Methods of Decreasing Procrastination.

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ABSTRACT

In this paper, we sought to learn methods to decrease procrastination and lower related stress. Previous research has predicted that procrastination decreases by variables such as mindfulness, reminder intervention, and cognitive behaviour therapy. In our first (correlational) study, we tested the strength of these relationships by examining naturalistic daily changes in their variables longitudinally over a period of one week. We measured mindfulness by each moment of acting with intention, reminders by the number of daily external reminders received, cognitive distortions by each time participants experienced a negative cognitive distortion, and procrastination by a modified General Procrastination Scale (GPS). Based on the strength of correlation found between procrastination and reminders in our correlational study, we then conducted a second (experimental) study to test for a causal relationship between these two variables. Over a period of one week, we randomly assigned participants each day to either a reminder intervention condition or a non-reminder intervention condition and measured the effect this manipulation had upon procrastination. In our correlational study, using raw data pooled across participants procrastination showed a statistically significant correlation only with cognitive distortions, while when using pooled standardized data reminders had the strongest correlation. Data pooled across participants in our experimental study showed reminders produced a significant reduction in procrastination, as measured both subjectively by the GPS test and objectively by the number of tasks completed. Our experimental study suggests that reminder intervention could be useful to mitigate procrastination and increase university students' ability to complete their many academic tasks.

1. Introduction

1.1 Research Problem

Our study's goal was to find methods to relieve procrastination due to our shared struggles with procrastination and its effects on our quality of life, especially related to our studies. We sometimes experience mental paralysis and anxiety when faced with beginning or completely even small, routine tasks. Understanding how to alleviate this reaction would help us feel less overwhelmed and more able to meet our goals. People who struggle with procrastination often suffer from hampered career and academic achievements. Finding solutions to mitigating procrastination may thus have practical and concrete benefits such as a reduction in stress and long-term productivity gain. Tendencies to procrastinate pose a disadvantage

academically as well as causing feelings of self-doubt and anxiety towards completing schoolwork. Learning about what makes procrastination less likely to occur will enable us and others to implement effective changes and become more motivated to achieve goals.

1.2 Literature Review

One factor previously found to predict a decrease in procrastination is mindfulness. Gautam et al. (2019) hypothesized that students who exhibited higher mindfulness traits would have lower anxiety and thus also exhibit lower procrastination. To test this, they conducted an online survey of 801 university students, in which participants answered 39 questions on the Five-Facet Mindfulness Scale. This questionnaire measured five facets of mindfulness: observing, acting with awareness, nonjudging, describing, and nonreactivity. These items were measured on a 5-point Likert scale ranging from 1 = "never to rarely true" to 5 = "very often or always true". Questions included, "I do jobs or tasks automatically without being aware of what I'm doing," and "I pay attention to sensations, such as the wind in my hair or sun on my face." The survey also used the Tuckman Procrastination Scale for students to self-evaluate their procrastination levels. On each of its 16 questions, participants used a 4-point Likert scale where 1 = "that's me for sure" and 4 = "that's not me for sure". Examples of questions include, "When I have a deadline, I wait until the last minute," and, "When something's too tough to tackle, I believe in postponing it." The study found that nonreactivity and describing were not significantly related to procrastination while observing and acting with awareness were, especially the latter. Researchers concluded that interventions

involving the acting with awareness would be particularly effective in decreasing procrastination.

Another factor previously found to predict a decrease in procrastination is the use of a reminder intervention. For example, a novel study was conducted by Wessel et al. (2020) used a modified Temporal Motivation Theory (TMT) based intervention with the aim to reduce procrastination. They measured procrastination as behavioural delay: the amount of delay that occurs before completing a. To measure this reliably the Experience Sampling Method (ESM) was used to collect data on college students and measure the amount of behavioural delay via progress surveys through text messaging. Task progress for assignments among students follows an accelerating, hyperbolic, curve to task completion, with behavioural delay being high initially and lower when closer to assignment deadline, meaning higher assignment progress the closer the student is to the deadline, making an upward curve. Students scoring high in trait procrastination display steeper curves with greater behavioural delay, making the distribution of task progress concentrated greater near the assignment due date, while students scoring low in trait procrastination would have a more gradual curve and an earlier start. The study took place over two weeks and split students in two groups: those scoring high in trait procrastination and those scoring low. The split was in both the experimental group that received the intervention and the control group, which received no intervention and was only given ESM progress surveys. ESM surveys were sent twice daily through texts; once students answered the survey, an intervention prompt was sent out via text for the experimental group. The modified TMT intervention was based on four strategies to reduce

