How Being Busy Overcomes Procrastination and Enhances Productivity

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Abstract

Procrastination can have a negative effect on both individual and organizational productivity. This research examines how being busy influences procrastination when people have missed a deadline for completing a task. We demonstrate that missing a task deadline results in negative emotions that lead people to procrastinate, but that being busy mitigates these negative emotions. Therefore, when people have missed a deadline, they are less likely to procrastinate when they have many (vs. few) tasks to complete. Empirical evidence for this conceptualization is provided by an analysis of 586,808 real tasks from a software application designed to help people manage their tasks. One field study and two experiments replicate these findings and demonstrate that the extent to which people experience negative emotions from missing a deadline explains the effect of being busy on procrastination.

Key words: procrastination, productivity, goals, busyness

1. Introduction

     Improved productivity is an important driver of economic growth (Bisson, Stephenson, and Viguerie 2010). For individuals, increasing productivity in daily tasks can help them achieve their goals, both personal and professional. For this reason, many companies offer products and services aimed at helping people manage their time in order to be more productive (Gleick 1999). This is evidenced by the large numbers of time management courses available on the market, self-help books on time management and productivity, and companies offering services to help people be more productive. For example, approximately 5,000 productivity-related books were released in the U.S. from 2011 to 2013 (Baer 2013). A more recent trend, particularly with the increased adoption of mobile computing and smartphones, has been the use of software applications designed to make people more productive, such as "to do" list and reminder applications (e.g., Apple's App Store now features over 3,700 productivity-related applications; Baer 2013). The use of such applications has been increasing, with the average usage of productivity software applications growing from 15 times a month in 2011 to 30.6 times a month in 2013 (Baer 2013). Thus, understanding the factors that affect productivity is important for individuals and organizations.

     A particularly common factor that can negatively impact productivity is procrastination (Gupta, Hershey, and Gaur 2012). Because procrastination has been characterized as the tendency to delay a task that one would like to complete (Steel 2007), we use the terms "task delay" and "procrastination" interchangeably. Conventional wisdom suggests that the more tasks a person has to complete, the more likely they should be to delay a task (i.e., procrastinate) because they have less time to allocate toward the task. Thus, busier people should be more prone to procrastination. Indeed, research suggests that trying to do many tasks concurrently can

lead to procrastination and have a negative effect on productivity (Korkki 2012, Rubinstein, Meyer, and Evans 2001). Additionally, people often blame their procrastination on being busy with other activities (Schraw, Wadkins, and Olafson 2007).

Despite extant research and conventional wisdom, there may be contexts in which having more tasks to do *reduces* procrastination. In this paper we investigate the extremely commonplace context in which people have missed a deadline for completing a task, and examine how this impacts procrastination. We propose that when people do not have many tasks to do (i.e., are not busy), missing a task deadline results in negative emotions that lead people to temporarily disengage from that task, which results in procrastination. Conversely, when people have many tasks to do (i.e., are busy), this disengagement is mitigated because being busy reduces the negative emotions resulting from missing the task deadline. This occurs because, as we will discuss later, having many tasks allows for an attribution that the deadline was missed *due to being busy*, which does not warrant negative feelings. Thus, the current research contributes to the literatures on productivity, procrastination, and goal pursuit by showing that the impact of missing a deadline for completing a task on one's ability to subsequently complete that task depends on how busy they are.

The sections that follow present our reasoning and describe how the literature on goal violation offers theoretical support for the predictions. We then present the results of four studies supporting our theory. In study 1, we analyze data from 586,808 real tasks submitted by 28,806 users of a popular task management (to-do list) software application that is designed to help people manage their tasks. We find that once an initial task-completion deadline has been missed, busier people tend to complete it sooner. In study 2, we replicate the findings of study 1 using data collected in a field study where we examined how being busy at the time of missing a

task deadline impacts the likelihood of subsequently procrastinating on the task. In studies 3 and 4, we present the results of two experiments that manipulated perceptions of how busy people were and whether they missed a deadline to complete a task. We demonstrate that when people are not busy, missing a deadline increases negative emotions, which makes people more likely to procrastinate on the task. Busier people experience fewer negative emotions from missing a task deadline, which makes them less likely to procrastinate. Thus, real-world and experimental data support our predictions.

2. Theoretical Background

2.1 Missed Deadlines and Procrastination

Procrastination refers to delaying the completion of a task that one would ideally like to complete at the moment (Steel 2007). It typically manifests in a variety of everyday personal situations, such as delaying the completion of house chores, putting off a car repair until a later date, or deferring getting a doctor's appointment that is important to one's health. Procrastination is also extremely prevalent in work-related contexts, such as an employee putting of writing a report, a manager deferring conference calls or meetings, or an executive delaying an important business trip. The negative effects of procrastination on personal well-being and productivity are well documented in personal- and work-related settings. People who procrastinate tend to be more agitated, anxious, and miserable than those who do not procrastinate (Herweg and Müller 2011, Lay 1994, Tice and Baumeister 1997). Procrastination is also associated with low self-esteem, dependency on others and a range of self-defeating behaviors, such as inciting anger in others and rejecting opportunities for pleasure (Ferrari and Tice 2000, Ferrari 2000). Procrastination also presents a significant threat to individual and organizational productivity

(Gupta et al. 2012). Procrastinators tend to spend less time focusing on projects that are likely to succeed and more time on projects that are likely to fail (Lay 1990). Additionally, procrastinators tend to perform worse on tasks compared to those who do not procrastinate because they leave themselves too little time to complete tasks effectively (Ariely and Wertenbroch 2002, Dewitte and Lens 2000, Ferrari and Tice 2000, Van Eerde 2003).

Because of the negative consequences of procrastination, understanding how to reduce people's tendency to procrastinate is important. Procrastination is often regarded as a quintessential failure of self-regulation (Steel 2007, Wohl, Pychyl, and Bennett 2010). Consequently, setting a specific goal—or concrete deadline—for completing a task reduces procrastination (Ariely and Wertenbroch 2002, Soman and Cheema 2004). People are less likely to procrastinate on tasks with concrete deadlines compared to ones that have open-ended deadlines (Gupta et al. 2012). Additionally, because people often delay working on a task until a deadline is near, people perform better at tasks and are more likely to complete them when they set deadlines that are before the due date compared to deadlines that are at the due date (Ariely and Wertenbroch 2002). As a result, people often self-impose costly deadlines before the due date for completing tasks in order to reduce the likelihood that they will procrastinate (Ariely and Wertenbroch 2002).

