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Envisioning success: an in depth look at the relationship between episodic future thinking and academic goal achievement

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Abstract

Episodic future thinking is defined as the ability to mentally project oneself into the future and pre-experience an event. Prospective memory, on the other hand, is often defined as remembering to complete future intentions. Prospective memory includes two kinds of prospective memory tasks: event-based, or prospective memory prompted by some form of external cue or event, and time-based, or a task that an individual must remember to complete at a specific time. One area that synthesizes these two subjects is the realm of goal achievement, specifically academic goal achievement. In this study, I explored how episodic future thinking, when used as an encoding strategy, might affect both time and event-based naturalistic prospective memory tasks. In this naturalistic study, students generated a series of six academic goal-motivated tasks to be completed in the following three days. All academic goals were submitted over a Google form where students also answered whether they used internal or external reminders to remember their goals. Half of the participants underwent an episodic future thinking protocol when encoding their academic goals, which did not significantly increase prospective memory performance. There was a positive correlation between external cue use and academic goal achievement, implying there may be a benefit for using external reminders for remembering goals. In addition, results showed that students submitted their event-based goals at a higher rate when compared to their time-based goals.

Literature Review

While goals range in type and scale they can most accurately be understood as a desired outcome or aim for an individual that helps to shape future behavior (Elliot & Fryer, 2007; Elliot & Murayama, 2008). College students especially are familiar with the goal creation process, having to keep up with multiple academic goals within a given day. Tasks for college students may include anything from completing homework, writing papers, studying for exams, or finishing readings (Ferrari, & Scher, 2000). It is apparent that college students have a large amount of daily, monthly, and semester-long goals they consistently have to keep up with. However, with all the tasks that college students have to face, it is disturbing to see the quality at which college students are able to set academic goals for themselves. Researchers that focused on teaching college students goal-setting techniques, found that even after their goal-coaching sessions, college students' abilities to set goals for themselves were still severely limited and lacked sufficient details to be effective (Mccardle, Webster, Haffey, & Hadwin, 2017). Numerous studies have demonstrated the importance of college students being able to set and achieve goals for themselves. Self-efficacy, or the belief in one's own ability to perform well, is highly correlated with academic performance in college students. With the constant fluctuation of their personal goals, facilitating goal achievement is critical to bolster students' self-confidence in the academic realm and the workplace (Richardson, Abraham, and Barn 2012; Joel 2009). Not only has general well-being been found to improve as a result of goal achievement, but individuals that achieved goals that mattered to them have surpassed their expected GPA score that had been predicted from their former ACT scores (Sheldon, & Houser-Marko, 2001). Considering how college students struggle to set quality academic goals, it is important to investigate other methodological avenues, like memory strategies, that could aid college students in remembering to complete their goals. The

purpose of this study is to directly explore the impact that episodic future thinking, when used as a memory strategy, has on helping college-aged students achieve their goals.

One concept relevant to this discussion of goals and goal setting strategies, is the idea of prospective memory. Prospective memory tasks are described as tasks that an individual has to remember to accomplish in the future (Penningroth, Scott, & Penningroth, 2019). Researchers Pennigroth and Scott demonstrated this connection between goals and prospective memory tasks through their Motivational Cognitive Prospective Memory Model, which suggests that many prospective memory tasks are actually part of larger goal networks, causing certain propsective memory tasks to be deemed more important when related to personal goals (Penningroth & Scott, 2013; Penningroth & Scott, 2007) . It is important to note, however, that while prospective memory tasks are deemed more important when associated with personal goals, not all kinds of prospective memory tasks are created equal. According to Einstein and McDaniel, the two main kinds of prospective memory tasks include time-based and event-based prospective memory (Einstein et al., 1995). Time-based prospective memory tasks are tasks that one has to remember to complete at a specific time, i.e. remembering to meet up with a study group at 3:00 P.M. Event-based prospective memory tasks are tasks one remembers to initiate due to a cue in the environment apart from time, i.e. remembering to turn in a paper for history class after seeing one's laptop. A theme often included with prospective memory is reminder usage, which is typically divided into categories of either internal or external. While both kinds of reminders can be used to improve prospective memory performance, individuals typically depend on external reminders in their environment versus utilizing internal reminders to remember what they need to do (Kvavilashvili & Fisher, 2007; Walker & Andrews, 2001; Intons-Peterson & Fournier, 1986).

Over the years, researchers have explored ways to utilize goal strategies in order to improve performance in prospective memory tasks. Numerous studies have been conducted to investigate how an individual can successfully achieve one's own goals and what cognitive strategies are most conducive to personal achievement. The most widely studied goal execution strategy is referred to as implementation intentions (Chen et al., 2015; Gollwitzer & Brandstätter, 1997). According to Gollwitzer, implementation intentions generally take the form of a statement such as, "I intend to do goal-directed behavior Y when I encounter situation Z". Implementation intentions have been effective in increasing fruit and vegetable intake (Harris et al. 2014), reducing snacking habits (Sheeran, Aubrey, & Kellet 2007), improving emotional regulation (Gallo et al. 2009), and even increasing attendance to psychotherapy sessions (Tam, Bagozzi, & Spanjol 2010). In one meta-analysis conducted by Chen et al., researchers found that implementation intentions were able to improve prospective memory performance in nearly all age brackets (Chen et al. 2015) .In older adults, however, event-based prospective memory performance was the only type of prospective memory that improved for individuals 60-75 years old. Within these studies regarding implementation intentions, however, imagery, or visually imagining one's goal, is a technique commonly mentioned as a part of the implementation intention procedure (McFarland & Glisky 2012). Indeed, research suggests that imagery on its own could have a positive effect on prospective memory tasks, a term often linked with the goal planning process (Penningroth & Scott 2013). Such findings highlight the potential benefits of "imagining the future context" of one's own goal, for successful goal attainment. It is this orientation towards the future that researchers Atance and O'Neill describe as episodic future thinking. In their words, episodic future thinking is, "...our ability to project our self into the future and pre-experience an event (Attance & O'Neill, 2001). Episodic future thinking is a process built off an individual's general knowledge gained

from autobiographical memories (Argembeau & Mathy 2011). In order to envision the future, individuals utilize the memories of their own personal experiences and imagine future situations while considering potential outcomes based on said memories.