procrastination, which would be used throughout the study. They consisted of four factors. The first was Metacognitive Strategies, which consist of reflecting on thinking, decision making and planning, behind one's task approach or time use. Metacognitive Strategies factor was a modification of TMT in this study. The second factor was Expectancy; if expectancy of positive outcomes is increased then people will feel more motivated to progress on the task. The third factor was Value, which consisted of techniques of visualization and mental time travel, such as involving the student imagining themselves at the end of the task with it completed vs. having it not completed, as well as comparing it to their current state. The fourth factor was Delay Sensitivity, which refers to an increased likelihood of impulse-driven behavior when deadlines are temporarily distant. Tasks that are perceived as large can be overwhelming and may appear temporally distant from completion. In order to decrease delay sensitivity and promote more efficient use of time, large tasks are to be broken up into smaller chunks with less distant completion. The authors of the study proposed that more frequent, less time-consuming, smaller chunks completed of a task will exploit participants' innate bias to interests in the present vs. the future. The study's novel approach was that they used all these factors throughout the study. Based on these four factors, one of four prompts were sent via text message. They would be something like these: 1. Expectancy: "Studies show student who score high on tests, study frequently and well in advance of the test. Demonstrate your understanding by telling us what students who score high on tests do." 2. Value: "Imagine yourself the day before a test, and picture yourself having done no studying. How does that make you feel?" 3.

Delay sensitivity: "Research has shown that breaking large tasks (like the completion of an assignment), into smaller tasks (like completing an assignment summary) can increase motivation. What is your next small step going to be?" 4. General metacognition: "If you could do one thing to make sure that you completed your essay on time, what would it be?" One of these prompts would be sent after an ESM survey of task completion point. The prompt that would be sent out would be chosen randomly; this was done to avoid inattentiveness and boredom from the students. The results of the study were that assignment grade and completion date of the assignment between experimental and control groups showed no significant change. Students in the experimental group with high trait procrastination did not show a significant change in behaviour delay compared to the control group; however, students with low trait procrastination did show a significant reduction in behaviour delay, displaying a less steep curve on assignment completion in comparison to the control group. These results showed that the intervention was effective in reducing procrastination in students with low trait procrastination.

A third factor previously found to predict a decrease in procrastination is cognitive behaviour therapy. In a clinical trial by Rozental et al., (2018), researchers compared the effectiveness of self-guided internet based cognitive behavior therapy (ICBT) and group CBT in reducing the effects of procrastination. The two trials were conducted over eight weeks using content based on a self-help book. Intervention strategies derived from this include psychoeducation, cost/benefit analysis, motivation, mental fatigue, self-assertiveness strategies, value clarifications, and relapse prevention. Group CBT included three-hour sessions accompanied by

clinicians trained in CBT who would participate in psychoeducation and discussions with participants. The ICBT method was unguided and included little contact with clinicians; this method included modules and homework based on the intervention strategies. The Pure Procrastination Scale (PSS) was used to assess participants on a scale of 1-5 during different time intervals: before the trial, post-trial, and a six-month follow up. Participants from both methods showed an improvement in productivity on the PSS (33.7%). However, participants from the group CBT continued to improve after the six-month follow up while some deterioration was found for those who participated in ICBT. These results suggest that both methods can be used to treat procrastination short-term and that group CBT may be a more beneficial long-term treatment for procrastination.

1.3 Hypotheses

Based on the above literature review, we predicted the following hypotheses: Hypothesis #1: If acting with awareness increases then procrastination will decrease. Hypothesis #2: If reminders increase then procrastination will decrease. Hypothesis #3: If cognitive distortions decrease then procrastination will decrease.

2. Methods

2.1 Participants

The three authors of this paper served as the participants in its studies. The participants ranged in age from 18-35 years old, with an average age of 26 years, and included both men and women. The participants were all undergraduate students at Camosun College who completed the current studies as an assignment for Psyc 110 ("Experimental Psychology") and were grouped together due to their mutual interest in procrastination.

2.2 Correlational Study Methods

We first performed a correlational study to test concurrently all of our hypotheses by examining naturalistic daily changes in their variables longitudinally. Each participant kept a study journal with them at all times over this study's one-week period in order to record self-observations of the following three variables: (1) acting with awareness, (2) reminders, (3) cognitive distortions, and (4) procrastination.