Although task deadlines may be effective at reducing procrastination, setting a deadline but then missing it can make procrastination more likely. Soman and Cheema (2004; study 2) examined the effect of setting a task deadline on the time it takes to complete a task. People who completed a task before a self-imposed deadline finished the task in less time than people who did not set a deadline. However, they also found that people who missed their self-imposed deadline took longer to complete the task compared to people who did not set a deadline. The

reasoning behind this effect is that failing to achieve a personal goal can be painful. Consequently, when people violate a goal, they temporarily disengage from the goal in order to avoid the pain associated with failure (Cochran and Tesser 1996, Soman and Cheema 2004). Thus, when people miss a task deadline they may perceive the missed deadline as a personal failure and be more likely to procrastinate on that still-incomplete task. However, as we discuss in the next section, the influence of a missed deadline on procrastination (and, ultimately, productivity) may depend on how busy people are when they miss the deadline.

2.2 Being Busy and Procrastination

The current research investigates the effect of being busy on an individual's likelihood of procrastinating on a focal task and the time it takes to complete the task. We define being busy as the extent to which an individual has many tasks to complete at a given point in time. We do not establish an exact number of tasks at which point an individual enters a state of being busy. Rather, we assume that having two tasks to complete makes people busier than having one task, having three tasks makes people busier than having two tasks, and so on. Important in this characterization of busyness is that it does not necessarily refer to having multiple simultaneous tasks to be completed at once (i.e., multitasking). Rather, just having things to do in the near future (e.g., during a 24-hour period) will determine how busy a person is.

When a person misses a task deadline there are two possible courses of action. They can either disengage from the task (i.e., procrastinate) or they can stay actively engaged in their attempts to complete it. From a time availability standpoint, the fewer tasks an individual has to complete when they miss a deadline, the less likely they should be to disengage from the task because they have more time to allocate to it. However, there are a number of factors that may

influence task engagement for more versus less busy individuals. Potential factors are whether some people have more tasks because these tasks are more important and whether people who set more tasks for themselves are generally more productive. While all of these factors might predict higher task engagement for busier people, an examination of the goal violation literature suggests a more nuanced theory of the influence of being busy on task engagement.

Failing to achieve or violating a goal leads people to experience negative self-conscious emotions, such as shame and guilt (Muraven et al. 2005). Because the experience of these emotions is aversive, people attempt to avoid the pain associated with their failure by temporarily disengaging from the goal (Cochran and Tesser 1996, Hill 2004, Wilcox, Block, and Eisenstein 2011). The effect of even a small failure has been shown to lead to goal disengagement in several domains. For instance, when people exceed a monthly budget it results in negative emotions and makes people more likely to make an unnecessary purchase (Soman and Cheema 2004). Similarly, people who incur an outstanding balance in their credit card feel increased feelings of shame and guilt, which leads them to temporarily abandon their spending goals (Wilcox et al. 2011). Negative self-conscious emotions differ from other negative emotions in that people experience self-conscious emotions when they attribute the cause of an emotion-eliciting event to the self (Weiner 1986). Thus, people disengage from a goal once it has been violated because they fault themselves for the transgression. This suggests that when people attribute the cause of missing a deadline to themselves, they should be more likely to procrastinate. This idea is consistent with research finding that when people blame themselves for an initial act of procrastination it can result in negative emotions, such as guilt, and make them more likely to subsequently procrastinate (Wohl et al. 2010). These findings also imply that

when conditions reduce the negative emotions associated with missing a deadline people should be less likely to procrastinate.

The extent to which people experience negative emotions after personal transgressions often depends on whether the transgression can be justified (McGraw 1987). When a person can justify violating a personal standard they experience fewer negative emotions compared to when they cannot justify the transgression (Brock and Buss 1964). Thus, people who miss a task deadline may experience fewer negative emotions and be less likely to procrastinate if they can justify missing the deadline. For example, consider someone who had been trying to raise a target amount of money for a local charity based on a self-imposed deadline. If the person misses the deadline they may experience negative emotions for failing to reach the target, which could cause the person to procrastinate or give up on the goal entirely. However, if this failure is justifiable, or, put differently, could be plausibly excused (e.g., she was sick), she may be less likely to experience negative emotions, which would lead her to stay actively engaged in the task and be less likely to procrastinate. We propose that being busy provides individuals with the opportunity to justify missing a deadline and to thus excuse themselves for this transgression.

When people are pursuing many goals and are therefore attempting to complete multiple tasks (i.e., they are busy), completing any single task is understandably more difficult given limited time and resources. People who are in this situation may link being busy to the expectation that not everything can be done and not all tasks can be completed on time. Thus, the busier a person is, the more they expect that they will not get everything done on time. This expectation should mitigate the negative emotions associated with failing at goal pursuit because it allows them to justify their failure. In other words, being busy serves as justification that allows people to excuse themselves for their failure. Therefore, when busy people miss a task

deadline they should experience fewer negative emotions from missing the deadline and be less likely to procrastinate on a task compared to people who are not busy.

In summary, we predict that when people are not busy, missing a deadline for a task will make people more likely to subsequently procrastinate compared to when they do not miss the deadline. However, being busy will mitigate the negative effect of missing a deadline on procrastination. Busy people will experience fewer negative emotions and be less likely to procrastinate than people who are not busy. The next section presents the results of our analysis of real tasks from a task management software application. Following that we present results from a field study and two experiments aimed at testing the proposed mechanism.

3. Study 1: Real Tasks from a Task Management Software Application

3.1 Overview and Data Description

In this study we use data on real tasks to test our prediction that being busy reduces procrastination when people miss a task deadline. Our dataset is a record of tasks created and completed in a 538-day period in 2010 and 2011 by users of a popular to-do list software application. People use this software to help keep themselves organized in their personal and professional lives. The application can be used on mobile devices such as smartphones and tablets as an "app," by visiting a website, or through integration with email and calendar software. When a user creates a task, they give it a descriptive title (e.g., "write draft of new research paper") and set a deadline for completion (e.g., January 3). Once a task has been created they can change the deadline, and once the task is finished they mark it as "complete."

To test our theory, we needed to examine how the extent to which a user is busy moderates the relationship between deadlines (missed vs. not missed) and task completion. We

used the time it takes to complete a task as an indicator of procrastination, and the number of

incomplete tasks at any point in time as an indicator of the degree to which a person is busy.

Since we were interested in time to completion as our dependent variable, all tasks in our

analysis had to be completed. Tasks that were incomplete at the end of our 538-day observation

window were not part of the analysis. This is necessary because in this context we can only

assume that a task is real if it is eventually marked as complete (e.g., it is possible that an

incomplete task in these data was never intended by a user to be a real task and could simply be a

placeholder or general reminder). For similar reasons we also excluded tasks that users marked

as complete and then changed back to incomplete.

Additionally, all tasks in our analysis had deadlines, and initial user-specified deadlines

ranged between 1 and 365 days from the day of task creation. In this software application a user

can create tasks without deadlines, however this was not typical. We observed, for each task a

user creates, the initial deadline and all subsequent deadline deferrals ("push backs") before the

user marked the task as complete. We used the number of deadline deferrals as an indicator of

missing a deadline, which, as we argued earlier, could generate negative emotions and increase

procrastination. As a robustness check, we also report an analysis using a different measure of

missed deadlines, which produced consistent results.

