5-2016

The role of context and memory strategies in prospective memory commission errors

Iain A. Scott
University of Tennessee at Chattanooga, hsj463@mocs.utc.edu

The Role of Context and Memory Strategies in Prospective Memory Commission Errors

Iain Scott

Departmental Honors Thesis

The University of Tennessee at Chattanooga

Department of Psychology

Dr. Jill Shelton

April 11th, 2016

Project Director

(Dr. Jill Shelton)

Department Examiner

(Dr. Amanda Clark)

Department Examiner

(Ms. Libby Byers)

Liaison, Departmental Honors Committee

(Dr. Randy Evans)

Abstract

Within the field of prospective memory (memory related to future tasks), the repetition of an already completed task has recently been of great interest within the field. Referred to as a commission error, the cognitive mechanisms and specific risk factors that relate to this memory error have been the focus of research in this area of memory. For example, research suggests that a well-established behavioral strategy for improving prospective memory, termed implementation intentions, also elicits higher levels of commission errors, particularly for older adults (Bugg, Scullin, & McDaniel 2013). The impact of commission errors on everyday life can have extreme consequences, such as an individual accidentally taking an important medication twice. Currently, there lacks any method of reducing these memory errors. The purpose of this study was to test the potential efficacy of a reverse implementation intention (i.e., stating and imagining that one will no longer respond to a past prospective memory cue) to reduce the likelihood for the occurrence of commission errors in both younger and older adults. We utilized a novel eye-tracking paradigm that provided rich contextual cues in an effort to induce a high probability of commission errors. Although we did not observe a statistically significant benefit of reverse implementation intentions in reducing the likelihood of commission errors, at least in younger adults, individuals given this memory strategy were less likely to have commission errors relative to a group that was told to no longer perform a future task. Additionally, we used eye fixation patterns to assess strategic monitoring and evidence of spontaneous retrieval in relation to commission errors. The results suggest that the high incidence of commission errors observed in our study was due to spontaneous retrieval processes.

The Role of Context and Memory Strategies in Prospective Memory Commission Errors

The completion of future intentions plays an integral role in daily functioning. These intentions can range in importance from remembering to take a vital medication to sending an email to a colleague. Given the importance of prospective remembering to everyday functioning, it is critical to understand how to improve prospective memory function and reduce errors. Recent studies have been interested in memory errors within the field of prospective memory (Bugg & Scullin, 2013; Ping & Dodson, 2013; Scullin & Bugg, 2013). In particular, research has focused on commission errors, which are characterized by repeating a previously completed prospective memory task that is no longer relevant. Making a commission error can have severe consequences in everyday life, such as accidentally making a monthly payment twice without accounting for monetary funds. To date, there are no known studies on how to reduce the likelihood of commission errors, which is the focus of the present study.

A growing body of research has focused on strategies for improving prospective memory function. Gollwitzer (1999) demonstrated the strength of utilizing a specific encoding strategy to consciously form specific intentions, termed implementation intentions, to respond to a specific stimulus. Implementation intentions direct participants to repeat an "If I do X, then I will do Y" statement such as, "When I eat breakfast, then I will take my blood pressure medication," followed by a 30 second mental representation of performing the intention. Implementation intentions often enhance prospective memory by creating a stronger link between the cue and intention (Gollwitzer, 1999), which has been shown to increase the likelihood that one will spontaneously retrieve their intention when identifying the cue (McDaniel & Scullin 2010). The use of implementation intentions has been effective in boosting the likelihood of successfully completing a variety of prospective memory tasks in both laboratory and naturalistic settings (Chasteen, Park, & Schwarz, 2001; Gollwitzer & Brandstätter, 1997; McDaniel & Scullin, 2010).

The stronger link between the prospective memory cue and response that is created by implementation intentions can, however, lead to an increased risk for commission errors in both younger and older adults. Research suggests that older adults are more likely to commit commission errors compared to younger adults because of an inability to deactivate the prospective memory intention (Bugg, Scullin, & McDaniel, 2013). Furthermore, older adults who make commission errors in laboratory tasks may have lower inhibition ability compared to those who do not make commission errors (Scullin, Bugg, & McDaniel, 2012). Importantly, using an implementation intention (II) strategy to improve prospective memory performance makes it more difficult to de-activate the future intention when necessary, leading to higher levels of commission errors (Bugg, Scullin, & McDaniel, 2013).