2.2.1 Acting With Awareness

To measure acting with awareness, participants marked down in their journal each time they exhibited acting with awareness over the course of a week. "Acting with awareness" is operationally defined as a self- reminder of the participant's intention for a task, non-contingent on external reminders. The intention can be written, verbalized to oneself or another, or simply be a purposeful thought. Examples would be thinking, "I decided to mail these letters by noon today," or telling one's mother one would respond to her text by three o'clock, or writing in one's journal the intention to finish the first draft of one's essay tomorrow. Acting with awareness can happen before or during the task, either in setting the initial intention or returning to the intention while preparing for or engaged in the task.

2.2.2 Reminders

To measure reminders participants recorded with a journal their daily number of reminders. Reminders was operationally defined as an external event that reminds you to initiate starting, completing, and/or progressing on any day-to-day tasks and objectives or assignments. The tasks,

objectives and assignments were not limited to an academic setting and could be in any facet of day-to-day life, like simple chores. The reminders could be any event that reminded the participants of something they needed to do, including indirectly via external factors such as a character in a movie doing a similar task that the participants needed to do, inadvertently reminding participants to attend to it. Direct reminders were also recorded, such as a person actively reminding the participants to do something they needed to do that they were not currently doing. Direct reminders included automated reminders; for example: an automated message from a company providing a service the participant uses, notifying the participant their bill is due/overdue, as well as automated assignment due date notifications for work or school progress.

2.2.3 Cognitive Distortions

To measure negative cognitive distortions, participants created a tally with a journal recording their daily amount of cognitive distortions every time they had one. A cognitive distortion can be define as any form of self-talk that includes negative generalizations about a participant's own ability to do a task. This includes thinking that a certain task is impossible to complete, even before the person has attempted the task. A negative cognitive distortion can also include making assumptions about a person or situation, such as, "If I email this person again they will get annoyed." This can cause the person to procrastinate when sending emails. Another form of negative cognitive distortions is self-defeating thoughts, such as, "I am not smart enough," or, "I am a failure." The results were recorded then submitted at the end of each day and the number of tally marks were analyzed to find day-to-day variations.

2.2.4 Procrastination

Participants used the General Procrastination Scale (GPS; see the Appendix for a complete list of its items), developed by Lodha et al. (2019), to measure their level of procrastination each day at 9:00pm. The scale was modified by one of the current authors (D.T.) to include a prompt at the beginning instructing the participants that "The following is to be answered only pertaining to the last 24 hours", and with no other modifications. The scale totals 23 items and measures procrastination in these 4 areas: academic, medical, workplace and civic responsibilities, with the areas all relating to procrastination. The items require a 5-point Likert scale ranging from 1 to 5, to be rated, with scores being defined as; 1 being: never, 2 being: rarely, 3 being: sometimes, 4 being: often, 5 being: always. The items #5, 8, 12, 16, 18, 21 and 23 are scored in reverse. So, for example, if your score was 1 for item 23 it would be tallied as a score of 5. A lower sum of scores obtained on all items indicates a lower level of procrastination with higher sum scores indicating a higher level of procrastination for the participants taking the test.

2.3 Correlational Study Planned Analyses

To assess the strength and statistical significance of associations between variables predicted by our three hypotheses, we performed Pearson product moment correlations of their predictor variables acting with awareness, reminders, and cognitive distortions with their outcome variable procrastination. For testing Hypothesis #1, we correlated the tally of acting with awareness with the GPS score. For testing Hypothesis #2, we correlated the number of reminders with the GPS score. For testing Hypothesis #3, we correlated the number of cognitive distortions with the GPS score. We performed all of the above

correlations separately for each participant as well as using data pooled across all of the participants. For the correlations using pooled data, in addition to using the raw data, we also performed correlations after we had first transformed the data from each participant into *z*-scores in order to standardize differences in averages and variability seen between the participants in their data and thus make them more comparable. A correlation coefficient was considered statistically significant if the probability of its random occurrence (*p*) was < .05 (i.e., less than 5% of the time expected by chance alone).

2.4 Experimental Study Methods

Based on the strength of the correlation between reminders and procrastination found in our correlational study, we then chose to conduct an experimental study to test for a causal relationship between these two variables from Hypothesis #2.