3.2 Variables Used in the Analysis

Our dataset includes 586,808 unique tasks from 28,806 separate users of the application.

The main variables used in our analysis are as follows:

- *Time to completion* (dependent variable): the number of days between task creation

  and task completion as indicated by the user.

- *Deadline changes*: the number of times a user pushed back the initial deadline before the task is marked as complete.

- *Busyness*: the number of other tasks a user had created but not yet completed at the time of creating the task.

We used a number of other variables that were provided by the company as control variables, as follows:

- *User completion time*: the average number of days a user takes to complete tasks, including all tasks completed prior to the focal task. This is used to control for heterogeneity in users' general task-completion behaviors.

- *User completion rate*: the proportion of a user's tasks created prior to the focal task that the user completed. This is also used to control for heterogeneity in users' general task-completion behaviors.

- *First task*: equals 1 if the focal task is the user's first task created or -1 otherwise. This is used to control for the possibility that a user's first task is different from other tasks (e.g., due to a "learning curve" with the application).

- *First week of month*: equals 1 if the task is created in the first week of a month or -1 otherwise. This is used to control for the possibility that tasks created at the beginning of a month may be treated differently from tasks created later in a month.

- *Last week of month*: equals 1 if the task is created in the last week of a month, or -1 otherwise. This is used to control for the possibility that tasks created at the end of a month may be treated differently from tasks created earlier in a month.

- *Day of week task created*: indicators for the day of the week that the task was created. This is used to control for week-level seasonality.

• *Month of year task created*: indicators for the month of the year that the task was created. This is used to control for year-level seasonality.

3.3 Data Analysis and Results

Since our dependent variable is a time-duration variable (measured in days), we used a Cox proportional hazard model for testing our predictions. This allowed us to model how the hazard of task completion (i.e., the instantaneous probability of an incomplete task being completed at any given time) is affected by deadline changes, busyness, and the control variables. Following our predictions, we expected that while increasing deadline changes would be associated with a decrease in the hazard of task completion (or, put differently, an increase in time to completion), this effect would be mitigated as a person's busyness increased (i.e., smaller effect for busier people, resulting in a significant deadline changes x busyness interaction).

[INSERT TABLE 1 ABOUT HERE]

Results from this analysis are reported in Table 1. The table shows a base model which estimates the effects of all control variables on the hazard of task completion but excludes the covariates of interest (deadline changes, busyness, and their interaction). The table also shows a full model which includes the covariates of interest and all control variables. Except for the binary control variables (first task, first week of month, last week of month, day of week, and month of year), all covariates were standardized (mean = 0, standard deviation = 1) prior to analysis. Since the full model fits the data better than the base model (based on -2 log-likelihood, AIC, and BIC), we focus on the results from the full model. In Table 1 we report the parameter estimate for each effect (b) as well as the hazard ratio (HR = exp[b]). The hazard ratio indicates how a one-unit increase in a covariate affects the hazard of task completion controlling for the

other covariates. If HR > 1, then an increase in the corresponding covariate increases the hazard of task completion and therefore *reduces* time to completion (i.e., *less* procrastination). If HR < 1, then an increase in the corresponding covariate decreases the hazard of task completion and therefore *increases* time to completion (i.e., *more* procrastination).

The main effect of deadline changes on hazard of task completion is significant and negative (b = -.30, HR = .74, χ^2[1] = 25,541.59, p < .001). Deadline changes therefore slow down time to completion, which is indicative of increased procrastination on the focal task. Increasing a task's deadline by one standard deviation is associated with an approximate reduction in likelihood of task completion of 26%. Expressed differently, a one-unit increase in the number of times a task's deadline is pushed back reduces its completion likelihood by approximately 16% (deadline changes: M = .53, SD = 1.72). While pushing back a task's deadline makes a task less likely to be completed and increases the time to complete it, as expected, this effect is moderated by busyness. The deadline changes x busyness interaction is significant and positive (b = .012, HR = 1.01, χ^2[1] = 117.49, p < .001), as is the main effect of busyness (b = .011, HR = 1.01, χ^2[1] = 70.66, p < .001). Thus, as a person's busyness increases, the negative effect of deadline changes on hazard of task completion decreases. This suggests that deadline changes do not trigger as much procrastination in busier people as they do in less busy people.

The moderating effect of busyness on the effect of deadline changes on task completion can be illustrated by the following simple analysis. We compared the mean time to completion for tasks with zero versus one or more deadline changes for users who were not busy (busyness = 0) or at least somewhat busy (busyness > 0). For tasks created by users with busyness > 0, the mean time to completion was 12.24 days if there were no deadline push backs or 25.54 days if

there was at least one deadline change (diff. = 13.30 days). In contrast, for tasks created by non-busy users (busyness = 0), the mean times to completion were 19.44 days and 37.63 days, respectively for tasks with no deadline changes and at least one deadline change (diff. = 18.19). A comparison of the differences (13.30 days for busy people, and 18.19 days for non-busy people) illustrates the moderating effect of busyness. Although the simple effect of deadline changes on task time to completion is always negative (i.e., tasks take longer to be completed when deadlines are pushed back), it is substantially less negative for busy people.

As a robustness check we considered a different deadline variable that indicated if a task was completed after the deadline (missed deadline) or on/before the deadline (no missed deadline). Although this is a less sensitive measure than the deadline changes variable, it should generate consistent results if our theory about missing or deferring deadlines and negative emotions is true. We estimated a similar Cox proportional hazard model as before, but with the deadline changes covariate (main and interaction effects) replaced by the missed deadline variable. The results were very similar. The main effect of a missed deadline on hazard of task completion was significant and negative (b = -.48, HR = .62, $\chi^2[1] = 117,504.98$, p < .001), and this was qualified by a significant and positive missed deadline by busyness interaction (b = .02, HR = 1.02, $\chi^2[1] = 140.49$, p < .001). The main effect of busyness, although positive, was not significant in this model (p = .30). Thus, using a different deadline-related covariate does not appear to alter the main findings. This suggests that the results are reasonably robust, and also provides implicit support for our theory that the effect of missing or pushing back a deadline on procrastination is mitigated by being busy.

In summary, this study examined 586,808 real tasks submitted by users of a popular task management "to do" list software application. Our findings suggest that pushing back a task's

deadline can substantially hurt an individual's ability to expeditiously complete that task. This is consistent with our theory that missing a task deadline can result in negative emotions, which in turn reduces individual motivation to complete that task. Moreover, we found that this effect is mitigated by being busy; having more incomplete, active tasks reduces procrastination. This is also consistent with our theory: being busy may provide individuals with an opportunity to excuse their tardiness on a focal task.