In prospective memory, several different theories exist to explain the processes that support memory retrieval, which subsequently increases the likelihood for commission errors. The preparatory attentional and memory processes (PAM) theory argues successful prospective memory always relies on a resource-demanding system of strategic and non-automatic monitoring (or preparatory attention), where the inclusion of a prospective memory task shows apparent cost to the ongoing task (Smith, 2003; Smith & Bayen, 2004; Smith, Hunt, McVay, & McConnell 2007). From this perspective, commission errors would only occur if individuals were engaging preparatory attention to strategically monitor for an upcoming target.

The multiprocess framework, on the other hand, argues successful prospective remembering may be supported by either a resource-demanding strategic monitoring process or a more reflexive, spontaneous retrieval process. Specifically, spontaneous retrieval of a future intention will be more likely to occur when attention to ongoing task information naturally directs attention to the presence of a prospective memory target (McDaniel & Einstein, 2000). The dynamic multi-process theory extends this view by arguing for a dynamic interaction between the spontaneous retrieval and strategic monitoring process that is moderated by the context in which the prospective memory task needs to be completed. For example, the presence of environmental cues can trigger spontaneous retrieval of the intention (e.g., seeing a car maintenance billboard reminds you of the intention to get an oil change), which leads an individual to monitor the environment for an opportunity to execute their prospective memory intention (Scullin, McDaniel, & Shelton, 2013).

While spontaneous retrieval processes increase the probability that one will remember to execute their future intention, they can also increase the likelihood of making a commission error. Commission errors have been shown to occur when a completed intention is spontaneously retrieved but the individual is unable to suppress repeating the intention (Scullin, Bugg, & McDaniel, 2012). Failed executive control due to fatigue and the spontaneous retrieval of already completed intentions may be responsible for commission errors. The absence of preparatory monitoring in situations where commission errors occur supports the spontaneous retrieval view that a strong link between the cue and response will bring an intention into thought. Monitoring is characterized by the need to maintain the intention in memory to search for the prospective memory cue, which is attributed to ongoing task costs in the form of slower response speeds when encountering the prospective memory cue. In paradigms where individuals are not required to constantly update their memory to constantly monitor, they will disengage prospective memory monitoring (Scullin et al., 2012, Scullin & Bugg, 2013).

Laboratory Paradigms for Commission Errors in Prospective Memory

In a typical prospective memory laboratory-based task, participants are engaged in an ongoing activity (e.g., making living/non-living judgments) while also given a prospective memory demand to remember to make a response (e.g., key press) whenever a particular cue appears (e.g., the word apple). Strategic monitoring costs are characterized by slower responding to the ongoing task in the presence of a prospective memory demand relative to when no prospective memory demand is present. This is presumably due to cognitive resources being allocated toward monitoring the environment for the prospective memory cue (Marsh, Hicks, Cook, Hansen, & Pallos, 2003).

In typical paradigms, commission errors are assessed utilizing two blocks (an active prospective memory block and an inactive block). Participants are given the prospective memory task during the active block. During the inactive block, participants are told to no longer respond to the prospective memory cues that still occur.

In classic prospective memory tasks, after an intention is formed, monitoring is often needed to maintain the intentions and is characterized by ongoing task costs that are normally characterized by slower response speeds. Spontaneous retrieval is indicated when people perform well on the prospective memory task in the absence of monitoring, evidenced by no ongoing task costs. Making a prospective memory response during the inactive block as well as slowing trial response speed when presented a prospective memory cue is considered a commission error. Commission errors reflect the spontaneous retrieval of the prospective memory intention (Bugg & Scullin, 2013; Bugg, Scullin, & McDaniel, 2013).

Present Research

In this experiment we utilized a novel eye-tracking paradigm influenced by Meiser and Rummel (2012) and Shelton and Christopher (2016) to create a task that would increase the probability of committing commission errors. This allowed us to test which processes support commission errors (as predicted by the PAM or Dynamic Multi-Process theory). We were particularly interested in testing the potential efficacy of an implementation intention in reducing memory errors, in what I have termed as a reverse implementation intention. Finally, we were interested in the role aging plays in the likelihood for commission errors; however, we are still in the process of collecting data from an older adult sample. Thus, we will focus on the younger adult data in the present paper.