I argue that it is the pre-experiencing of a future event, characteristic of episodic future thinking, that grants an individual a more fully defined and effective plan with a greater perspective of possible obstacles that could prevent future success. It is only by being prepared for the roadblocks to one's achievements and envisioning the potential solutions to those achievements that individuals may persevere and accomplish their goals. I hypothesize that, individuals who participate in episodic future thinking protocols are more likely to complete their personal goals versus individuals who do not. The present research provides an opportunity to bring more awareness to the topic of episodic future thinking, initiate a path to merge two different psychological fields in their theories on goal planning, and finally, attempt to improve the techniques that we utilize when making and accomplishing daily goals. With all of these topics in mind, I explored three main hypotheses:

H1: By using episodic future thinking as an encoding strategy, individuals will be more likely to remember to execute their academic goals.

H2: Greater use of external reminders will be associated with better prospective memory for academic goal performance.

H3: Students will be more likely to execute academic goals that are non-time specific (event-based) relative to time-specific (time-based) in nature.

Method

Participants and Design

Individuals participating in this study were undergraduate and graduate students at the University of Tennessee at Chattanooga (n=44). Participants were recruited utilizing the UTC SONA system and received extra credit in Psychology courses along with a $10 Amazon gift card following their participation in the study. Participants ranged in age from 18 to 39 with a mean age of 21.75. Most participants were female (84%) and 16% were male. A majority of participants were Caucasian (75%), 20.5% were African American, 2.3% were Pacific Islander, and 2.3% were multiracial. Mean hours worked weekly was 12.55 hours while mean credit hours enrolled were 15.35. The mean hours of sleep was 6.96 with the average number of naps per week falling around 1.42. All participants spoke English as their first language

This study followed a true experimental 2 X 2 mixed factor design, with goal planning protocol (Control/EFT protocol) as the between-participants factor and prospective memory task type (Time-Based/Event-Based) as the within participants factor. Additionally, the potential moderating variables that were assessed included academic motivation, internal reminder use, and external reminder use.

Materials

Working Memory Tasks: Participants within the study were first assessed on their working memory by completing three working memory tasks within a computer setting in the laboratory. Tasks included a shortened and adapted version of a reading span task, an operation span task, and a modified lag task (Oswald et al., 2015; Shelton, Elliot, & Metzger, 2007) and were programmed using the E-Prime software (Schneider, Eschman, & Zuccolotto, 2002). For the reading span tasks, individuals were required to read phrases, assess how logical the phrases

were, and recall the words of each phrase. In the operation span task, individuals had to both evaluate a math equation and read a word after each math operation. After a certain number of the pairings, participants underwent a recall test. Finally, in the modified lag test participants viewed a sequence of words, each by themselves, then were asked to recall one of the words from the list. After each trial, participants were asked what word was one back, two back, or three back. Each list of words presented to participants varied in number to avoid participants anticipating the order.

Goal Elicitation Procedure: After completing the working memory tasks, participants within the study were then split into the episodic future thinking condition and the control condition. Participants within both conditions were responsible for generating a list of six task-specific goals to complete, two a day, over the next three days. Participants were instructed that goals listed should be action-oriented, task specific, and measurable. These goals had to be separate from obligational tasks like class attendance, or vague tasks like making a good grade in the class. Of the goals listed within a day, participants were instructed to make one of their goals time-specific (Time-Based) and one non-time specific (Event-Based). It was explained that time-specific tasks had to start at a certain time, but not necessarily be completed at a certain time. Finally, all goals listed had to fall under the category of educational and could feasibly be accomplished within a day. Once participants in both groups had chosen their specific tasks for the week, they rated each goal in terms of goal importance and attainability on a scale of one to five. Participants were told that they were free to use any materials they needed in order to come up with their goals to ensure that individuals chose goals that were personally relevant to themselves. After defining their goals, participants within each condition were asked to repeat back the academic tasks they said they would complete. After naming a task and defining

whether it was time-specific or non-time-specific, participants would undergo either a verbal fluency task (Control), or EFT Protocol (Experimental). Participation in both conditions were recorded.

Verbal Fluency Task: For the verbal fluency task, participants were to recount as many words as possible for one minute that started with a specific letter. Letters included T, J, B, L, P, and F. Participants were asked to close their eyes and proceed for one minute in order to equate the times for both conditions.

Episodic Future Thinking Protocol: Following prior research on episodic future thinking (EFT), participants were asked to close their eyes and imagine the various details surrounding each one of their chosen tasks in order to attain a realistic first-person experience of their task-specific goal. Participants described the details of what they were imagining aloud for one minute. As participants envisioned their goal, they were asked to verbalize aloud the context regarding what they would experience. This context might include: whatever one may see, hear, or feel, where one will be, what one might think, or what obstacles might keep one from attaining one's goal.

