

An Experimental Study of Habit and Time Incentive in Online-Exam Procrastination

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Abstract

When it comes to task completion, habit is an automatic human behavior, where frequent past behaviors have a direct effect on future behavior. In contrast, procrastination appears to be a significantly observed habit. With today's fast-moving, information-rich environment and the speed at which information workers are required to complete their assignments, task performance, as well as task completion time, are crucial to the success of individuals and organizations. In the context of online exams, we have observed significant levels (nearly 60%) of procrastination in task completion, based on a large volume of exams. This study was set as a quasi-experiment that included an experimental group of 480 and a control group of 1,629 online exams. Given the significant procrastination observed, time incentives were provided to the experimental group in an effort to measure their effects on procrastination, task performance, and task completion time in online exams. Mann-Whitney U tests were conducted to assess such differences between the experimental and control groups. Using the 2,109 online-exam records, our results indicated a significant effect of time incentives on procrastination, while task performance and task completion time documented no significant effect. Discussion and conclusion are provided.

Keywords: habits in online learning activities, procrastination, online-exams procrastination, time incentives, incentives in online learning.

Introduction

Over the past three decades, information systems and digital technologies have changed the way people conduct their daily tasks (Kalman & Rafaeli, 2011). Eshet-Alkalai and Soffer (2012) noted that “digital technologies ... have penetrated almost every aspect of our lives. They’ve become an essential element in learning, interpersonal communication, organizational work, and our leisure time” (p. 1). Moreover, with today’s fast moving, information-rich environment, and speed at which information workers are required to complete ~~their~~ tasks, procrastination appears to be inevitable (Díaz-Morales, Ferrari, & Cohen, 2008; Levy & Ramim, 2012; Steel, 2007). Gafni and Geri (2010) defined procrastination as “the tendency to postpone an activity under one’s control to the last possible minute, or even not to perform it at all” (p. 115). Prior research has documented that consistent procrastination appears to be the habit of about a third of the adult population (Ferrari, 2010; Harriott & Ferrari, 1996; McCown, Johnson, & Petzel, 1989; Pychyl, 2010; Sigall, Kruglanski, & Fyock, 2000). Earlier studies in psychology defined habit as an automatic human behavior, where frequent past behaviors have a direct effect on future behavior (Ouellette & Wood, 1998). Furthermore, habit theory suggests that habits are created based on past frequent behaviors, thereby generating patterns that are repeated in future behavior (Triandis, 1977, 1980). In the context of our study, habit will be denoted in an

aggregated form across all participants in the form of procrastination in task completion (online exams).

According to Clark et al. (2007), classical behaviorists like Watson viewed habit as “conditioned reflex or response” (p. 9s). They also claimed that individuals create habits to reduce the cognitive load on repeated tasks. Rehabilitation scholars view habit as learned behavior that develops through reinforcement, and have identified nine categories of habit, some overlapping one another. Procrastination fits the category of “Conditional Reflex,” comma where “behaviors are learned through conditioning, motivated by physiological reward, triggered by environmental stimuli” (Clark et al., 2007, p. 17s). Consequently, the habit of procrastination is a powerful human behavior that can be changed with the use of certain incentives or interventions, particularly in the healthcare field.

According to Skinner (1973), positive incentives can have a significant impact on human behavior. Bandura et al. (1977) claimed that “there are many things that people can do with certitude of success that they fail to perform because they have no incentives to do so” (p. 138). They also indicated that “given sufficient capabilities and incentives, however, efficacy expectations are likely to be a major determinant of people's choice of activities” (Bandura et al., 1977, p. 138). Raviv and Netz (2007) defined incentives as “facets of the environment that are attractive or unattractive to an individual” (p. 242). They also indicated that incentives “are the motivational focus of a person’s activity. They represent the desirable outcomes people value and provide an impetus toward behavior, which is expected to provide benefits” (Raviv & Netz, 2007, p. 242).

Since time is a key component in tasks, the central aim of this study was to assess the effect of a *time incentive on procrastination, task performance, and task completion time* in the context of online exams. Specifically, this study attempted to investigate the following research questions:

RQ1: What is the effect of *time incentives* on *procrastination* in completing the task (online exam)?

RQ2: What is the effect of *time incentives* on *task performance* (online-exam score)?

RQ3: What is the effect of *time incentives* on *task completion time* (actual elapsed time)?