An eye-tracking paradigm allows new methods to measure commission errors through the tracking of not only incorrect responses and trial speed during the inactive block, but also through gaze fixations. Gaze fixations allow us to measure the amount of time participants spent looking in particular areas of a task. I predicted that participants would be more likely to spend time fixating in quadrants where the prospective memory cue occurred. I theorized that this fixation data could be used in the inactive block to show that participants who were no longer told to complete the prospective memory task would still show increased time spent looking in a no longer relevant prospective memory quadrant. It was hypothesized that the use of reverse implementation intentions would be an effective memory strategy in reducing the amount of commission errors in young adults. Lastly, it was also expected that commission errors would be lower in the experimental condition compared to the control condition.

Method

Participants and Design

Participants (*n*=42) were undergraduates at the University of Tennessee at Chattanooga. The sample ranged demographically between the ages of 18-27 and identified themselves as predominately female (77.5%) and Caucasian (54.5%). In addition to these undergraduates, two of the participants were older adults recruited from the greater Chattanooga region.

A two (Condition; II/Reverse II) x two (Partial match cue: Sound/Visual) x two (Block: Active/Inactive) mixed factor design was used with condition as a between-participants factor and partial match cue and block as a within-participants factors. In this paradigm, participants were engaged in the ongoing task of reporting the number of pictures that resemble living objects and were given the intention to press the prospective memory key when they saw a specific picture in a certain context. Participants were randomly assigned to one of two conditions, the experimental condition and control condition. The experimental group received reverse implementation intention instructions during the second phase of the experiment and the control group was told to no longer respond to the prospective memory target.

Materials and Procedure

Participants were positioned and set-up on an Eye-tracker model Red-M on a PC utilizing Windows 7, a mouse, and keyboard. For this computerized task, participants were presented with two blocks (prospective memory active and inactive phase) of 40 trials per block consisting of living and non-living pictures presented on the computer screen. Across both blocks, each trial consisted of an average of 18 living and non-living pictures that changed with every trial. The only visual stimuli that repeated was the prospective memory target. Pictures on each trial were further divided between four different colored quadrants (blue, orange, yellow, and purple) that randomly changed position every tenth trial. At the beginning of every trial, one of nine different sounds, excluding the prospective memory target sound, played and appeared 34 times through each block. The prospective memory task was randomly presented four times in each block (appearing on the 9th, 17th, 27th, and 36th trial). Prospective memory partial match cues, stimuli similar to the prospective memory target designed to test for false prospective memory responses, were presented four times in each block. Partial matched cues consisted of either the auditory cue with the appearance of the visual target in the wrong target quadrant, or the visual target in the correct colored quadrant accompanied by the wrong auditory cue.

Participants first filled out an informed consent and then underwent a calibration procedure on the eye-tracker. Participants were then presented instructions for the ongoing task of reporting the number of living pictures presented on each trial, emphasizing both speed and accuracy. During the active block, participants were told that in addition to the ongoing task, they should perform a secondary task (prospective memory task), which was to press the spacebar whenever they saw a picture of an apple in a blue quadrant after hearing bird noises (carrot in a yellow quadrant after hearing cat noises in the counter-balanced condition). Participants from both groups were then given the implementation intention and told to repeat the following phrase, “When I see an apple (carrot) in the blue (yellow) quadrant and hear bird (cat) noises, I will press the spacebar key,” followed by a thirty-second time interval where the participant was instructed to visualize themselves completing the task. Participants were asked to repeat the secondary task immediately following the implementation intention to ensure proper encoding of the prospective memory task. To allow space between encoding and the experimental block the Delis Kaplan Executive System Letter Fluency subtask, a short five-minute test of executive functioning, was administered. Participants then began the first block of trials (active prospective memory block). Upon completion of the active block, participants were asked three questions to check for understanding of the prospective memory task. All participants were able to successfully report what their prospective memory target and response were.

Participants then began the inactive block of the experiment where they were told that they are no longer required to respond to the previous prospective memory task, but were still asked to report the number of living pictures. Those in the experimental condition were given an additional implementation intention and told to repeat the following phrase, “When I see an apple (carrot) in a blue (yellow) quadrant and hear bird (cat) noises, I will not press the spacebar key,” followed by a thirty-second time interval where the participant was instructed to think about the instructions. Participants in the control condition were given a one-minute break to ensure the time delay was equivalent across groups. Following the end of the inactive block, participants were given a post-experiment survey asking them about the different mental strategies they may have used during the experiment. Following this survey participants were administered Raven’s Progressive Matrices (Raven, J., Raven, J.C., & Court, J.H. 2003), a measure of fluid intelligence. Participants were then given a short vocabulary test, demographics questionnaire, debriefed and dismissed.