Academic Motivation Scale: Participants were given the College (CEGEP) version of the Academic Motivation Scale. The scale was composed of seven subscales which measured Extrinsic Motivation (external, introjected, and identified regulation), Intrinsic Motivation, and Amotivation in students. While External motivation is generally described as doing an activity just to have it completed, Intrinsic motivation is defined as doing an activity for the sake of itself. Amotivation, on the other hand, occurs when an individual lacks an understanding of the connection between their actions and the outcomes of those actions (Vallerand, Blais, & Pelletier, 1989). Individuals are asked why they went to college and rated on a 7-point Likert

scale how much their reasons for going to college corresponded with the following statements. An example is answering, “For the pleasure I’ll feel while surpassing myself in my studies.”

Demographic Form: Participants were given a demographic form which included questions regarding: age, gender, race, current occupation, hours worked in the week, credit hours enrolled in, first language spoken, hours slept per night, naps taken per week, and days exercising more than at least 15 minutes or longer.

Submission Form: After individuals in both conditions had completed their assigned protocols and scales, they were given a link to a google form that contained the submission portals for their specific prospective memory tasks. Participants were instructed that the next portion of the study would need to be completed outside of the lab. In order to participate in this portion of the study, participants submitted images of their goals on Google forms to the primary researchers. Images submitted had to be of the specified goals and could not contain an image of themselves. On the Google form there were separate submissions for time-specific and non-time specific goals each day. Apart from the submission portals, a general reminder use survey was also attached to the Google form which asked participants how they remembered to complete their goals. External reminders included: cell-phone reminders, environment reminders, or written reminders. Internal reminders included mentally repeated reminders, association reminders, or no reminders.

Procedure

The first half of this study was conducted in the Cognitive Aging, Learning, and Memory (CALM) lab, and took an average of one hour for participants to complete. Participants were expected to complete all three working memory tasks at a computer at the beginning of a session, however, results from these working memory tasks will not be discussed in this paper. Working

memory tasks were followed by the goal elicitation procedure and goal encoding protocols based on the condition they had randomly been assigned to. Before initiating the session, participants were asked if they had a cellphone that had reliable access to the internet. Once confirmed, participants were asked to complete an informed consent form that explained both the in-person and out-of-lab portion of the study, and then were also asked to complete a demographic questionnaire. Participants were also informed that upon completion of the out-of-lab portion of the study they would receive a $10 gift card.

The three working memory tasks consisted of a reading span task, an operation Span task, and a modified lag task. After participants had completed their working memory tasks, they were then asked to list six of their academic goals to the researcher. Once the researcher had recorded all of the goals and the participant had specified which of the academic goals were time-specific and non-time-specific, the researcher proceeded to do an encoding check for each of the goals before each of the conditions' protocols. Participants in the control condition completed their assigned verbal fluency task, and participants in the experimental group completed the EFT protocol for each goal. Both conditions were equated in time, with both lasting for one minute. After both protocols were finished, all participants were asked to complete the Academic Motivation Scale (Vallerand, Blais, & Pelletier, 1989).

At the end of the session participants were informed that the next part of the session was to be completed outside of the lab in the form of Google form submissions of their goals. Participants were given the Google form link and walked through the submission portals and reminder use survey on the form. The session ended with participants being informed that they could do anything they would normally do to remember their goals.

Once participants had submitted photographic evidence of their goal completion via the google form link, data was collected via a secure Google Drive folder seen only by the researchers. Researchers then coded the pictures to see if the image related to the participants' original goals.

Results

Prospective Memory Performance

For this study, prospective memory performance was operationalized as the percentage of correct submissions out of three possible submissions uploaded for each prospective memory type. Pictures submitted for time-specified goals were restricted to a 15-minute window to count as a successful submission. When using a repeated-measures ANOVA to compare within-group variables, the mean scores for prospective memory were significantly different ($F(1,42) = 9.802$, $p = .003$, $\eta_p^2 = .189$: time-based $M = 37.12\%$, $SE = 5.505$, *95% CI* [26, 48.2] event-based $M = 55.30\%$, $SE = 6.523$, *95% CI* [42.1,68.5] showing event-based goals were submitted at a higher rate than time-based goals. When comparing mean scores for between-group variables (control/EFT protocol) mean scores of conditions were not significantly different ($F(1,42) = .328$ $p = .57$, $\eta_p^2 = .008$: control $M = 43.18\%$, $SE = 7.483$, *95% CI* [28.1,58.3], experimental $M = 49.24$, $SE = 7.483$, *95% CI* [34.14, 64.34]. When evaluating prospective memory performance across condition, there was no significant interaction between the two: ($F(1,42) = .613$, $p = .438$, $\eta_p^2 = .014$.

Totals for day one, day two, and day three submissions were then compared across condition. Goal performance was operationalized as the submitted picture of participants' self-set goal on the day specified. Again, pictures submitted for time-specified goals were restricted to a 15-minute window. After conducting another repeated-measures ANOVA comparing

submissions rates over day, a main effect of day was seen ($F(2,84) = 10.924$, $p = <.000$, $\eta_p^2 = .206$, however, there was no main effect of condition ($F(1,42) = .328$, $p = .570$, $\eta_p^2 = .008$. When evaluating the interaction between day and condition, no interaction was found ($F(2,84) = .742$, $p = .479$, $\eta_p^2 = .017$.To follow up the main effect of day, I ran a Bonferroni test which revealed that day one goal execution performance was higher *M*=1.23 *SE*=.122, *95% CI* [.98,1.47] than day two *M*=.82 *SE*=.124, *95% CI* [.57,1.07] and day three *M*=.727, *SE*=.127, *95% CI* [.47,.98]. There was no significant difference between day two and day three submission rates. In addition to submitting prospective memory tasks, participants were also expected to complete an academic motivation scale. After doing a correlation analysis, there was no relationship found between academic motivation and time-based prospective memory performance in any of the three categories of intrinsic $r = .025$, $p = .871$, extrinsic $r = -1.81$, $p = .246$, or amotivation $r = -.066$, $p = .673$. In addition, no relationship was found between event-based prospective memory and intrinsic $r = .177$, $p = .255$, extrinsic $r = -.013$, $p = .934$, or amotivation $r = - .216$, $p = .164$, suggesting that academic motivation did not significantly impact prospective memory performance.