Methodology

This study was set out as a quasi-experiment. There are two types of experiments, true- and quasi-experiments. True-experiment is defined as research “in which an experimenter having complete mastery can schedule treatments and measurements for optional statistical efficiency” (Campbell & Stanley, 1963, p. 1). Specifically, true-experiment is “a study in which participants are randomly assigned to groups that undergo various researcher-imposed treatments or interviews, followed by observations or measurements to assess the effects of the treatments” (Leedy & Ormrod, 2010, p. 108). However, according to Creswell (2005), the reality is that “many experimental situations occur in which researchers need to use intact groups. This might happen because of the availability of the participants or because the setting prohibits forming artificial groups” (Creswell, 2005, p. 297). Consequently, a quasi-experiment is possible where the researchers control some of the variables of the experiment, while other variables are beyond their control and when the researcher is unable to randomize the participants into the groups (Leedy & Ormrod, 2010). Given that we were not able to randomize participants into the two groups, our experiment is categorized as a quasi-experiment. Additionally, the variable that was introduced into the experimental group is *time incentive*, while the control group didn’t receive such incentive. Over the past several years, we have observed online-exam takers continually request the overall time completion be extended. As such, the incentive considered

was time extension of the task (noted as "time incentive"). Aside from the time incentive, all other variables were kept constant between the two groups, including the format of the course, instructor, number of online exams, and task window. The context of the task was a bi-weekly online exam covering two chapters from the textbook studied during the previous two weeks. The task completion window included a whole week.

During our prior investigation (the control), we uncovered that 58% of exams takers procrastinated until the last day, while about 40% procrastinated until the last 12 hours (Levy & Ramim, 2012). Coupled with these findings, we observed that performance (scores) dropped as exams were taken closer to the due time. One plausible explanation for this was that, as the content covered in each exam was studied in the two weeks prior to the assessment, exam takers might have forgotten the content studied/discussed. Following this line of thought, the current quasi-experiment investigated whether time incentives affect the common habit of excessive procrastination. The control group's tasks included 30-minute-long online exams. However, exam takers were instructed that they could exceed that time limit, while receiving constant notifications while doing so. The experimental group included a time incentive ("incentivized group") in a gradually decreasing format, where 50% more time was provided (15 minutes positive time incentive) for exams taken, Mondays (00:01) to Wednesdays (23:59), about 26% more time was provided (eight minutes positive time incentive), Thursdays (00:01) to Saturdays (23:59), and about 17% less time was provided (five minutes negative time incentive) on Sundays. Figure 1 provides an illustration of the control and the experimental groups.



Figure 1. Task Information for the Control and Experimental Groups

The following were the hypotheses investigated in this study, noted in null form:

- H1: There will be no statistically significant difference on the *procrastination in completing the task (online exam)* between the *incentivized group* and the *control group*.
- H2: There will be no statistically significant difference on the *task performance (online exam score)* between the *incentivized group* and the *control group*.
- H3: There will be no statistically significant difference on the *task completion time (actual elapsed time)* between the *incentivized group* and the *control group*.

In this study, we have extracted a data set of 2,109 online exam records with 1,629 online exams in the control group and 480 online exams in the experimental group. The data set was compiled over a period of seven terms at an academic institution in the southeastern United States. The unit of analysis for this study was the task completed (i.e. an online exam), where each record indicated an instance of online exam completion. On average, there were about 35 students in each course, each taking six online exams during each term, with the same number of questions per exam, and a total of 16 courses in seven terms. The 16 courses were within the context of information systems. All courses were structured similarly with the same instructor, and the six online exams were staged throughout each term to cover the fundamental concepts discussed in the course. Two main time-related measures were extracted: proximity (in hours) to due time (procrastination) and task completion time. The task completion window, a week-long time frame (Monday to Sunday), was constant for both groups. Mann-Whitney U tests using SPSS 20 was utilized to conduct the data analysis and hypotheses testing.

Results

The experimental group included online exam records completed by 269 (56%) females and 211 (44%) males, while the control group of 1,629 online exam records included 913 (56%) completed by females and 716 (44%) completed by males. Table 1 provides summary of gender distributions among the experimental and control groups.

Table 1: Descriptive Statistics and Demographics of Learners (n=2,109)

Item	Control Group		Experimental Group	
	Frequency	Percentage (%)	Frequency	Percentage (%)
<i>Gender</i>				
Female	913	56.0%	269	56.0%
Male	716	44.0%	211	44.0%
	1,629		480	

In addressing H1-H3, we have conducted a Mann-Whitney U test on the three following variables and comparing them for the incentivized experimental group and the control group: a) procrastination in completing the task (online exam) as measured in proximity (in hours) to due time; b) performance (online exam score); and c) task completion time (actual elapsed time). Table 2 below provides the outcome of this analysis.