4. Study 2: Longitudinal Field Study

4.1 Overview and Method

The first study demonstrated that when people miss a deadline, the extent to which they subsequently procrastinate is based on how busy they are when the deadline is missed. The purpose of the second study was to replicate the previous study's findings using data collected in a longitudinal field experiment. We examined the likelihood of procrastinating on a task after missing an initial deadline based on how busy a person was at the time they missed the deadline. Consistent with the results of the previous study, we expected that the busier people were, the less likely they would be to subsequently procrastinate.

Data were collected through a two-part survey, with the two parts being administered on two consecutive weekends (see Web Appendix for experiment instructions). In part 1, participants were asked to describe a task for which they had missed a deadline. The missed-deadline task was described as a task they had planned to complete during the week, but did not finish and intended to complete during the upcoming week. Before describing the task, participants were given the option to skip this portion of the study by indicating that they did not have a task that they had intended to complete. After describing the task, participants reported

how likely they were to procrastinate on this task in the upcoming week on a seven-point scale (1 = not likely, 7 = very likely). They then answered several additional questions about the task including one where they indicated how much of the task they had completed (1 = did not start, 10 = 90% complete). Based on participants' reports, the average missed-deadline task was 23.6% complete (SD = 24.7%). Next, participants were told to copy and paste their task description into a document so that it could be saved to their computer. How busy participants felt they were during the week before was measured with two seven-point items, which were averaged to form a single item (r = .81): "How busy were you this week?" (1 = not busy at all, 7 = very busy) and "How many things did you have to do this week?" (1 = very few things, 7 = a lot of things).

After answering questions about the focal task, participants were asked similar questions about a task that they had not intended to do this week, but intended to complete during the upcoming week. The purpose of having people answer questions about this second task was to reduce the possibility that participants' responses to the focal task would influence their behavior during the upcoming week. After describing the second task, participants were instructed to save the descriptions of both tasks (focal and second) on their computer so that they could participate in a follow-up study. A week later, on the next weekend, participants completed part 2 of the study. First, participants were asked to paste the focal task description, written the week before, into an essay box in the survey. Afterward, they indicated whether or not they had actually completed the focal task in the intervening week, and we again measured how busy they were in that week with the same two scale items.

4.2 Study Sample

We anticipated a small, but significant positive correlation between how busy people were the week prior to part 1 of the study and their likelihood of completing the task during the week prior to part 2 of the study. Because this was a two-part field study and many things can happen in people's lives, even over the course of a week, that affect their productivity, we expected the data to be noisier than data collected at a single time in a laboratory environment. Consequently, we set a target sample size of approximately 200 to 300 participants. Because of this study's design, we expected a high attrition rate between parts 1 and 2 of the survey. Further, we expected that some participants would be excluded because they did not have a task that they had intended to complete the week before. Consequently, we sent part 1 of the survey to approximately 1,000 participants on Amazon's Mechanical Turk. We received 858 surveys with completed answers to the focal task portion of the survey.[1] Of the participants who completed part 1 of the survey, we received 305 completed surveys from part 2 of the study one week later. Of these we excluded 57 participants because the demographic data they provided in part 1 did not match their responses to the same questions in part 2 (age, sex, ethnicity, income, and language; e.g., some participants indicated they were female in part 1 and male in part 2). Thus, our results are based on the 248 remaining participants who provided complete and valid data in both parts 1 and 2 of the survey.

4.3 Data Analysis and Results

First, we regressed likelihood of procrastination (measured in part 1) on how busy participants said they were during the week leading up to the part 1 survey. The effect of busyness on intention to procrastinate was negative and significant (b = -.20, t = -2.38, p = .018),

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[1] Several participants indicated that they did not have a task that they intended to complete the week before but did not complete, or left blank one or more of our key measures in part 1 (measures of busyness or likelihood of procrastinating).

which, consistent with the previous study, indicates that the busier people were, the less likely they were to procrastinate on completing the task in the coming week.

Second, and most importantly, we examined whether or not the task whose deadline was missed was completed by the time of the part 2 survey (i.e., one week later), and if the probability of task completion was affected by how busy participants said they were at the time the deadline was missed (i.e., busyness measured in the part 1 survey). We expected that busier participants would be more likely to complete their missed-deadline task compared to participants who were less busy.

To test this we ran a logistic regression of task completion measured in part 2 of the survey (0 = not complete, 1 = complete) on how busy participants said they were in part 1 of the survey (i.e., when they realized they had missed their deadline), controlling for how busy they were between the two survey times (because that could conceivably also affect productivity in the intervening week). The results were consistent with our expectation. There was a significant positive effect of being busy at the time of missing the deadline on the (conditional) probability of completing the task in the following week (b = .26, χ^2 = 4.89, p = .027). Put differently, a one-unit increase in how busy they were (on a seven-point scale) increased the odds of completing the task by approximately 30%.

Finally, missing the deadline did not appear to make participants substantially more or less busy in the subsequent week. Based on our measures of busyness in both surveys, 39.52% of participants reported being busier in the second week than in the first week, and 60.48% reported being either less busy or as busy in the second week than in the first week. Further, a repeated-measures ANOVA with the two busyness measures did not find a significant within-participant change in busyness (F(1, 247) < 1, p = .375).

These results are consistent with our theory that being busy at the time of missing a task deadline reduces the likelihood of procrastinating on the task. The results demonstrated that busier people not only expect to procrastinate less when they miss the deadline, but are more likely to actually complete the task in the period following the missed deadline. In the next two studies, which are controlled experiments, we replicate the patterns of effects found in these first two studies and directly test our hypothesized process that being busy reduces the negative emotions that lead to procrastination.

5. Study 3: Experimental Findings for a Work-Related Task

5.1 Overview and Method

We contend that being busy reduces the likelihood of procrastinating once a deadline is missed because it reduces the negative emotions associated with missing the deadline. In this study, we wanted to demonstrate this process using a manipulation of how many tasks people had to accomplish and whether or not they had missed a deadline on a focal task. Explicitly manipulating the extent to which people were busy also allows us to rule out an alternative explanation for the previous results that people who tend to be busier are generally more motivated or productive. Consistent with the previous studies, we expected people who had fewer tasks to do (i.e., were less busy) to be more likely to procrastinate on a focal task when they missed a deadline. Alternatively, the effect of missing a deadline on procrastination would be mitigated when people had more tasks to do (i.e., were busy). That is, when a deadline was missed, we expected busier people to be less likely to procrastinate than people who were less busy. Finally, we predicted these effects would be mediated by negative emotions induced by missing a deadline.