We manipulated the independent variable, reminders, over a one-week period by randomly assigning participants each day to either a condition with only naturally-occurring reminders or a condition involving daily reminders from a cellphone app. To avoid order effects, we used an alternating (ABAB) design, alternating days between control and experimental conditions. On control days, participants received only whichever reminders occurred naturally in their daily lives. On experimental days, participants used an app that gave them five random reminders throughout the day for specific tasks they felt the urge to procrastinate.

We could not use a blind procedure to control for placebo effects since participants were required to set reminders themselves and required to have conscious knowledge of the procedure. Despite these limitations, we were able to somewhat

minimize the possibility of subjective bias in our measurements by having participants measure their productivity objectively via recording in a journal how many significant tasks they had completed on both experimental and control days. The operational definition of "significant tasks" is tasks participants feel tempted to procrastinate in these three categories: work, school, or personal life. Examples include academic assignments, work projects, house maintenance, appointments, personal projects, relational maintenance, exercise, etc. We then compared the number of tasks completed between control and experimental days, with a higher number of tasks completed indicating higher productivity. We also controlled for the possible effects of knowing the time of day when reminders would occur by having participants using an app (Yapp Reminders for participants using an iPhone and Randomly Remind Me for participants using android) that would randomly remind them without their knowledge of when the reminders would happen. Participants also measured themselves each evening using the same GPS scale described above for the correlational study.

2.5 Experimental Study Planned Analyses

To assess the statistical significance of differences seen in procrastination on reminder intervention experimental days vs. non-reminder intervention control days, Student's *t*-tests were performed. We performed *t*-tests separately for each participant as well as using data pooled across all of the participants. For the *t*-tests using pooled data, in addition to using the raw data, we also performed *t*-tests after we had first transformed the data from each participant into *z*-scores in order to standardize differences in averages and variability seen between the participants in

their data and thus make them more comparable. An average difference between conditions was considered statistically significant if, using a one-tailed distribution (i.e., to determine if there is a difference between groups in a specific direction), the probability of its random occurrence (p) was < .05 (i.e., less than 5% of the time expected by chance alone).

3. Results

3.1 Correlational Study Results

As shown in Table 1, after testing correlations for eight days between our three variables, we found that none of the variables showed statistical significance in the pooled standardized data. In the pooled raw data, only cognitive distortions was significant. As shown in Figures 1 and 2, acting with awareness was not significant in the pooled raw data ($r = 0.03$, $p = 0.91$) or the pooled standardized data ($r = -0.14$, $p = 0.53$). The pooled raw data also had a positive r value, which contradicts the hypothesis for acting with awareness being associated with a decrease in procrastination. The p value for participant 1 ($p = 0.04$) was significant; however, again the direction of the correlation did not match the hypothesis ($r = 0.73$). The other participants' results were not significant ($p \geq 0.09$). As shown in Figures 3 and 4, neither the pooled raw data ($r = -0.21$, $p = 0.34$) nor the pooled standardized data ($r = -0.37$, $p = 0.07$) showed significant correlations between reminders and procrastination. None of the participants' values were significant ($p \geq 0.21$). As shown in Figures 5 and 6, cognitive distortions were significant for the pooled raw data ($r = 0.44$, $p = 0.03$) but the standardized data was not significant ($r = 0.27$, $p = 0.20$). None of the participants' individual data was significant

($p \geq 0.08$); the data for participant 3 showed an opposite correlation to the hypothesis ($r = -0.30$) and the other participants ($r \geq 0.47$). Using the pooled standardized data, reminders showed the strongest correlation with procrastination.

3.2 Experimental Study Results

As shown in Table 2, when participants recorded procrastination using the GPS for nine days, both the pooled raw data and pooled standardized data showed significant differences between the pooled mean on experimental days, where participants had five daily reminders, and control days, where they had no experimental condition reminders. The degree of significance for these differences between control days and experimental days was $p = 0.0097$ using the raw pooled data (see Figure 7) and $p = 0.002$ using the standardized pooled data (see Figure 9). On experimental days when participants used the reminders app, the mean GPS showed a z-score of -0.46, compared to a z-score of 0.57 on control days.

As shown in Table 3, when participants recorded the number of tasks completed, the pooled raw data and the pooled standardized data also showed significant differences between the pooled mean on experimental and control days. The degree of significance for these differences between the mean on control days and experimental days was $p = 0.0077$ using the raw pooled data (see Figure 8) and $p = 0.0021$ using the standardized pooled data (see Figure 10). The number of tasks completed was higher on experimental days, with a z-score of 0.43, as compared to a z-score of -0.54 on control days.