Analyses

Alpha value was set at .05. We analyzed the occurrence of correct prospective memory responses in the active block across participants and conditions. Additionally, we were interested in the occurrence of commission errors between conditions to isolate if the use of reverse implementation intentions were an effective tool in reducing memory errors. We examined eye fixation patterns to assess whether prospective memory performance and commission errors were supported by spontaneous retrieval or strategic monitoring processes.

Results

PM Hits and Commission Errors

Prospective memory hits were defined as correct responses to the prospective memory cue during the active block within three trials of when the cue appeared. As expected, an independent-samples *t*-test did not reveal a significant difference between the control condition (*M*=.63, *SD*=.39) and the experimental condition[1] (*M*=.77, *SD*=.34), $t(40) = 1.24$, $p > .05$.

Commission errors were defined as a response in the inactive block up to three trials after the presentation of the prospective memory cue or partial match cue. The amount of commission errors per block between the control group (*M*=1.84, *SD*= 1.64) and experimental group (*M*=1.78, *SD*=2.34) was assessed using an independent-samples *t*-test and no significant differences were observed between the groups, $t(40) = .015$, $p > .05$.

Although individuals using reverse implementation intentions were associated with half as many people making no commission errors, there was not a significant effect. There were more instances of at least one error in the control condition compared to the experimental condition (13 vs. 12) and more error free participants in the experimental condition compared to the control (11 vs. 6; see figure 1) indicated by making a false prospective memory response at any time during the inactive block, $X^2(N=1) = 1.149$, $p > .05$; however, this was not significant. When focusing on pure commission errors, responses to the prospective memory target in the inactive block, a marginal effect was

[1] This lack of effect may be due to the salience of the individual quadrant color in drawing the gaze of the participant. There was an interaction between color conditions suggesting that individuals were performing better overall in trials where the prospective memory cue was presented in the blue quadrant compared to the yellow

present where those in the experimental group had less errors compared to the control group (0 vs. 3), $X^2(N=1)=3.964$, $p=.05$.

Fixation Data

We did not have fixation data for seven of the subjects due to calibration issues. Prospective memory relevance was defined by the average amount of eye fixations within 200 pixels of the prospective memory target quadrant in relation to the control quadrant. For participants who were told to respond to the prospective memory cue in the blue quadrant, the yellow quadrant was treated as the control quadrant and vice versa. We analyzed the data using a two (Prospective Memory Relevance: relevant/irrelevant) x two (Block: active/inactive) x two (Condition: experimental/control) mixed-factor analysis of variance with PM relevance and block as within-participants factors and condition as a between-participants factor. A main effect of PM relevance was observed such that individuals fixated longer in relevant quadrants in both the control (M= 3.03, SEM= .23) and experimental conditions (M=*2.45*, SEM=.22) in the active block, $F(1,33) = 9.29$, $p <$ .01. This suggests that individuals fixated primarily within the prospective memory quadrant during the active block relative to other quadrants. However, this main effect was qualified by a significant interaction between prospective memory relevance and block, $F(1,33) = 24.84$, $p < .05$. This interaction reflected the observation that participants fixated more in the relevant quadrant in the active block (M=3.43) related to the irrelevant quadrant (M=2.35); however, in the inactive block participants fixated equally as often on the relevant (M=2.64) and irrelevant quadrants (M=2.55) (see figure 3). This finding supports that individuals did not spend significantly more time fixating within the prospective memory relevant quadrant during the inactive phase. No other significant main effects or interactions were observed.

Discussion

This experiment utilized a novel eye-tracking paradigm to extend research methodologies within prospective memory. To our knowledge, this is the first study within the realm of commission errors to have used eye-tracking indices or have attempted to reduce commission errors using reverse implementation intentions. Our results indicate that the use of reverse implementation intentions is not an effective strategy for young adults to reduce commission errors. Additionally, the results show that individuals were fixating within the prospective memory relevant quadrant during the active block compared to all other quadrants. Compared to quadrants in the active block, there was no significant difference in the amount of fixations per quadrant in the inactive block. These findings suggest participants were engaging in monitoring processes only during the active block. In the inactive block, the lack of fixations coupled with the occurrence of commission errors, are evidence of spontaneous retrieval processes.

