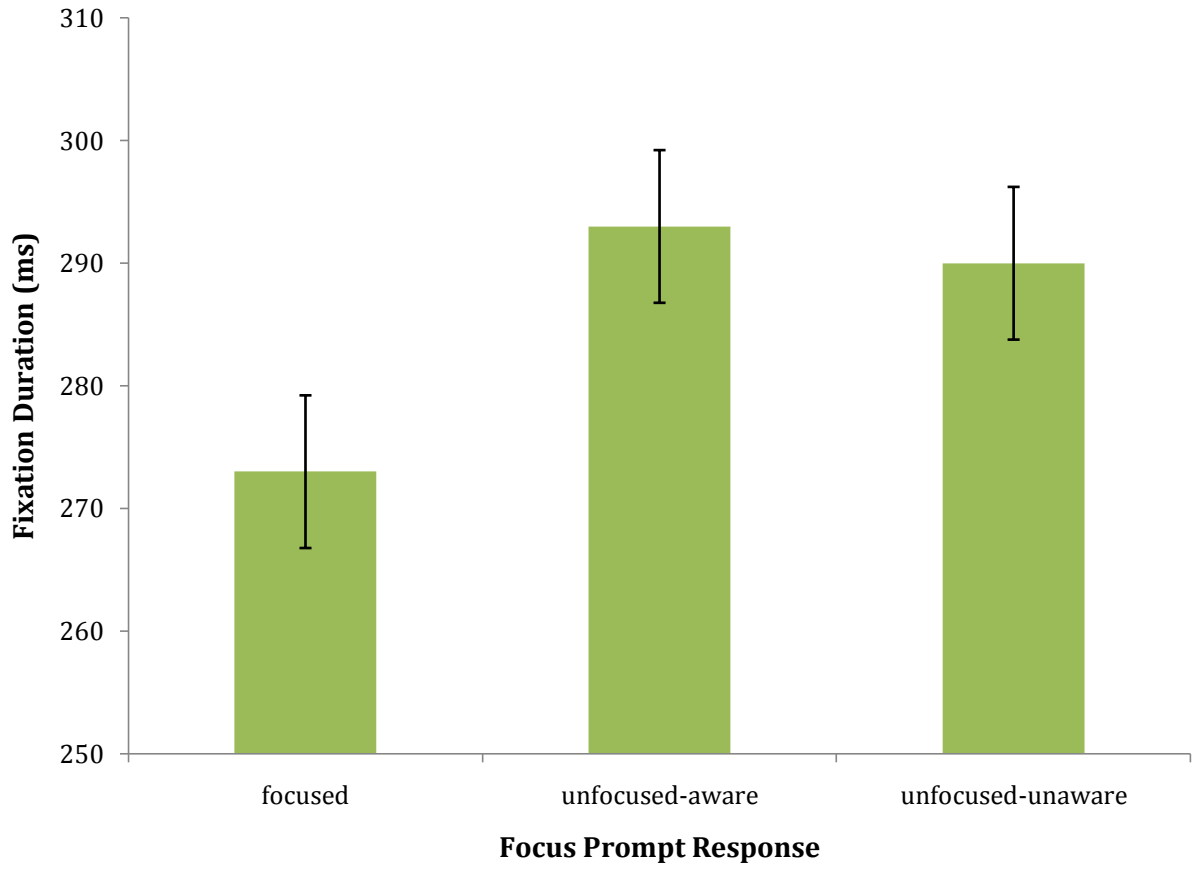
181
193
199
209
221
229
241
247
261
275
283
289
300
Sentence ID

Figure 4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300
290
280
270
260
250
Fixation Duration (ms)
focused
unfocused-aware
unfocused-unaware
Focus Prompt Response