(See Figure 1).

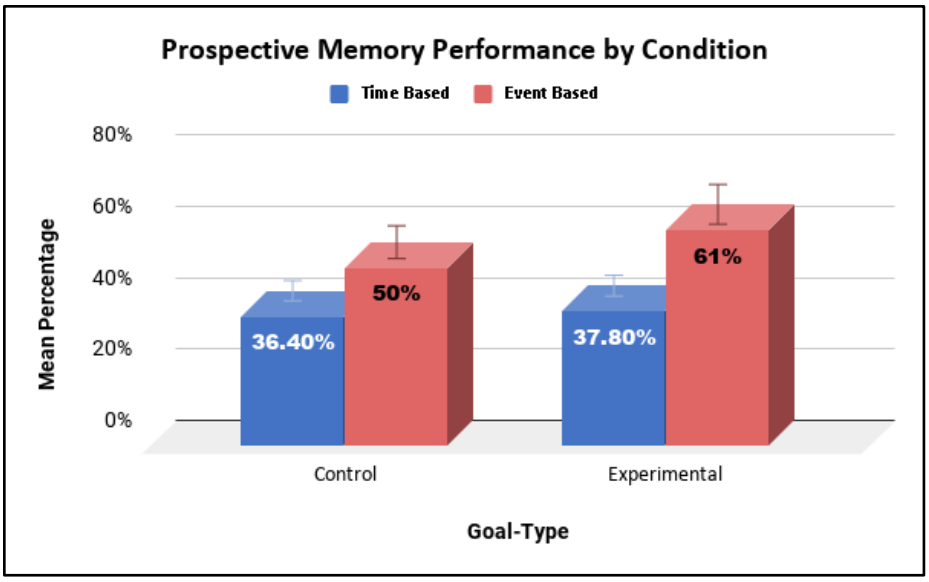

Figure 1. Prospective memory performance compared across goal-type and condition.

Reminder Usage

I measured goal type and reminder usage by comparing both variables in a correlation matrix. A significant correlation between overall goal submissions and external reminder usage was found for both event-based (r =.620, n = 43, p = <.000) and time-based goals (r = .524, n = 43, p = <.000). Finally, overall mean external reminder usage (M=.814, SD =.827) proved to be greater than mean internal reminder usage (M=.568. SD =.591). When mean frequency of reminder usage was divided between all six reminder categories, results showed specifically cell phone reminders were used most often: cell phone reminders *(*M= 1.55 SD = 2.118), environment reminders (M= 0.07 SD = 0.258), written reminders (M = 0.80 SD = 1.579), mentally repeated reminders (M = 0.95 SD = 1.539), association reminders (M = 0.25 SD = 0.751), no reminders M= 0.5 SD = 0.976)

(*See Figure 2).*

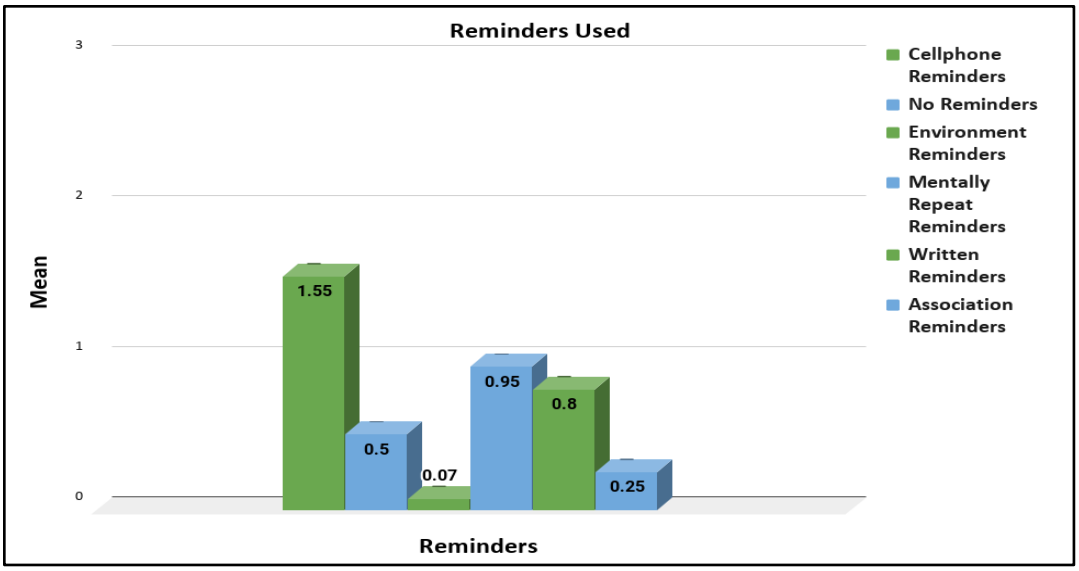

Figure 2. Reminder usage separated by external (green) and internal (blue) reminders.