Practical Implications

A primary goal of the present study was to use a modified version of implementation intentions, a well-established and relatively easy to use memory strategy, to reduce commission errors. Results from this study did not support our hypotheses that the use of reverse implementations was an effective strategy in reducing these memory errors in young adults. Despite this finding, younger adults using reverse implementation intentions in the experimental group compared to the control group had more occurrences of no errors.

A possible problem with using an implementation intention to decrease the likelihood of repeating an already completed prospective memory task is that they serve as an additional reminder of the prospective memory task. Instead of being told to just forget the task all together, the reverse implementation intention may suppress any potential benefits regarding deactivation. Bugg, Scullin and McDaniel (2013) demonstrate the strength of using an implementation intention to strengthen encoding and thus increasing the likelihood of commission errors. If future studies seek to discover ways to undo this strengthening of cue and intention formed by implementation intentions, perhaps using different memory strategies may facilitate this.

In older adults, reverse implementation intentions may serve to reduce commission errors compared to young adults. Perhaps the limitation noted above regarding this memory strategy serving as a reminder of the prospective memory task may serve to aid older adults in inhibiting their response to the prospective memory cue in the inactive block. Burkard et al. (2014) found evidence that older adults utilizing implementation intentions had improved cognitive functioning and inhibition in everyday life.

Theoretical Implications

Utilizing a key component of eye fixation patterns, as measured with an eye-tracker, has allowed for an alternative index of monitoring without relying on response times between an active and inactive block (ongoing task cost). Our results suggest that individuals were monitoring more in the active block in relevant quadrants compared to irrelevant quadrants. This was indexed by more gaze fixations in prospective memory quadrants. Additionally, there was no difference in gaze fixations during the inactive block. This suggests that the occurrence of commission errors in the inactive block was due to spontaneous retrieval mechanisms. This is aligned with the literature (Scullin et al., 2012; Scullin & Bugg, 2013).

Limitations

Due to funding, we were only able to have two groups. Our groups consisted of the control group where participants received implementation intentions during the active block and were told to no longer worry about the prospective memory task in the inactive block, and the experimental group where individuals were again given the implementation intention during the active block as well as the reverse implementation intention in the inactive block. Ideally, we would have included a third group who received no implementation intentions in either the active or inactive blocks. The inclusion of this third group would allow us to measure if utilizing reverse implementation intentions would be effective in individuals who were not exposed to standard implementation intentions in the active block.

There has been a large push in recruiting older adults from various organizations, such as churches and senior living centers, which are proving valuable resources in assisting in the collection of older adult data. I am still recruiting and running older adult participants, but due to attrition, there has been difficulty in effectively attaining high amount of older adult participants.

Future Directions

In future studies, utilizing reverse implementations and other memory strategies may discern effective methods to reduce commission errors in middle aged and older adult populations. Additionally, future studies may utilize reverse implementations in individuals who did not increase their prospective memory recall utilizing implementation intentions. The use of this memory strategy may possibly be effective in more standard commission error designs.

Using an eye-tracking paradigm will allow researchers to expand their investigation beyond gaze fixation in particular regions and instead examine fixations to the individual prospective memory targets themselves. This would allow quantitative measures of capturing monitoring and spontaneous retrieval in relation to direct gazes of the prospective memory cue. In addition, researchers would be able to collect data on gaze duration to quantitatively gauge the amount of time spent looking at specific stimuli and how they interact with the prospective memory cue.

Exploring reverse implementation intentions on differing populations, such as middle and older aged adults, may serve to support an effective memory strategy for individuals outside of young adults. If found to be an effective strategy, reverse implementation intentions would offer a simple strategy to help reduce unwanted commission errors.

References

Bugg, J. M., Scullin, M. K., & McDaniel, M. A. (2013). Strengthening encoding via implementation intention formation increases prospective memory commission errors. *Psychonomic Bulletin & Review, 20*(3), 522-527. doi:10.3758/s13423-013-0378-3

Burkard, C., Rochat, L., Emmenegger, J., Juillerat Van der Linden, A., Gold, G., & Van der Linden, M. (2014). Implementation intentions improve prospective memory and inhibition performances in older adults: The role of visualization. *Applied Cognitive Psychology*, 28(5), 640-652. doi:10.1002/acp.3046

Einstein, G. O., McDaniel, M. A., Thomas, R., Mayfield, S., Shank, H., Morrisette, N., & Breneiser, J. (2005). Multiple Processes in Prospective Memory Retrieval: Factors Determining Monitoring Versus Spontaneous Retrieval. *Journal of Experimental Psychology: General*, *134*(3), 327-342. doi:10.1037/0096-3445.134.3.327