Figure 5

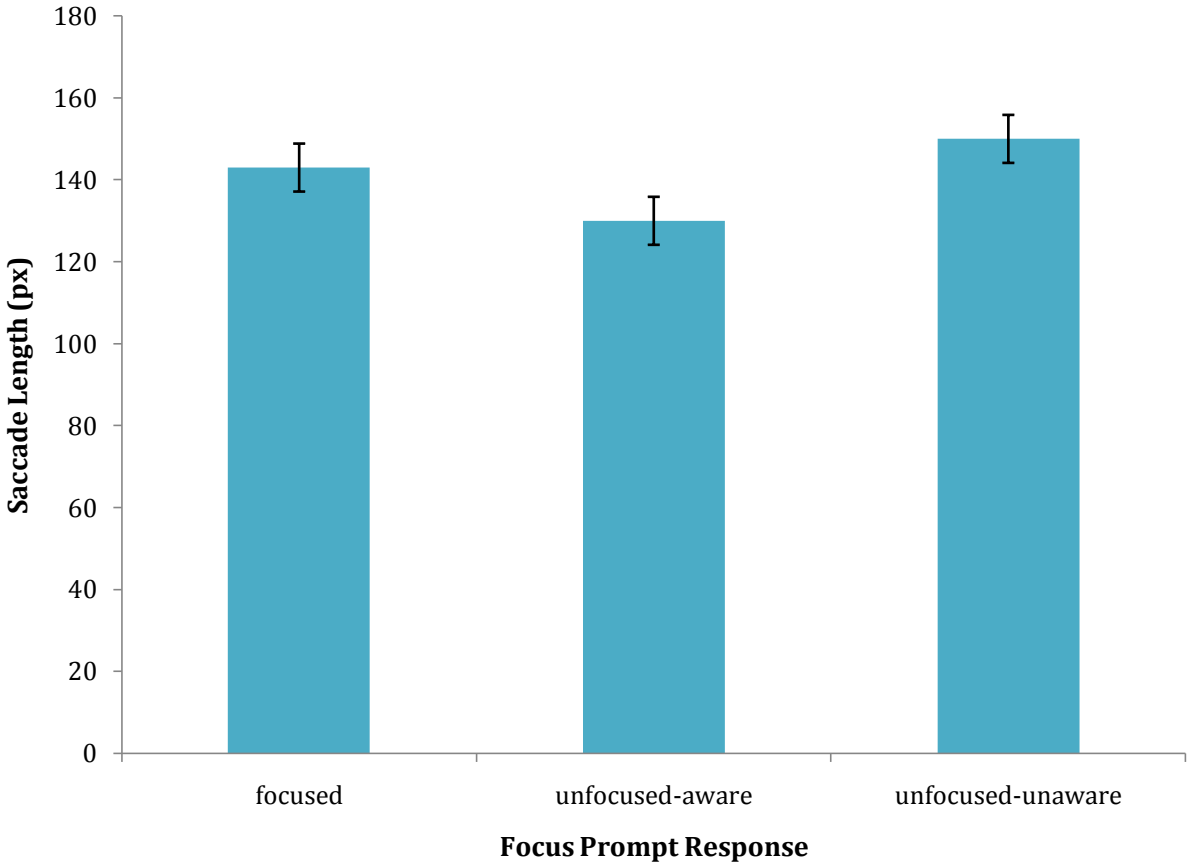
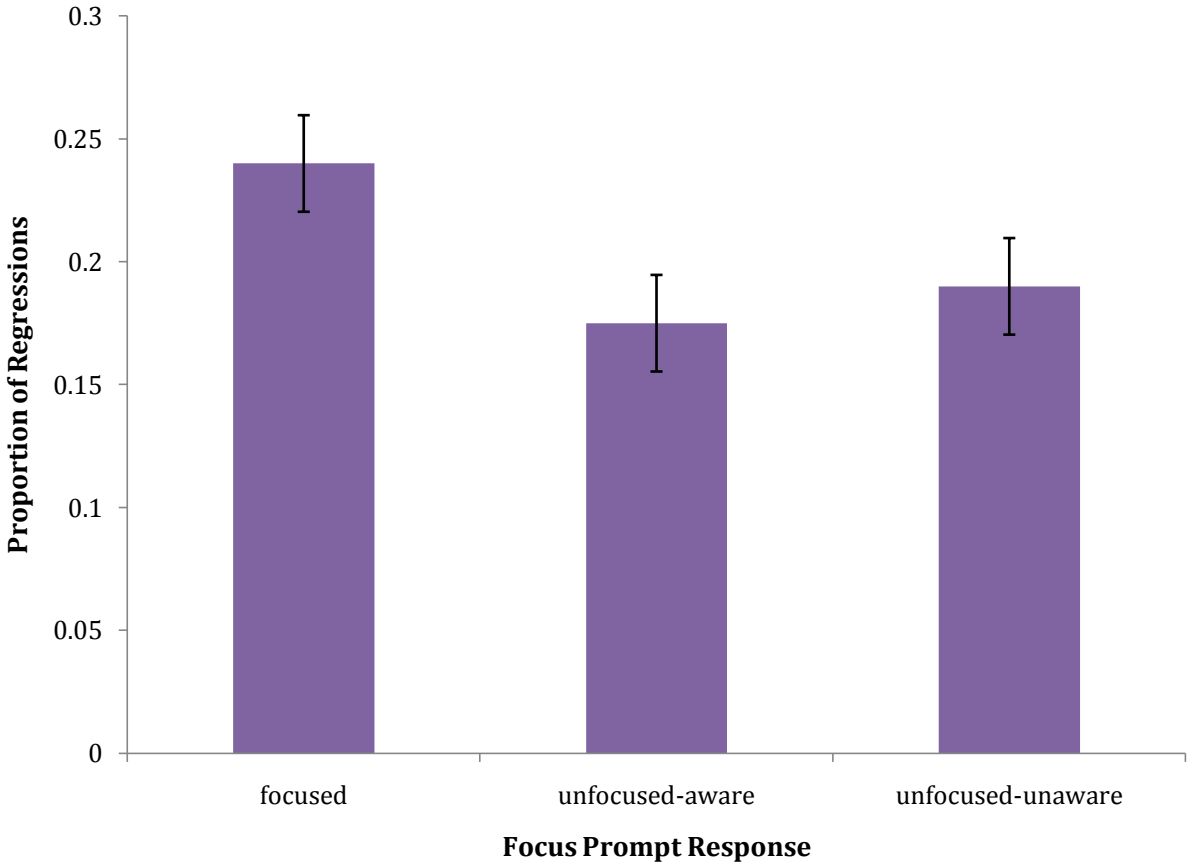

180
160
140
120
100
80
60
40
20
0
Saccade Length (px)
focused
unfocused-aware
unfocused-unaware
Focus Prompt Response

Figure 6


0.3
0.25
0.2
0.15
0.1
0.05
0
Proportion of Regressions
focused
unfocused-aware
unfocused-unaware
Focus Prompt Response