Discussion

In contrast to previous findings suggesting episodic future thinking benefits goal pursuit (Ernst, Phillipe, & D'argembeau, 2018), individuals that underwent the episodic future thinking protocol in the present study had no significant increase in prospective memory performance when compared to the participants in the control group. Although there was a nominal increase in event-based submissions for the experimental group, the difference was not statistically significant. Research suggests that one possible reason for episodic future thinking having a larger effect on event-based submission, is because articulating the visuo-spatial context might assist in remembering the specific task where that context clue is encountered. Time-based prospective memory tasks, on the other hand, requires one to initiate retrieval unprompted (Altgassen et al., 2015) ; Paraskevaides et al., 2010). Another potential reason for the lack of effect in episodic future thinking may be because episodic future thinking, when used as an encoding strategy, only works in the short-term. For this study, participants started submitting

their self-set goals the day after the protocol. Although overall goal submission was low, there was a noted difference in submission amount by day, with higher submission rates present for the first day when compared to day two and day three of the study. In one episodic future thinking study, participants were required to come in on two consecutive days to complete prospective memory tasks. In one condition, participants received the same prospective memory task they were instructed to imagine the day before, while another group received a different prospective memory task on the second day than what they were told. Although participants received instruction for both days, researchers found that participants performed significantly better when they had already imagined the task the day before (Neroni, Gamboz, & Brandimonte, 2014). Although overall goal submission was low, there was a noted difference in submission amount by day, with higher submission rates present for the first day when compared to day two and day three of the study. There may also be a possibility that participants were lacking adequate detail when verbalizing the context of their goals in the EFT protocol. Although participants were asked to undergo the EFT protocol with an example in order to ensure clarity, oftentimes participants described purely procedural aspects of their goal rather than the autobiographical information, visuo-spatial details, and feelings of experiencing that are usually present for an episodic future thinking occurrence (D'Argembeau et al., 2010). One key difference in this study in comparison to other episodic future thinking studies was that participants were not asked to rate their level of belief in occurrence for their desired goal, which is believed to play a pivotal role in evaluating to what extent individuals truly "experienced" their future events (Ernst & D'Argembeau, 2017; Scoboria, Mazzoni, Ernst, D'argembeau, 2020). Although audio of the episodic future thinking protocol was recorded for each participant, the participant's level of episodic detail has not yet been rated by researchers, as seen in past literature (D'Argembeau et

al., 2010). Additional analysis has to assess the level of episodic detail for each participant in order to measure the extent that individuals envisioned the future and truly pre-experienced their goals.

As mentioned earlier, finding ways to increase success for students' academic goals is pivotal for increasing academic achievement as a whole. Whether it is using techniques like episodic future thinking, or other goal-setting procedures like writing down personal goals or improving self-regulation, those working in an academic setting are learning how to shape education in a way that facilitates rather than hinders academic success (Schippers et al., 2020; Schunk & Ertmer, 2000). While the goal-setting procedure did not benefit academic goal performance in this study, it is still important to note the positive correlation between external reminders and goal submission rates, as well as the higher submission rates for event-based goals overall. Prior literature on this topic has varied when it comes to the effect of reminders on prospective memory performance. Gilbert (2015) found that individuals that use external reminders as a way to offload their intentions not only completed their tasks more often, but they also chose to set them as a way to mitigate their own perceived memory deficits. Another study found that when participants were given SMS (Short message service) reminders to take their medication, overall adherence to medication consumption was increased (Vervloet et al., 2012). While higher reminder usage was expected, there are still several inconsistent findings when it comes to prospective memory performance and the use of reminders. One phenomenon that continues to stir debate within prospective memory literature is the age-related paradox, or the elevated level of prospective memory performance for older adults in a naturalistic setting compared to higher prospective memory performance for younger adults in a lab setting (Schnitzspahn et al., 2011). Researchers have hypothesized a number of causes behind this

phenomenon, whether it be an effect of experimenter versus participant-generated tasks, lab-based versus naturalistic studies, or individual differences related to age (Schnitzspahn et al., 2018; Ihle et al., 2012; Schnitzspahn et al., 2011). One of the most common hypotheses for this age-paradox is that older adults simply use more external reminders when remembering to complete their goals, however, other findings show that there are no significant age differences between reminder usage and goal performance (Schnitzspahn et al., 2018). To date, this is one of only a few studies addressing these kinds of limitations by accounting for prospective memory performance in both a naturalistic setting and by incorporating participant-set prospective memory tasks. While this study does not directly compare prospective memory task performance between older and younger individuals to explore this age-paradox, it does provide additional detail into the ways younger individuals in a collegiate setting choose to set and complete their goals. Findings from this experiment reveals how college students oftentimes complete their non-time specific (event-based) goals at a higher rate than their time-specific (time-based) goals. Seeing that it was event-based goals that maintained a greater submission rate, this suggests students might perform better when given event-based assignments, rather than time-based. In the future, instructors could encourage assignment completion by simply connecting students' tasks with future environmental cues. An example of this is teachers asking students to remember to complete their discussion board after they eat lunch tomorrow, versus telling them to complete their discussion board at 1:00 P.M. tomorrow. It is also worth noting that studies that have evaluated prospective memory performance in an ecologically valid manner tended to provide solely experimenter-given tasks, and prohibited the use of reminders (Rendell et al., 2000). This study, however, included participant set prospective memory tasks and evaluated reminder usage, extending past limitations to studies in this field. That being said, it was only

external cue use that was positively correlated to goal submission, aligning with past literature on the topic (Kvavilashvili & Fisher; Walker & Andrews, 2001; Intons-Peterson & Fournier, 1986). As indicated by this study and others, this prevalence of external reminder usage may be a result of modern technology; with cell phone devices nearly always being at hand, the ability to set reminders with notifications and updates streamlines our ability to task manage and keep up with important dates (Gilbert, 2015; Svoboda, Rowe, & Murphy, 2012). Instructors could use this finding to their advantage by utilizing external reminders on smart phones as a way to increase students' assignment completion.