Einstein, G. O., & McDaniel, M. A. (2005). Prospective memory: Multiple retrieval processes. *Current Directions in Psychological Science*, *14*(6), 286-290. doi:10.1111/j.0963-7214.2005.00382

Marsh, R. L., Hicks, J. L., Cook, G. I., Hansen, J. S., & Pallos, A. L. (2003). Interference to ongoing activities covaries with the characteristics of an event-based intention. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *29*(5), 861-870. doi:10.1037/0278-7393.29.5.861

McDaniel, M. A., & Einstein, G. O. (2000). Strategic and automatic processes in prospective memory retrieval: A multiprocess framework. *Applied Cognitive Psychology*, *14*, 127-144. doi:10.1002/acp.775

Pink, J. E., & Dodson, C. S. (2013). Negative prospective memory: Remembering not to perform an action. *Psychonomic Bulletin & Review*, 20(1), 184-190. doi:10.3758/s13423-012-0337-4

Rayner, K. (1998). Eye movements in reading and information processing: 20 years of research. *Psychological Bulletin, 124*(3), 372-422. doi:10.1037/0033-2909.124.3.372

Raven, J., Raven, J.C., & Court, J.H. (2003, updated 2004). Manual for Raven's Progressive Matrices and Vocabulary Scales. San Antonio, TX: Harcourt Assessment.

Scullin, M. K., & Bugg, J. M. (2013). Failing to forget: Prospective memory commission errors can result from spontaneous retrieval and impaired executive control. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *39*(3), 965-971. doi:10.1037/a0029198u

Scullin, M. K., Bugg, J. M., & McDaniel, M. A. (2012). Whoops, I did it again: Commission errors in prospective memory. *Psychology and Aging, 27*(1), 46-53. doi:10.1037/a0026112

Scullin, M. K., McDaniel, M. A., & Einstein, G. O. (2010). Control of cost in prospective memory: Evidence for spontaneous retrieval processes. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *36*(1), 190-203. doi:10.1037/a0017732

Scullin, M. K., McDaniel, M. A., & Shelton, J. T. (2013). The Dynamic Multiprocess Framework: Evidence from prospective memory with contextual variability. *Cognitive Psychology*, *67*(1-2), 55-71. doi:10.1016/j.cogpsych.2013.07.001

Smith, R. E. (2011). Prospective Memory: Beyond the cost debate. *Journal of Psychology*, *219* (2), 75-76.

Smith, R. E. (2003). The cost of remembering to remember in event-based prospective memory: Investigating the capacity demands of delayed intention performance. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *29*(3), 347-361. doi:10.1037/0278-7393.29.3.347

Smith, R. E., & Bayen, U. J. (2004). A Multinomial Model of Event-Based Prospective Memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *30*(4), 756-777. doi:10.1037/0278-7393.30.4.756

Smith, R. E., Hunt, R. R., McVay, J. C., & McConnell, M. D. (2007). The cost of event-based prospective memory: Salient target events. *Journal of Experimental Psychology: Learning, Memory, and Cognition.*

Figure 1: The amount of no errors and occurrence of at least one error between the control and experimental condition.