The study employed a 2 (busyness: busy vs. not busy) by 2 (deadline: missed vs. not missed) between-subjects design (see Web Appendix for experiment instructions). Participants were asked to imagine that they were freelance workers who could make their own hours and were looking at their list of tasks to accomplish for a client. Participants in the not-busy condition were shown a task list that had two items on it: develop a client presentation and review a client report. Participants in the busy condition were shown a task list that included the same items as in the not-busy condition plus four additional items: plan a client meeting, finish expense reports, enter client data, and make client calls. All participants were told that they had decided to develop the client presentation. However, participants in the missed deadline condition were told that they had intended to get it done yesterday (i.e., they had missed this task's deadline). Next, they answered several questions about the task including filler questions to mask our dependent measure and a procrastination measure where they indicated how likely they would be to procrastinate (1 = not likely at all, 7 = very likely). Participants then indicated the extent to which they would feel each of the following negative emotions in this situation: guilt, shame, and embarrassment (1 = not at all, 7 = very much). The items were averaged to form a negative emotions index (α = .91). As a manipulation check for the missed deadline manipulation, participants indicated how late they were in completing the sales presentation (1 = not late at all, 7 = very late). Finally, participants indicated whether they had previously worked in an office environment before (1 = Yes, 2 = No).

5.2 Study Sample

We set a target sample size of 80 participants (i.e., 20 per cell). However, we screened participants based on whether they had ever worked in an office environment to ensure that they

could realistically respond to the task manipulation scenario. Consequently, we collected 139 surveys on Amazon's Mechanical Turk. Ninety-seven participants who indicated that they had previously worked in an office environment completed the survey.[2]

5.3 Data Analysis and Results

We tested the validity of our missed deadline manipulation (i.e., how late a participant was) using ANOVA with busyness and deadline as the factors. As expected, participants perceived themselves to be later in the missed deadline condition (M = 3.96) compared to the not missed deadline condition (M = 2.39; $F(1,93) = 33.29$, $p < .001$). The main effect of busyness ($F(1,93) = .54$, $p = .46$) and the busyness by deadline interaction ($F(1,93) = 1.73$, $p = .19$) were insignificant.

We analyzed the likelihood of procrastinating using ANOVA with busyness and deadline as the factors. As depicted in Figure 1A, the predicted deadline by busyness interaction was significant ($F(1,93) = 11.00$, $p = .001$). As predicted, when participants missed a deadline they were less likely to procrastinate when they were busy (M = 3.11) compared to when they were not busy (M = 4.18, $F(1,93) = 4.24$, $p < .05$). However, when participants did not miss a deadline they were more likely to procrastinate when they were busy (M = 4.00) compared to when they were not busy (M = 2.65, $F(1,93) = 6.94$, $p = .01$). Thus, participants expected to procrastinate more when they had more things to do, but had not missed their deadline. Importantly, the results in the conditions that test our theory are consistent with those of our previous studies. Once a deadline is missed, busier people are less likely to procrastinate than those who are not busy.

[INSERT FIGURE 1 ABOUT HERE]

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[2] Ninety-eight participants indicated that they had worked in an office environment before, but one participant did not complete the procrastination measure.

We then analyzed negative emotions using ANOVA. As expected, there was a main effect of missing a deadline such that participants felt more negative emotions when they missed the deadline (M = 2.25) compared to when they did not miss the deadline (M = 1.74, $F_{(1,93)}$ = 4.10, p < .05). As depicted in Figure 1B, the predicted deadline by busyness interaction was significant ($F_{(1,93)}$ = 6.93, p = .01). Participants who missed the deadline felt less negative emotions when they were busy (M = 1.90) compared to when they were not busy (M = 2.67, $F_{(1,93)}$ = 3.89, p = .05). When participants did not miss the deadline they felt marginally more negative emotions when they were busy (M = 2.06) compared to when they were not busy (M = 1.39, $F_{(1,93)}$ = 3.05, p < .10).

We tested whether negative emotions mediate the effect of being busy on the likelihood of procrastinating when people did or did not miss a task deadline using conditional process modeling (Hayes 2012; model 8). Conditional indirect effects analyses revealed that the indirect effect of busyness on procrastination in the missed-deadline condition was negative with a confidence interval that did not include zero (indirect effect = -.15, 95% CI [-.47, -.01]), which supports mediation. This negative indirect effect was not found in the no-missed-deadline condition. The indirect effect of busyness on procrastination in the no-missed-deadline condition was positive, which was unexpected but not inconsistent with our theory, with a confidence interval that did not include zero (indirect effect = .13, 95% CI [.01, .36]).

The results of this study replicate our previous findings in a controlled experiment. Consistent with our theory, missing a task deadline induces negative emotions, which increases procrastination, but only when people are not busy. When people are busy, negative emotions associated with missing a task deadline are reduced, which mitigates the effect of missing a

deadline on procrastination. In the next study, we sought to demonstrate that it is the attribution that people are busy that reduces the effect of missing a task deadline on procrastination.

6. Study 4: Experimental Findings for a Personal Task

6.1 Overview and Method

Our theory suggests that it is the attribution that one is busy that reduces the feelings of guilt and shame associated with missing a task deadline. If that is correct, then merely mentioning being busy, without actually changing the number of tasks one has to do, should produce similar effects. To achieve this, we held the number of tasks constant in this study such that all people had only two tasks to accomplish. Participants were provided or not provided with information that would lead them to attribute the cause of the missed deadline to being busy. When people missed a deadline, being able to attribute the missed deadline to being busy should lead people to procrastinate less than those who were not able to attribute missing the deadline to being busy. When people did not miss a deadline, however, the effect of being busy should be mitigated. Since our data in studies 1 and 2 included a mix of personal and work-related tasks, and study 3 focused on work-related tasks, we chose to focus on personal tasks in this study.

The study employed a 2 (attribution: busy vs. not busy) by 2 (deadline: missed vs. not missed) between-subjects design (see Web Appendix for experiment instructions). Participants were asked to imagine that they were looking at their list of things to do today. They were then shown a task list that had two items on it: clean the living room and mow the lawn. All participants were told that they had decided to clean the living room first, but the information that accompanied these instructions varied by condition. Participants in the not missed/not busy condition were told: "You decide to clean the living room first." Participants in the missed/not

busy condition were told: "You decide to clean the living room first. You had intended to do this task yesterday." In the busy condition, we used the same instructions but added the words "but you are busy." Next, participants indicated how likely they would be to procrastinate (1 = not likely at all and 7 = very likely) as well as some filler questions. Participants then indicated the extent to which they would feel the negative emotions of guilt, shame, and embarrassment in this situation (1 = not at all and 7 = very much). The items were averaged to form a negative emotions index (α = .87). As a manipulation check for the missed deadline manipulation, participants indicated how late they were in cleaning the living room (1 = not late, 7 = very late). Finally, participants indicated whether someone else typically cleans their living room (1 = Yes, 2 = No).

6.2 Study Sample

We set a target sample size of 80 participants (i.e., 20 per cell). However, we screened participants based on whether someone else cleans their living room to ensure that they could realistically respond to the task manipulation scenario. Consequently, we collected 118 surveys on Amazon's Mechanical Turk. Thirty-three participants were screened out because they indicated that someone else typically cleans their living room, resulting in a final sample of 85 participants.