While this study utilized a novel methodology for evaluating prospective memory performance in an ecological valid way, there are a few limitations. While the episodic future thinking protocol accounted for the major three aspects of episodic future thinking (visuo-spatial context, feelings of experience, autobiographical relevance), it is still a novel protocol. Future studies could build off of the current protocol and include instructions that would facilitate more detailed aspects of episodic future thinking. Some future thinking researchers suggest that imagining a future event, based off of past experiences, requires several attempts to draft a well thought out experience (D'argembeau et al. 2010; Williams et al., 1996). One potential change might be to extend the amount of time participants are engaging in the protocol in order to allow for a more realistic and detailed version of the future situation. Future researchers might also attempt to increase the sample size of the study in order to improve the validity of findings. One might also consider expanding into allowing students to self-set more than just academically related goals, in order to ascertain more personally relevant goals for students. Future researchers should also consider transcribing and theming goals mentioned and the episodic future thinking protocol in order to understand the level of episodic details that participants had.

In summary, this study adds to a relatively new body of episodic future thinking literature and provides a potential framework for not only testing an episodic future thinking protocol, but also a framework for testing prospective memory performance in an ecologically valid way. To date, there are minimal studies that compare time-based and event-based prospective memory tasks in such a naturalistic setting, especially with tasks that are of personal importance to the participants. In addition, this study also informs prospective memory research as it relates to reminder use. By understanding how external cues relate to prospective memory performance, and often take the form of cell phone reminders, we are able to gain insight into the ways that students remember to complete their academic goals. On a broader scale, the information from this study might be used to inform new ways to teach college students how to not only set goals for themselves, but also teach them how to utilize techniques that might help them complete the tasks necessary for achieving their desired goals.

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Appendix A

Condition Specific Protocol

Control Protocol (Verbal Fluency): "Please close your eyes and repeat back the six academic tasks you said you will complete. Be sure to state which day you will complete each task noting which tasks are time-specific versus non time-specific. After you state each task, I will ask you to go through a mental exercise for one-minute that requires you to come up with all of the words you can think of that start with a particular letter. For example, saying all of the words that you can think of which start with the letter 'r', Do you have any questions?"

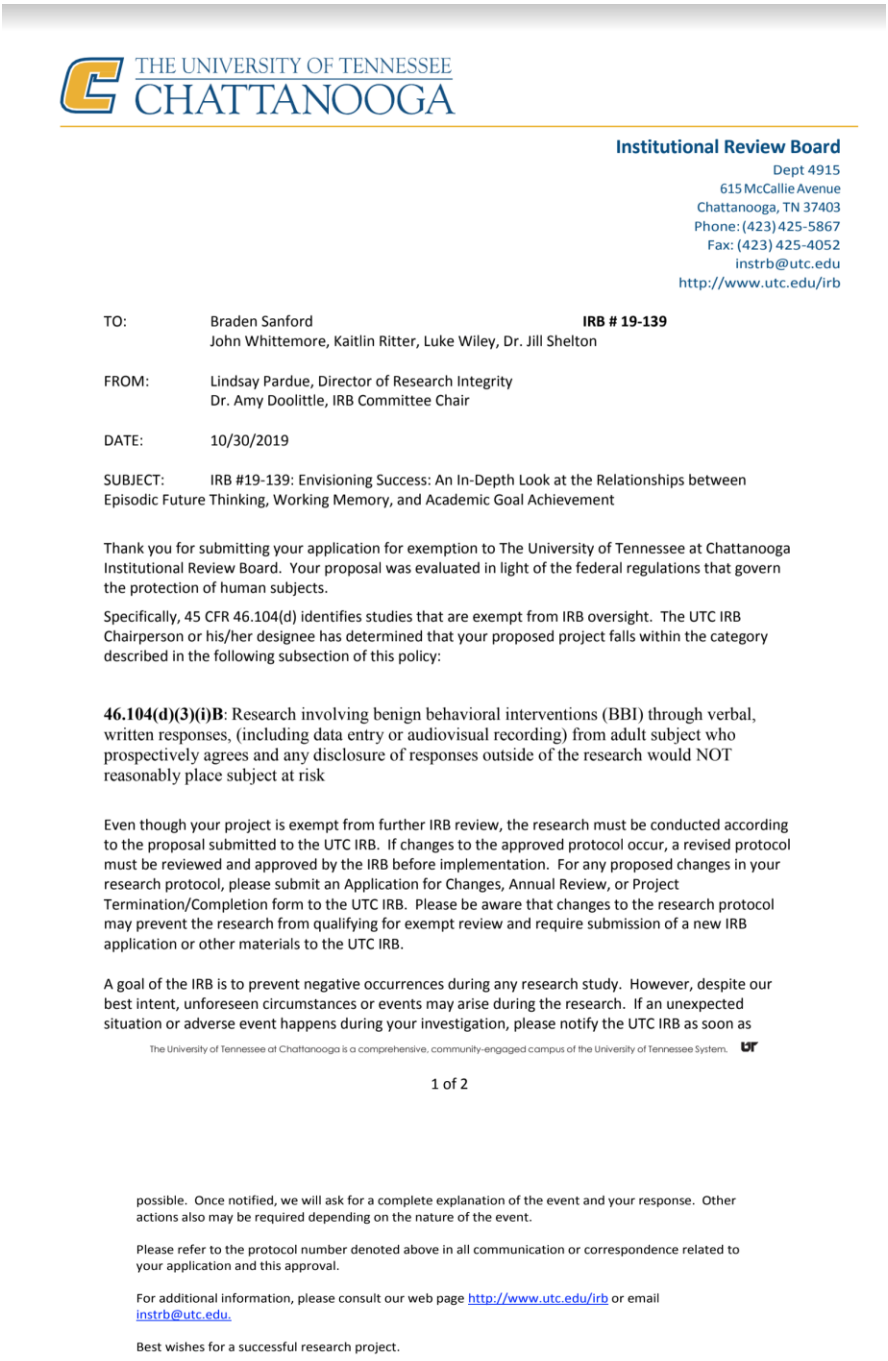
"What's your first task for the first day?"
"Is this time-specific or not? If so, what time will you start the task?"
"Please recount as many words as you can for one minute that starts with the letter __.
(1st Goal = T) (2nd Goal = J) (3rd Goal = B) (4th Goal = L) (5th Goal = P)
(6th Goal = F)