Table 2: Mann-Whitney U test on Experimental Group vs. the Control Group

Variable	Control Group (n=1,629)		Experimental Group (n=480)		Mann-Whitney U	
	Mean	St. Div	Mean	St. Div	Sig. (2-tailed)	Z
ProximitytoDueTime_hrs	32.6	42.33	80.1	48.20	0.000 *	-17.505
AttemptTimeElapsedMin	31.1	9.42	30.1	14.86	0.298	-1.041
Score	84.5	13.60	84.2	13.50	0.110	-1.599

* - $P < .001$

Our results indicate that the time incentive had a statistically significant ($p < .001$) effect on the procrastination in completing the task (online exam), which indicates that H1 is rejected. This discovery indicates that indeed time incentives can alter undesirable habits such as procrastination. Furthermore, we found that a significant number of tasks were completed in

timely manner due to the largest incentive (37.3%, experimental vs. 6%, control), which provided an interesting cumulative impact on procrastination (18.3%, experimental vs. 58.6%, control). Figure 2 provides a detailed distribution of the percentages of online exams completed over the weekdays for the two groups. Additionally, we have found that the time incentive had no statistically significant ($p=0.298$) effect on performance (online exam score), which indicates that H2 is not rejected. Surprisingly, our results indicate that the two groups had no statistically significant difference on the overall scores. Our initial assumption was primarily driven by the belief that, with time incentives, individuals tend to score better the earlier they take the online exam (i.e. closer to their prior week's studying). However, our results indicate that, despite being impacted by the time incentive and procrastinating less, exam-takers' overall scores weren't significantly different. The average overall score for the experimental group and the control group were almost identical (84.5/100 for control versus 84.2/100 for experimental). Moreover, our overall findings from both groups indicate that scores on Sundays (the last 24 hours before the due time) were significantly lower than on the rest of the week, as detailed in Figure 3.

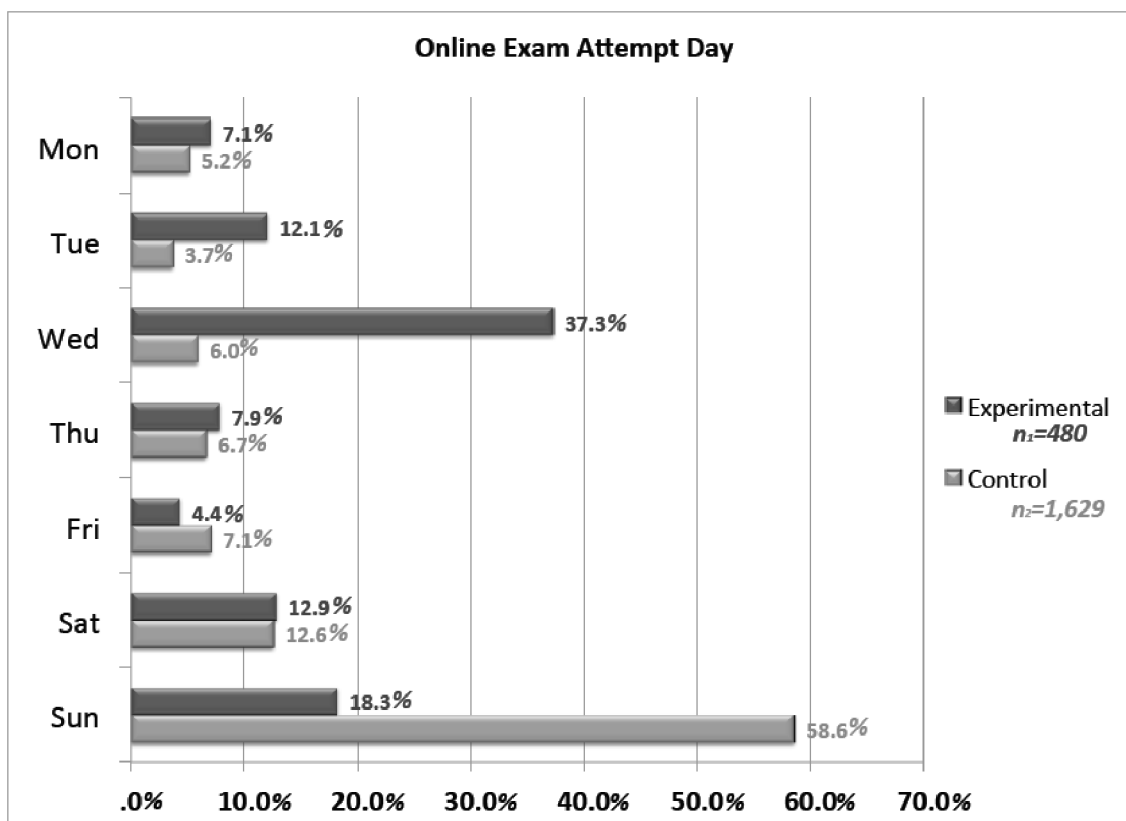


Figure 2. Distribution of Task Completion Procrastination (Day)