4. Discussion

4.1 Summary of Results

In our correlational study, we hypothesized that two variables, acting with awareness and reminders, would increase as procrastination decreased (Hypothesis #1 & #2) while one variable, cognitive distortions, would increase as procrastination increased (Hypothesis #3). In our results we found that only cognitive distortions showed a statistically significant correlation with procrastination using the pooled raw data, but not using the pooled standardized data. Acting with awareness and cognitive distortions did not show statistically significant correlation with procrastination. However, while not statistically significant, reminders had the strongest correlation with a decrease in procrastination out of any of the variables examined in this study.

In our experimental study, we hypothesized that days where participants received experimental reminders would show a decrease in procrastination, as opposed to control days without experimental reminders. Our results confirmed this hypothesis. Both of our measurements of procrastination, the GPS and number of tasks completed, showed a statistically significant difference between conditions with both the pooled and raw data.

4.2 Relation of Results to Past Research

In previous research, acting with awareness was shown to have a negative correlation with procrastination (Gautam et al., 2019). In our research, we found that only pooled standardized data, and not pooled raw data, showed a negative correlation between acting with awareness and procrastination, and neither of these correlations showed a statistical significance. At least three differences in our methodology could have resulted in these

discrepancies. First, the small number of participants (3) in our study vs. 801 in the Gautem et al. (2019) study gave us a small sample size and much less data. Secondly, in the Gautem et al. (2019) study, the participants did not conduct the study, which would have controlled for experimenter expectancy and placebo effects. We recommend that future research into acting with awareness and procrastination use a larger sample size and a double-blind procedure.

In our correlational study, we failed to confirm the negative relationship between reminders and procrastination previously reported by Wessel et al. (2020). Wessel et al. (2020) found that the participants scoring lowest in trait procrastination when put in the intervention condition resulted in lowered procrastination as reduced behaviour delay. Our study's findings, differing in statistical significance to the study Wessel et al. (2020), could be due to two notable differences. A difference in duration of the study was one notable difference. The study done by Wessel et al. (2020) was two weeks in duration in comparison to our study being eight days, suggesting the potential need for more data collection. The other notable difference in our study was how Wessel et al. (2020) measured delay associated with procrastination through the Experience Sampling Method (ESM) with short surveys performed twice daily. In our study procrastination was measured with a modified General Procrastination Scale (GPS) test taken once at the end of the day. This difference in measurement of procrastination could have been less precise in the day-to-day variation in procrastination that participants can have. Contributing to that, the items that the modified GPS uses may have posed questions that were not specific enough for day-to-day

measurements as some of the questions, like, "I often delay medical issues concerning my health," may have been less relevant as the modified GPS was to be scored only pertaining to the last 24 hours. GPS may be more suited in measuring procrastination when the items are scored in the context of a larger time frame. This suggests that measuring day-to-day procrastination could give inaccurate results if certain factors are to event-specific like attending to medical issues, which may give you an instant low score if you have no medical issues to attend to that day. Future studies could be used to see if procrastination can be measured more precisely for day-to-day variation with a focus in relation to how procrastination impacts whatever variety of tasks participants face that day rather than in relation to a set of tasks that may not have any reason to occur that day.

However, in contrast to our correlational study, our experimental study concluded that on days participants received reminder intervention, their procrastination decreased. We were not able to entirely control for experimenter expectancy or placebo effects, although we measured tasks completed to reduce these effects. Therefore, participants may have been affected by experimenter expectancy or placebo effects. We recommend that further research increase number of participants and find better ways to control for experimental expectancy and placebo effects.

Our study failed to confirm the findings of Rozental et al. (2018), which found CBT to decrease procrastination. The CBT used in the previous study included a module for "managing maladaptive thoughts and beliefs" (Rozental et al., 2018). Therefore, cognitive distortions may be correlated to an increase in procrastination. Much like the study by Rozental et al. (2018), participants in our study self-reported using a procrastination scale; however, the two studies differ by size, duration, and resources, possibly resulting in discrepancies. Future studies could observe the remaining factors treated by CBT in the study by Rozental et al. (2018); these factors may correlate to the amount of procrastination in participants.