Episodic Future Thinking Protocol: "We will now be moving on to the next phase of our study, which will require you to envision details regarding your specific goals over the next three days. Please repeat back the six academic tasks you said you will complete. Be sure to state which day you will complete each task noting which tasks are time-specific versus non time specific. Importantly, you should close your eyes and envision yourself completing your goal-specific task in as much detail as possible. As you envision your goal, please verbalize aloud the context regarding what you would experience. This context might include: whatever you may see, hear, or feel, where you will be, what you might think or what obstacles might keep you from attaining your goal. You will have one minute to describe each goal in as much detail as possible. I will alert you when your time is up, and we will proceed to envisioning the next goal. We will start with one example to determine if you understand the instructions.

"Imagine you are turning in a project for history class. Spend one-minute envisioning and verbalizing as many details surrounding the context of this action including whatever you may see, hear, or feel, where you will be, what you might think or what might keep you from attaining your goal. Do you have any questions?"

Appendix B

IRB Approval Letter



THE UNIVERSITY OF TENNESSEE CHATTANOOGA

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TO: Braden Sanford **IRB # 19-139**
John Whittemore, Kaitlin Ritter, Luke Wiley, Dr. Jill Shelton

FROM: Lindsay Pardue, Director of Research Integrity
Dr. Amy Doolittle, IRB Committee Chair

DATE: 10/30/2019

SUBJECT: IRB #19-139: Envisioning Success: An In-Depth Look at the Relationships between Episodic Future Thinking, Working Memory, and Academic Goal Achievement

Thank you for submitting your application for exemption to The University of Tennessee at Chattanooga Institutional Review Board. Your proposal was evaluated in light of the federal regulations that govern the protection of human subjects.

Specifically, 45 CFR 46.104(d) identifies studies that are exempt from IRB oversight. The UTC IRB Chairperson or his/her designee has determined that your proposed project falls within the category described in the following subsection of this policy:

46.104(d)(3)(i)B: Research involving benign behavioral interventions (BBI) through verbal, written responses, (including data entry or audiovisual recording) from adult subject who prospectively agrees and any disclosure of responses outside of the research would NOT reasonably place subject at risk

Even though your project is exempt from further IRB review, the research must be conducted according to the proposal submitted to the UTC IRB. If changes to the approved protocol occur, a revised protocol must be reviewed and approved by the IRB before implementation. For any proposed changes in your research protocol, please submit an Application for Changes, Annual Review, or Project Termination/Completion form to the UTC IRB. Please be aware that changes to the research protocol may prevent the research from qualifying for exempt review and require submission of a new IRB application or other materials to the UTC IRB.

A goal of the IRB is to prevent negative occurrences during any research study. However, despite our best intent, unforeseen circumstances or events may arise during the research. If an unexpected situation or adverse event happens during your investigation, please notify the UTC IRB as soon as

possible. Once notified, we will ask for a complete explanation of the event and your response. Other actions also may be required depending on the nature of the event.

Please refer to the protocol number denoted above in all communication or correspondence related to your application and this approval.

For additional information, please consult our web page http://www.utc.edu/irb or email instrb@utc.edu.

Best wishes for a successful research project.

Appendix C

Demographic Form

Please fill out this form to the best of your abilities. If there is any information you do not wish to provide, feel free to leave it blank.

Age: _____

Gender: _____

Race: _____ **Current Occupation (if any)**: _____

How many hours do you work each week if employed? _____

How many credit hours are you enrolled in this semester? _____

Is English your first language? _____

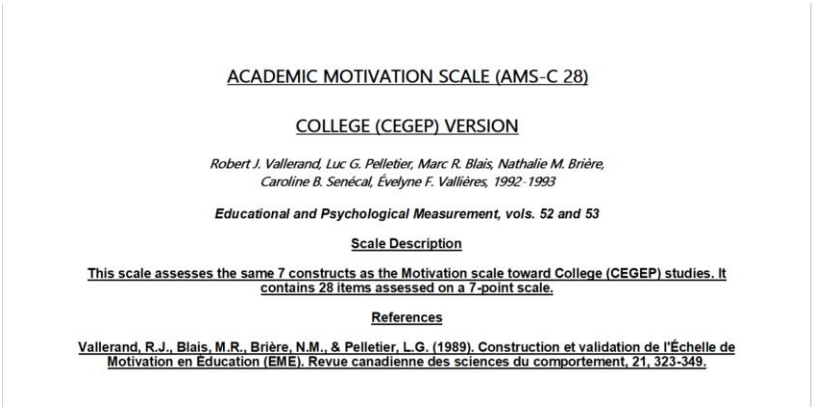
How many Hours do you Sleep per night (on average)? _____

How many naps do you take per week (on average)? _____

How many days per week do you exercise for 15 minutes or longer? _____

Appendix D

Academic Motivation Scale



ACADEMIC MOTIVATION SCALE (AMS-C 28)

COLLEGE (CEGEP) VERSION

Robert J. Vallerand, Luc G. Pelletier, Marc R. Blais, Nathalie M. Brière, Caroline B. Senécal, Évelyne F. Vallières, 1992-1993

Educational and Psychological Measurement, vols. 52 and 53

Scale Description

This scale assesses the same 7 constructs as the Motivation scale toward College (CEGEP) studies. It contains 28 items assessed on a 7-point scale.