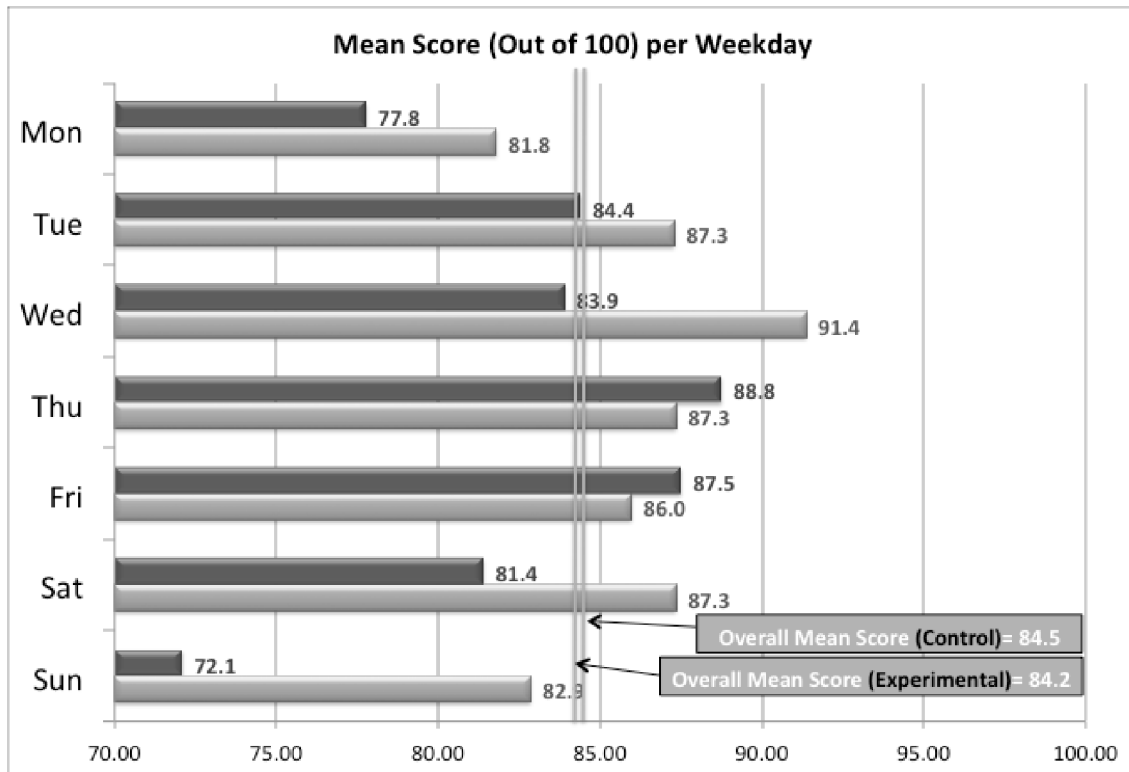


Figure 3. Distribution of Performance (Score) Throughout the Weekdays

Moreover, our results indicate that time incentives had no statistically significant ($p=0.110$) effect on the task completion time (actual elapsed time), which indicates that H3 is not rejected. To our amazement, we found that the two groups had no statistically significant difference on the overall actual elapsed time for the online exams. Specifically, the average elapsed time for the control group was about 31 minutes, whereas the experimental was about 30 minutes. On the surface, this appears counter-intuitive, as exam takers had been complaining repeatedly that they need additional time. However, when extra time was provided, we found no significant difference in the actual elapsed time used. We were astonished to find that the average, for each weekday on the actual elapsed time, was lower for the experimental group compared with the control group. One plausible explanation for this is that exam takers may not actually need the extra time – rather, the cognitive relief from knowing that there is extra time, allowed them to complete the task somewhat sooner. Figure 4 provides a detailed distribution of the task completion time (actual elapsed time) over the weekdays for the two groups, while Figure 5 provides the summary of experimental hypotheses and their outcomes.