6.3 Data Analysis and Results

We tested the validity of our missed deadline manipulation using ANOVA with deadline and attribution as the factors. As expected, participants perceived themselves to be later in the missed deadline condition (M = 4.41) compared to the not missed deadline condition (M = 3.33;

$F(1,85) = 8.33$, $p < .01$). The main effect of attribution ($F(1,85) = .17$, $p = .69$) and the attribution by deadline interaction ($F(1,85) = .13$, $p = .72$) were insignificant.

We analyzed the likelihood of procrastinating on cleaning the living room using ANOVA with deadline and attribution as the factors. As shown in Figure 2A, the predicted deadline by attribution interaction was significant ($F(1,81) = 10.36$, $p < .01$). As expected, when participants missed the deadline they were less likely to procrastinate in the attribution to being busy condition ($M = 3.30$) compared to the no attribution condition ($M = 4.95$, $F(1,81) = 7.63$, $p < .01$). However, when participants did not miss the deadline they were marginally more likely to procrastinate in the attribution to being busy condition ($M = 4.30$) compared to the no attribution condition ($M = 3.32$, $F(1,81) = 3.09$, $p < .10$).

[INSERT FIGURE 2 ABOUT HERE]

We then analyzed negative emotions using ANOVA. As depicted in Figure 2B, there was a marginally significant main effect of missing a deadline such that participants felt more negative emotions when they missed the deadline ($M = 2.46$) compared to when they did not miss the deadline ($M = 1.96$, $F(1,81) = 3.30$, $p < .10$). Additionally, the predicted deadline by attribution interaction was significant ($F(1,81) = 4.66$, $p < .05$). As expected, participants who missed the deadline felt less negative emotions in the attribution to being busy condition ($M = 2.03$) compared to the no attribution condition ($M = 2.91$, $F(1,81) = 4.02$, $p < .05$). When participants did not miss the deadline they did not feel more negative emotions in the attribution to being busy condition ($M = 2.14$) compared to the no attribution condition ($M = 1.72$, $F(1,81) = 1.03$, $p < .31$).

We tested whether negative emotions mediate the effect of attribution to being busy on the likelihood of procrastinating when people did or did not miss a task deadline using

conditional process modeling (Hayes 2012; model 15). Conditional indirect effects analyses revealed that negative emotions mediated the effect of attribution on the likelihood of procrastinating when people missed a deadline. The indirect effect of attribution on procrastination in the missed deadline condition was negative with a confidence interval that did not include zero (indirect effect = -.36, 95% CI [-99, -.02]), which supports mediation. However, negative emotions did not mediate when they did not miss a deadline. The indirect effect of attribution on procrastination in the no missed deadline condition had a confidence interval that included zero (indirect effect = .17, 95% CI [-.12, .61]), which does not support mediation.

The results of this study provide additional empirical support for our conceptualization. Specifically, they demonstrate that it is not only the number of tasks one has to complete at the time they miss a deadline that determines the effects shown in the previous studies. Merely mentioning the fact that one is busy allows for people to attribute missing a deadline to being busy. As a result, people who miss a deadline have less negative emotions and tend to procrastinate less. We discuss the implications of our findings next.

7. Discussion

This research examined individual productivity with respect to completing tasks by focusing on procrastination. Specifically, we considered situations in which people miss their deadlines for completing tasks and how this impacts their tendencies to subsequently procrastinate on those tasks. Counter to extant research and conventional wisdom, we found that being busy reduced procrastination when people had missed deadlines. Typically, missing a deadline triggers negative emotions that can lead people to temporarily disengage from a task and therefore procrastinate on that task. However, we found that this negative-emotion effect of

missing a deadline on procrastination was not present when people were busy—either because they actually had more things to do or by merely mentioning that they are busy. We found support for our theory through an analysis of hundreds of thousands of real-world tasks on individuals' electronic "to do" lists, a longitudinal field study, and two controlled laboratory experiments.

Our findings shed light on how goal violations, negative emotions, and being busy affect procrastination and, more generally, a person's productivity. How busy a person is, or perceives themselves to be, when they fail to achieve a goal (i.e., missing a task deadline) is particularly important in this process. Being busier (vs. less busy) means that a person has more tasks that they intend to complete in the near future or incomplete goals that they are trying to achieve. Thus, our findings suggest that having more active goals at the same time may be beneficial because it helps mitigate negative emotions triggered by goal violations on any single goal.

We contended that being busy reduced the impact of negative emotions on procrastination because it allowed people to justify missing a task deadline and reduced the negative emotions experienced from missing a deadline. An alternative explanation suggests that being busy could moderate this process by distracting people from experiencing negative emotions associated with missing deadlines. In other words, busier people might simply not have the time to think about how missing a deadline for a particular task makes them feel. While this process is somewhat consistent with our conceptualization (i.e., being busy mitigates negative emotions), we did not find evidence for this process in our studies. In addition to the mediating patterns supporting our conceptualization, the results of study 4 show that it is not the amount of tasks that people have to accomplish, but the attribution that one is busy that reduces the negative emotions experienced from missing a task deadline. This finding also suggests that other

variables that either justify or reduce the psychological impact of missing a deadline may reduce procrastination.

Our findings have a number of implications for how individuals engage with their tasks in both personal and professional contexts. A simple way for people to become more productive is to remind themselves of all the tasks they need to do. Thinking about all the tasks one needs to do should encourage a perception that one is busy. This should make people feel better, as there was a reason for missing certain tasks' deadlines or failing to achieve certain goals. Feeling better about a task or goal should lead people to not disengage from them. Instead, people should be motivated to complete the task or goal, and become more productive overall.

In addition, purposively keeping oneself busy may be a simple and effective antidote to chronic procrastination and task-completion tardiness. In a workplace setting, for example, managers may find that their subordinates are less likely to procrastinate if they give them more, not less, to do. There are, however, likely to be limits to this. We expect that extremely busy people will feel "overloaded" and "overwhelmed" by what they need to achieve, which could lead them to disengage entirely from a task. Thus, the potential of being busy to help reduce procrastination should be balanced against individuals' feelings of being overloaded and their perceptions of what "being busy" means to them.

Another implication of these findings is that, in work settings, managers can use busyness as a mechanism for motivating their employees to be more productive. For example, managers could communicate to each of their employees how many tasks they need to get done as a way of making their employees feel busier. Also, they could break larger tasks down into smaller sub-tasks and communicate those as a way of increasing an employee's perceived busyness without actually giving them extra work to do. Additionally, managers could use a busyness-related

mechanism to help employees overcome missed-deadline-related procrastination while also making employees feel good. For example, managers could tell their employees that they are busier than counterparts in other departments or business units. This should make employees feel good (because of the positive comparison) while also making busyness salient. Finally, since procrastination is due to the negative emotions from missing a task deadline, organizations may want to find ways to help their employees overcome the negative emotions they experience after missing a task deadline. Overall, our findings suggest that individuals in both their personal and work lives can benefit from being (or feeling) busier in the all-too-common context of missed deadlines because it helps them overcome procrastination.