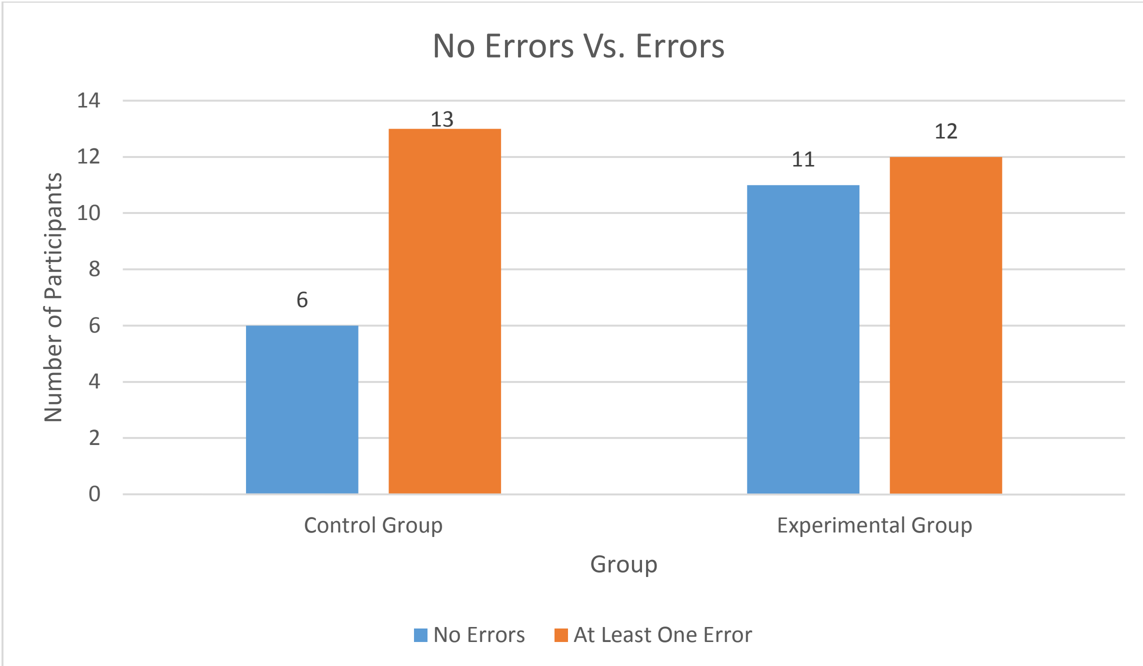

Figure 2: The total number of commission made between the control and experimental conditions.

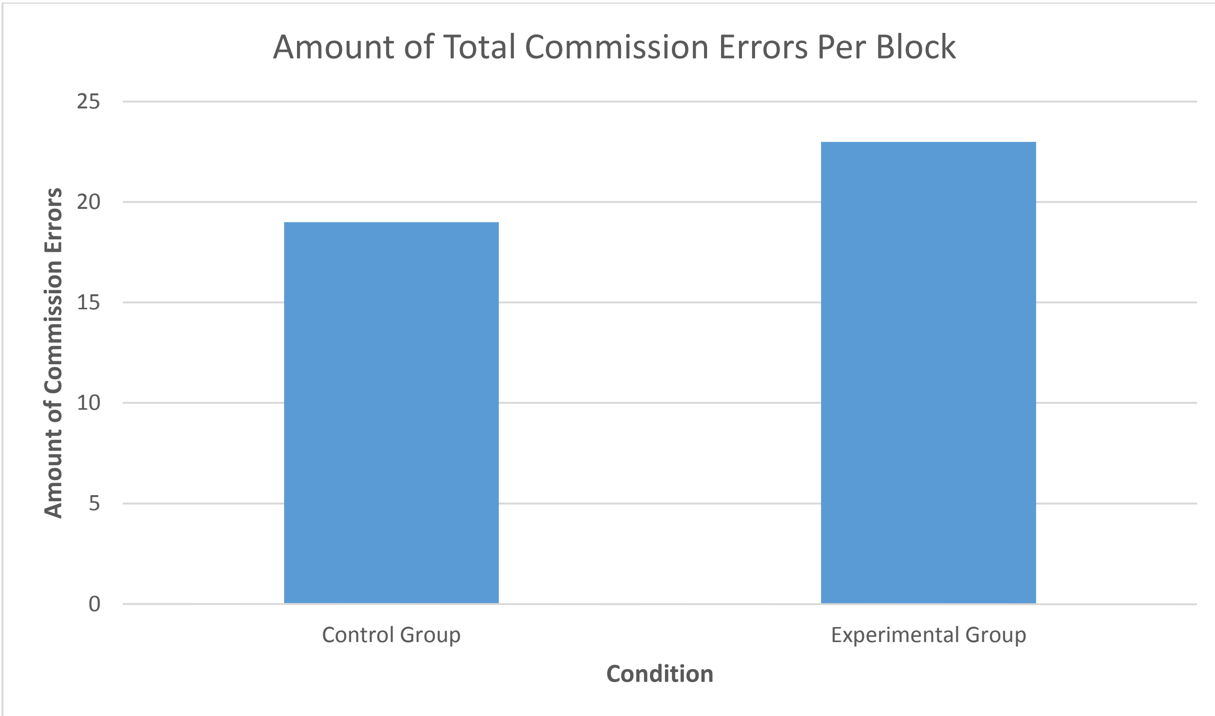

Figure 3: Amount of time individuals spent fixating in prospective memory relevant quadrants compared to irrelevant quadrants.