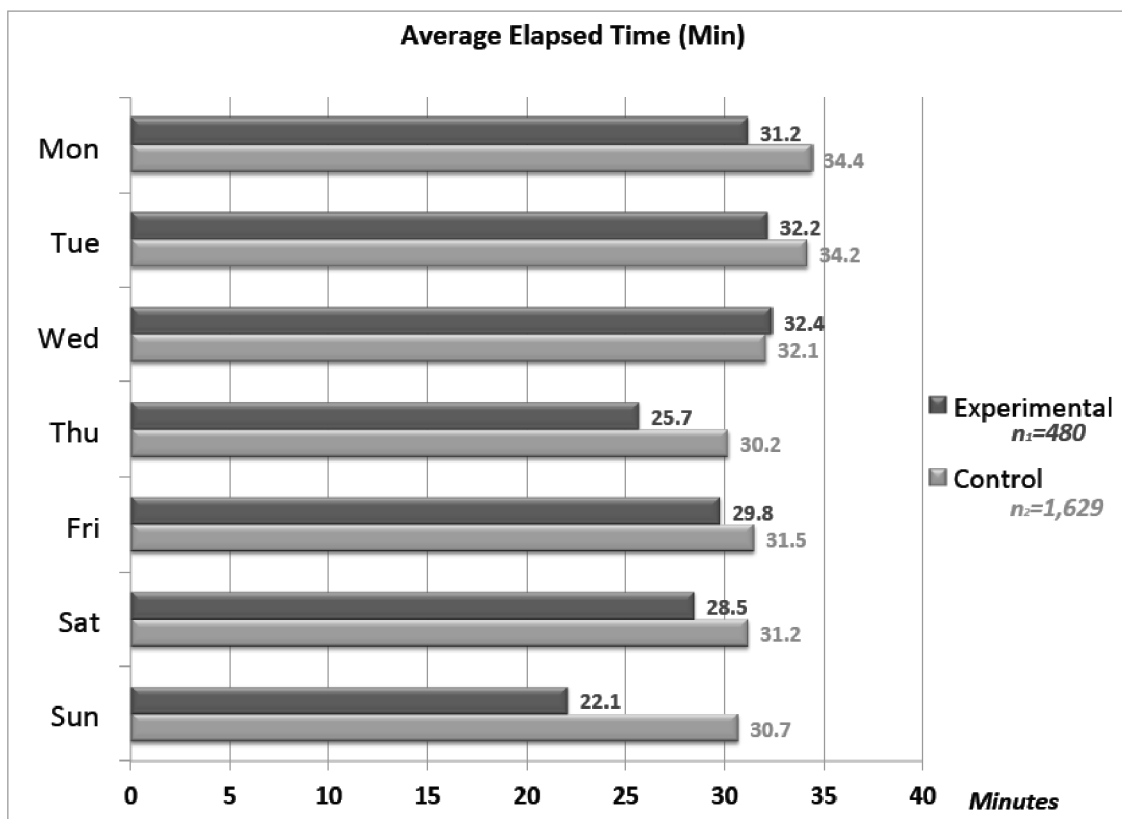


Figure 4. Distribution of Task Completion Time (Actual Elapsed Time) Throughout the Weekdays

Hypothesis #	Hypothesis	Outcome
H1	There will be no statistically significant difference on the procrastination in completing the task (online exam) between the incentivized group and the control group.	Reject
H2	There will be no statistically significant difference on the task performance (online exam score) between the incentivized group and the control group.	Fail to Reject
H3	There will be no statistically significant difference on the task completion time (actual elapsed time) between the incentivized group and the control group.	Fail to Reject

Figure 5. Summary of Experimental Hypotheses Outcomes

Discussions and Conclusions

In this research, we investigated habits in the context of online exams using a quasi-experiment. Prior results show significant levels (nearly 60%) of procrastination in task completion, based on a large volume of more than 1,600 online exams. Given the significant procrastination, time incentives were provided to the experimental group, to measure the effects of such incentives on procrastination, task performance, and task completion time in online exams. Our results indicate significant differences in procrastination based on time incentives, while task performance and task completion time documented no significant differences. Finally, results from both the experimental and the control groups indicate that grades on Sundays, or when exams were taken in the last 24 hours before the due time, significantly lower than those on the rest of the weekdays.