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Table 1: Effects on Hazard of Task Completion (Study 1)

Covariate	Base Model			Full Model		
	b	**$\chi^2(1)$**	**HR**	**b**	**$\chi^2(1)$**	**HR**
Deadline changes				-.30	25541.59	.74
Busyness				.01	70.66	1.01
Deadline changes x Busyness				.01	117.49	1.01
User completion time	-.52	62871.72	.60	-.54	67766.31	.58
User completion rate	.05	829.22	1.05	.04	449.92	1.04
First task	-.02	37.46	.98	-.02	88.20	.98
First week of month	-.01	19.10	.99	-.01	27.95	.99
Last week of month	.00	7.95	1.00	.00	8.16	1.00
Day task created (baseline = Saturday)						
Sunday	-.01	5.90	.99	-.01^{ns}	1.27	.99
Monday	-.02	15.75	.98	-.01	4.15	.99
Tuesday	-.03	39.61	.97	-.02	23.50	.98
Wednesday	-.04	66.54	.96	-.04	47.33	.96
Thursday	-.09	300.76	.91	-.09	260.74	.92
Friday	-.01	4.43	.99	-.02	7.46	.98
Month task created (baseline = December)						
January	.02	9.43	1.02	.02	11.14	1.02
February	.02	4.73	1.02	.02	8.40	1.02
March	.01^{ns}	2.10	1.01	.02	7.39	1.02
April	-.01^{ns}	2.66	.99	.00^{ns}	.18	1.00
May	.02	6.18	1.02	.03	23.79	1.03
June	.04	37.35	1.04	.06	72.47	1.06
July	.06	67.94	1.06	.08	119.79	1.08
August	.14	409.15	1.16	.15	461.32	1.17
September	.25	1121.15	1.29	.26	1143.81	1.29
October	.01^{ns}	.44	1.01	.02	4.36	1.02
November	.00^{ns}	.24	1.00	.00^{ns}	.07	1.00
-2LL		14,359,721			14,320,079	
AIC		14,359,765			14,320,129	
BIC		14,360,013			14,320,411	

These models estimate the effects of the covariates on the hazard of task completion, which is the instantaneous probability of a task being completed. Unless indicated by "ns" all parameters are significant at the *p* < .05 level.

HR = hazard ratio.

Figure 1: Effects of Busyness on Procrastination and Negative Emotions (Study 3)
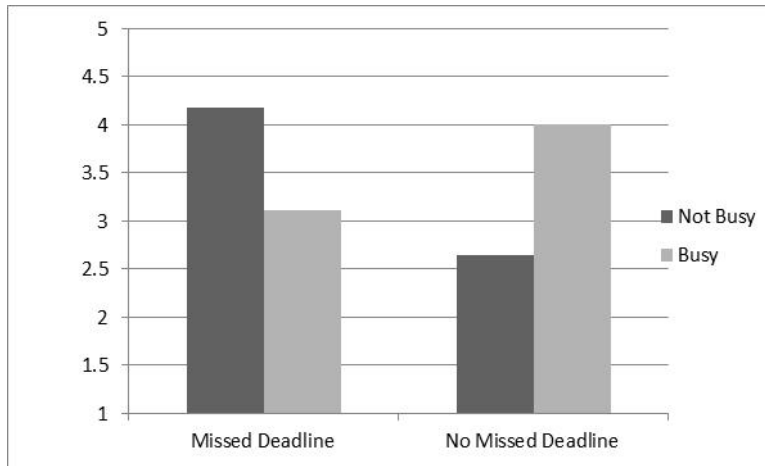
(A)
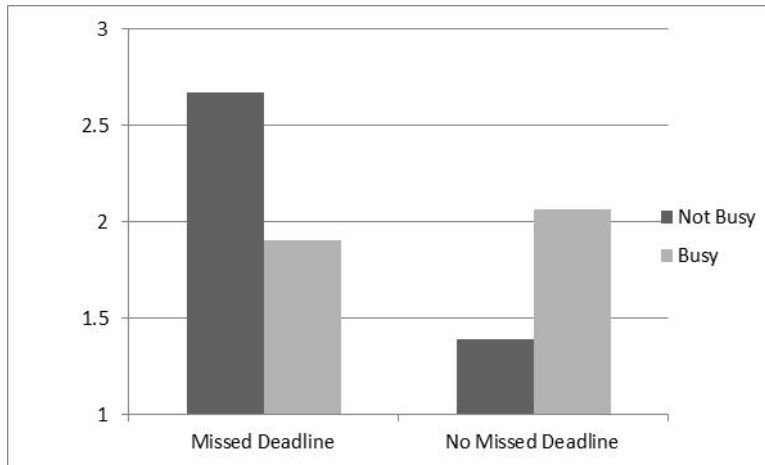
(B)

Figure 2: Effects of Attribution of Busyness on Procrastination and Negative Emotions

(Study 4)
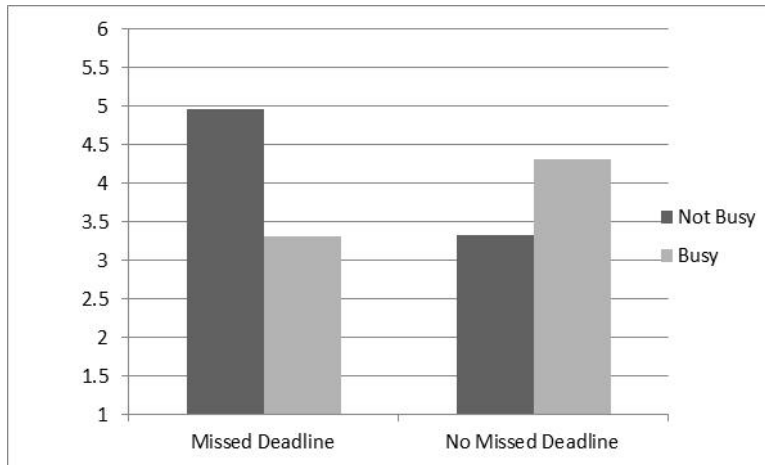
(A)
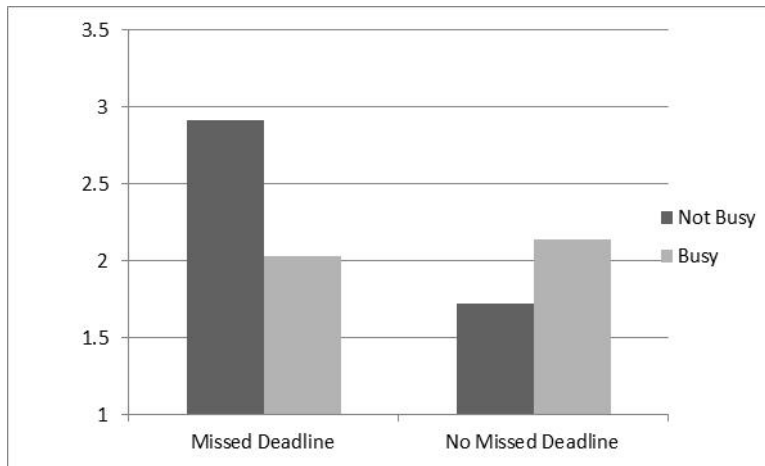
(B)

Web Appendix

STUDY 2: FURTHER INFORMATION ON METHODOLOGY AND STIMULI

Recruitment. Participants were recruited from Amazon's Mechanical Turk. Participants viewed a recruitment message on Mechanical Turk that included a link to the Part 1 Qualtrics survey. Approximately one week later all participants were sent a message through Mechanical Turk with a link to the Part 2 Qualtrics survey and a promise of a bonus payment upon completing the survey.