References

Vallerand, R.J., Blais, M.R., Brière, N.M., & Pelletier, L.G. (1989). Construction et validation de l'Échelle de Motivation en Éducation (EME). Revue canadienne des sciences du comportement, 21, 323-349.

WHY DO YOU GO TO COLLEGE (CEGEP) ?

Using the scale below, indicate to what extent each of the following items presently corresponds to one of the reasons why you go to college (CEGEP).

Does not correspond at all		Corresponds a little		Corresponds moderately		Corresponds a lot		Corresponds exactly
1	2		3	4	5		6	7

WHY DO YOU GO TO COLLEGE (CEGEP) ?

1. Because with only a high-school degree I would not find a high-paying job later on.	1	2	3	4	5	6	7
2. Because I experience pleasure and satisfaction while learning new things.	1	2	3	4	5	6	7
3. Because I think that a college (CEGEP) education will help me better prepare for the career I have chosen.	1	2	3	4	5	6	7
4. For the intense feelings I experience when I am communicating my own ideas to others.	1	2	3	4	5	6	7
5. Honestly, I don't know; I really feel that I am wasting my time in school.	1	2	3	4	5	6	7
6. For the pleasure I experience while surpassing myself in my studies.	1	2	3	4	5	6	7
7. To prove to myself that I am capable of completing my college (CEGEP) degree.	1	2	3	4	5	6	7
8. In order to obtain a more prestigious job later on.	1	2	3	4	5	6	7
9. For the pleasure I experience when I discover new things never seen before.	1	2	3	4	5	6	7
10. Because eventually it will enable me to enter the job market in a field that I like.	1	2	3	4	5	6	7
11. For the pleasure that I experience when I read interesting authors.	1	2	3	4	5	6	7
12. I once had good reasons for going to college (CEGEP); however, now I wonder whether I should continue.	1	2	3	4	5	6	7
13. For the pleasure that I experience while I am surpassing myself in one of my personal accomplishments.	1	2	3	4	5	6	7
14. Because of the fact that when I succeed in college (CEGEP) I feel important.	1	2	3	4	5	6	7
15. Because I want to have "the good life" later on.	1	2	3	4	5	6	7

Does not correspond at all		Corresponds a little		Corresponds moderately	Corresponds a lot		Corresponds exactly
1	2	3		4	5	6	7

WHY DO YOU GO TO COLLEGE (CEGEP) ?

16. For the pleasure that I experience in broadening my knowledge about subjects which appeal to me.	1	2	3	4	5	6	7
17. Because this will help me make a better choice regarding my career orientation.	1	2	3	4	5	6	7
18. For the pleasure that I experience when I feel completely absorbed by what certain authors have written.	1	2	3	4	5	6	7
19. I can't see why I go to college (CEGEP) and frankly, I couldn't care less.	1	2	3	4	5	6	7
20. For the satisfaction I feel when I am in the process of accomplishing difficult academic activities.	1	2	3	4	5	6	7
21. To show myself that I am an intelligent person.	1	2	3	4	5	6	7
22. In order to have a better salary later on.	1	2	3	4	5	6	7
23. Because my studies allow me to continue to learn about many things that interest me.	1	2	3	4	5	6	7
24. Because I believe that a few additional years of education will improve my competence as a worker.	1	2	3	4	5	6	7
25. For the "high" feeling that I experience while reading about various interesting subjects.	1	2	3	4	5	6	7
26. I don't know; I can't understand what I am doing in school.	1	2	3	4	5	6	7
27. Because college (CEGEP) allows me to experience a personal satisfaction in my quest for excellence in my studies.	1	2	3	4	5	6	7
28. Because I want to show myself that I can succeed in my studies.	1	2	3	4	5	6	7

KEY FOR AMS-28

 # 2, 9, 16, 23 Intrinsic motivation - to know

 # 6, 13, 20, 27 Intrinsic motivation - toward accomplishment

 # 4, 11, 18, 25 Intrinsic motivation - to experience stimulation

 # 3, 10, 17, 24 Extrinsic motivation - identified

 # 7, 14, 21, 28 Extrinsic motivation - introjected

 # 1, 8, 15, 22 Extrinsic motivation - external regulation

 # 5, 12, 19, 26 Amotivation

Appendix E

Sample Form

SAMPLE FORM

Please fill out the information below.

1. **Event-Based Submission**
   Files submitted:

2. **Time-Based Submission**
   Files submitted:

3. **How did you remember?**
   Check all that apply.

   - ☐ I did not use anything to remember things; the tasks usually pop into my mind.
   - ☐ I waited for external cues in my environment to remind me of things.
   - ☐ I mentally repeated things to myself that I needed to remember.
   - ☐ I used a cell phone or other electrical device to help me remember things.
   - ☐ I wrote things down on my hand or put things in special places to remember things.
   - ☐ I remembered things by associating them with other events (like “right after breakfast” or “before bed”)