Our study affirms that the habit of procrastination results in low scores, while time incentives, which can have some effect on such habits, may not play a significant role in overall task performance. As such, additional research is needed to investigate the role of other incentives that may have stronger impact on task performance. Moreover, Blau and Barak (2012) discussed information overload in today's society as one explanation to the differences between what online learners wish to perform and what they actually do perform. As such, it might be that a significant number of learners may wish to invest more time in exam preparation (i.e. task completion), while in reality, other personal obligations get in the way, causing students just to take the exams even if they're not fully prepared for them.

References

- Bandura, A., Adams, N. E., & Beyer, J. (1977). Cognitive processes mediating behavioral change. *Journal of Personality and Social Psychology*, 35(3), 125-139.
- Blau, I., & Barak, A. (2012). How do personality, synchronous media, and discussion topic affect participation? *Educational Technology & Society*, 15(2), 12-24.
- Clark, F., Sanders, K., Carlson, M., Blanche, E., & Jackson, J. (2007). Synthesis of habit theory. *OTJR: Occupation, Participation and Health*, 27(Supplement), 7s-23s.
- Creswell, J. W. (2005). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (2nd ed.). Upper Saddle River, NJ: Pearson.
- Díaz-Morales, J. F., Ferrari, J. R., & Cohen, J. R. (2008). Indecision and avoidant procrastination: The role of morningness-eveningness and time perspective in chronic delay lifestyles. *The Journal of General Psychology*, 135(3), 228-240.
- Eshet-Alkalai, Y., & Soffer, O. (2012). Navigating in the digital era: Digital literacy: Socio-cultural and educational aspects. *Educational Technology & Society*, 15(2), 1.
- Ferrari, J. R. (2010). *Still procrastinating? The no-regrets guide to getting it done*. Hoboken, NJ: John Wiley & Sons, Inc.
- Gafni, R., & Geri, N. (2010). Time management: Procrastination tendency in individual and collaborative tasks. *Interdisciplinary Journal of Information, Knowledge, and Management*, 5, 115-125.
- Harriott, J. S., & Ferrari, J. R. (1996). Prevalence of procrastination among samples of adults. *Psychological Reports*, 78, 611-616.
- Kalman, Y. M., & Rafaeli, S. (2011). Online pauses and silence: Chronemic expectancy violations in written computer-mediated communication. *Communication Research*, 38(1), 54-69.
- Kennelly, A., & Fantino, E. (2007). The sharing game: Fairness in resource allocation as a function of incentive, gender, and recipient types. *Judgment and Decision Making*, 2(3), 204.
- Leedy, P. D., & Ormrod, J. E. (2010). *Practical research: Planning and design* (9th ed. ed.). Upper Saddle River, NJ: Prentice Hall.
- Levy, Y., & Ramim, M. M. (2012). A study of online-exams procrastination using data analytics techniques. *Interdisciplinary Journal of E-Learning and Learning Objects*, 8, 97-113.
- McCown, w., Johnson, J., & Petzel, T. (1989). Procrastination, a principle components analysis. *Personality and Individual Differences*, 10(2), 197-202.
- Ouellette, J. A., & Wood, W. (1998). Habit and intention in everyday life: The multiple processes by which past behavior predicts future behavior. *Psychological Bulletin*, 124(1), 54-74.
- Pychyl, T. A. (2010). *The procrastinator's digest: A concise guide to solving the procrastination puzzle*. Bloomington, IN: Xlibris corporation.

- Raviv, S., & Netz, Y. (2007). Age, gender, and level of activity as moderators of personal incentives to physical activity in israel. *The Journal of Psychology, 141*(3), 241-261. doi: 10.1037/0022-3514.54.2.323.1988-13667-00110.1037/0022-3514.54.2.323
- Sigall, H., Kruglanski, A., & Fyock, J. (2000). Wishful thinking and procrastination. *Journal of Social Behavior and Personality, 15*, 283-296.
- Skinner, B. F. (1973). Conversation with b. F. Skinner. . *Organizational Dynamics, 1*(3), 31-40.
- Steel, P. (2007). The nature of procrastination: A meta-analytic and theoretical review of quintessential self regularity failure. *Psychological Bulletin, 133*(1), 65-94.
- Triandis, H. C. (1977). *Interpersonal behavior*. Monterey, CA: Brooks/Cole.
- Triandis, H. C. (1980). Values, attitudes, and interpersonal behavior. In J. M. M. P. H. E. Howe (Ed.), *Nebraska symposium on motivation: Beliefs, attitudes, and values* (Vol. 27, pp. 195- 259). Lincoln: University of Nebraska Press.