Manipulations and stimuli. Red text indicates if there was a difference between conditions.

Part 1 Survey

Task Instructions (shown to everyone):

> Please think of a task that you had wanted to get accomplished this week, but did NOT get a chance to finish and instead intend to accomplish NEXT WEEK. Please answer the questions below about the task.
>
> If there is no such task please click NO below. Otherwise click YES.

Task description question (shown to everyone):

> In the space below, describe the task by explaining what had to be done:

Task procrastination measure (shown to everyone):

> How likely are you to procrastinate on this task next week? (1 = Not likely; 7 = Very likely)

Percent complete measure (shown to everyone):

> How much of this task did you get accomplished? (1 = Did not start; 10 = 90% complete)

Task recording instructions (shown to everyone):

Please open Microsoft word (or some other program that will save text) on your computer. Once the document is open please cut and paste your description of the task in the word document. Do not close the document.

If you do not have the ability to save the description on your computer please click cannot save below (you will still be paid for this HIT if you cannot save).

Busyness measure (shown to everyone):

How busy were you this week? (1 = Not busy at all; 7 = Very busy)
How many things did you have to do this week? (1 = Very few things; 7 = A lot of things)

Task saving instructions (shown to everyone):

In a week or so, we will contact you via Mechanical Turk to see if you would like to complete a brief follow-up study that will pay $.50 for about two minutes.

In order to be eligible to participate you will need to have the document with the descriptions of your tasks. If you would like to remain eligible please save this document to your desktop or somewhere else that is easy to access.

Please call the file "Task MTurk."

Part 2 Survey

Survey instructions (shown to everyone):

In order to be eligible you will need to have saved the task descriptions that you were instructed to save in a word file on your desktop or somewhere else on your computer that is easy to access.

You were instructed to call the file: Task MTurk.

If you are able to access this file and read the task descriptions you wrote last Sunday please click YES below. If not click NO. We will check to make sure your task descriptions are the same so please do not click yes if you do not have access to the file.

Do you have access to this file? (Yes/No)

Task description question (shown to everyone):

In the space below, please cut and paste the first task description you wrote last week. This description is the description of the task that you had intended to do the week before, but did not complete.

```



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Task completion measure (shown to everyone):

    Did you complete the task this week? (Yes/No)

Busyness measure (shown to everyone):

    How busy were you this week? (1 = Not busy at all; 7 = Very busy)
    How many things did you have to do this week? (1 = Very few things; 7 = A lot of things)

STUDY 3: FURTHER INFORMATION ON METHODOLOGY AND STIMULI

Recruitment. Participants were recruited from Amazon's Mechanical Turk. Participants viewed a recruitment message on Mechanical Turk that included a link to the Qualtrics survey.

Manipulations and stimuli. Red text indicates if there was a difference between conditions.

Task manipulation:

<p style="text-align:center">Shown to everyone</p>

Imagine that you are a freelancer working for a client. You get to make your own hours. You are looking at your list of things to do. Your to do list is presented below. Please take a moment to look at your to do list.

<p style="text-align:center">To do list varied by condition</p>

Not Busy Condition:	Busy Condition:
Develop Client Presentation	Develop Client Presentation
Review Client Report	Review Client Report
	Plan Client Meeting
	Finish Expense Reports
	Enter Client Data
	Make Client Calls

<p style="text-align:center">Shown to not missed deadline condition</p>

You decide to develop the presentation first.

Please answer the questions below about developing the presentation.

<p style="text-align:center">Shown to missed deadline condition</p>

You decide to develop the presentation first because you had intended to get it done yesterday.

Please answer the questions below about developing the presentation.

Task procrastination measure (shown to everyone):

How likely are you to procrastinate? (1 = Not likely; 7 = Very likely)

Emotions measure (shown to everyone):

To what extent would you feel the following emotions in this situation: (1 = Not at all; 7 = Very much)

- Guilt
- Shame
- Embarrassment

Manipulation check (shown to everyone):

How late were you when you decided to develop the sales presentation? (1 = Not late at all; 7 = Very late)

Screener question (shown to everyone):

Have you ever worked in an office environment? (Yes/No)

STUDY 4: FURTHER INFORMATION ON METHODOLOGY AND STIMULI

Recruitment. Participants were recruited from Amazon's Mechanical Turk. Participants viewed a recruitment message on Mechanical Turk that included a link to the Qualtrics survey.

Manipulations and stimuli. Red text indicates if there was a difference between conditions.

Task manipulation:

<p style="color:red; text-align:center">Shown to everyone</p>

You are looking at your list of things that you would like to get done today. Please take a moment to look at this list below:

<div style="text-align:center">

To Do List

Clean Living Room
Mow Lawn

</div>

<p style="color:red; text-align:center">Shown in the not busy, not missed deadline condition</p>

You decide to clean the living room first.

Please answer the questions below about cleaning the living room.

<p style="color:red; text-align:center">Shown in the not busy, missed deadline condition</p>

You decide to clean the living room first. You had intended to do this task yesterday.

Please answer the questions below about cleaning the living room.

<p style="color:red; text-align:center">Shown in the busy, not missed deadline condition</p>

You decide to clean the living room first but you are very busy.

Please answer the questions below about cleaning the living room.

<p style="color:red; text-align:center">Shown in the busy, missed deadline condition</p>

You decide to clean the living room first. You had intended to do this task yesterday but you are very busy.

Please answer the questions below about cleaning the living room.

Task procrastination measure (shown to everyone):

How likely are you to procrastinate? (1 = Not likely; 7 = Very likely)

Emotions measure (shown to everyone):

To what extent would you feel the following emotions in this situation: (1 = Not at all; 7 = Very much)

- Guilt
- Shame
- Embarrassment

Manipulation check (shown to everyone):

How late were you when you decided to clean the living room? (1 = Not late at all; 7 = Very late)

Screener question (shown to everyone):

Does someone else typically clean your living room? (Yes/No)