4.3 Implications of Results

Based on our correlational study, we did not find statistical significance in the standardized data of any of the three variables (acting with awareness, reminders, and cognitive distortions). However, because reminders showed the strongest correlation, we tested reminders in our experimental study and found a strong effect upon procrastination. Based on the data, we suggest that a reminder app could be a helpful tool to mitigate procrastination. This could be particularly useful in scenarios where people have a number of tasks that require long-range planning and therefore are easier to procrastinate.

We originally decided to conduct this study on procrastination because we were concerned about the negative effects of procrastination on people's daily lives, particularly around academics. Given the results of our study, we believe that intervention reminders could provide an effective means to decrease student procrastination. For example, students may begin writing papers sooner or studying earlier for exams if they receive reminder interventions, as well as balancing their personal tasks with academic goals. Regardless of whether one is a student or not, using a reminder app could help with productivity and possibly also contribute to a decrease in procrastination-related anxiety.

References

Gautam, A., Polizzi, C. P., & Mattson, R. E. (2019). Mindfulness, procrastination, and anxiety: Assessing their interrelationships. *Psychology of Consciousness: Theory, Research, and Practice.* https://doi.org/10.1037/cns0000209

Lodha, P., Sharma, A., Dsouza, G., Marathe, I., Dsouza, S., Rawal, S., Pandya, V., & De Sousa, A. (2019). General procrastination scale: Development of validity and reliability. *International Journal of Medicine and Public Health, 9*(3), 74-80.

Rozental, F. A. D., Lindner, P., Nilsson, S., Mårtensson, L., Rizzo, A., Andersson, G., & Carlbring, P. (2018). Treating procrastination using cognitive behavior therapy: A pragmatic randomized controlled trial comparing treatment delivered via the internet or in groups. *Behavior Therapy, 49*(2), 180–197. https://doi.org/10.1016/j.beth.2017.08.002

Wessel, J., Bradley, G. L., & Hood, M. (2020). A low-intensity, high-frequency intervention to reduce procrastination. *Applied Psychology: An International Review, 70*(4), 1669–1690. https://doi.org/10.1111/apps.12293

Table 1

Correlations for Study Variables

Variables	Participant #1		Participant #2		Participant #3		Pooled raw data		Pooled standardized data	
	r	*n*	*r*	*n*	*r*	*n*	*r*	*n*	*r*	*n*
Acting with awareness and procrastination	0.73*	8	-0.50	8	-0.64	8	0.03	24	-0.14	24
Reminders and procrastination	-0.51	8	-0.21	8	-0.41	8	-0.21	24	-0.37	24
Cognitive distortions and procrastination	0.47	8	0.65	8	-0.30	8	0.44*	24	0.27	24

* $p < .05$.

Table 2

Descriptive Statistics for Procrastination (Measured by GPS) Across Different Reminder

   Conditions

Condition	Statistic	Participant #1	Participant #2	Participant #3	Pooled raw data	Pooled standardized data
Five Daily	*M*	43.40	55.00*	53.80	50.73*	-0.46*
Reminders	*SD*	5.18	5.43	10.64	8.80	0.78
	n	5	5	5	15	15
No Experimental	*M*	53.5	67.50	58.25	59.75	0.57
Reminders	*SD*	9.61	6.45	8.66	9.69	0.88
	n	4	4	4	12	12

Note. *M*, *SD*, and *n*, represent mean, standard deviation, and sample size, respectively. The

General Procrastination Scale was used to measure procrastination (with possible range of 23-

115; 23 = minimal procrastination; 115 = high procrastination).

* *p* < .05 for comparison of a five daily reminders condition with its respective no artificial

reminders condition.

Table 3

Descriptive Statistics for Procrastination (Measured by Tasks Completed) Across Different

Reminder Conditions

Condition	Statistic	Participant #1	Participant #2	Participant #3	Pooled raw data	Pooled standardized data
Five Daily	*M*	5.20*	4.20*	2.80	4.07*	0.43*
Reminders	*SD*	1.92	0.84	1.92	1.83	1.00
	n	5	5	5	15	15
No Experimental	*M*	3.00	3.00	2.00	2.67	-0.54
Reminders	*SD*	0.82	0.82	0.82	0.89	0.59
	n	4	4	4	12	12

Note: *M*, *SD*, and *n* represent mean, standard deviation, and sample size, respectively. The

number of tasks completed each day was used to measure procrastination (higher values indicate

less procrastination).

* $p < .05$ for comparison of the five daily reminders condition with its respective no

experimental reminders condition.

Figure 1

Association Between Acting with Awareness and Procrastination Using Pooled Raw Data
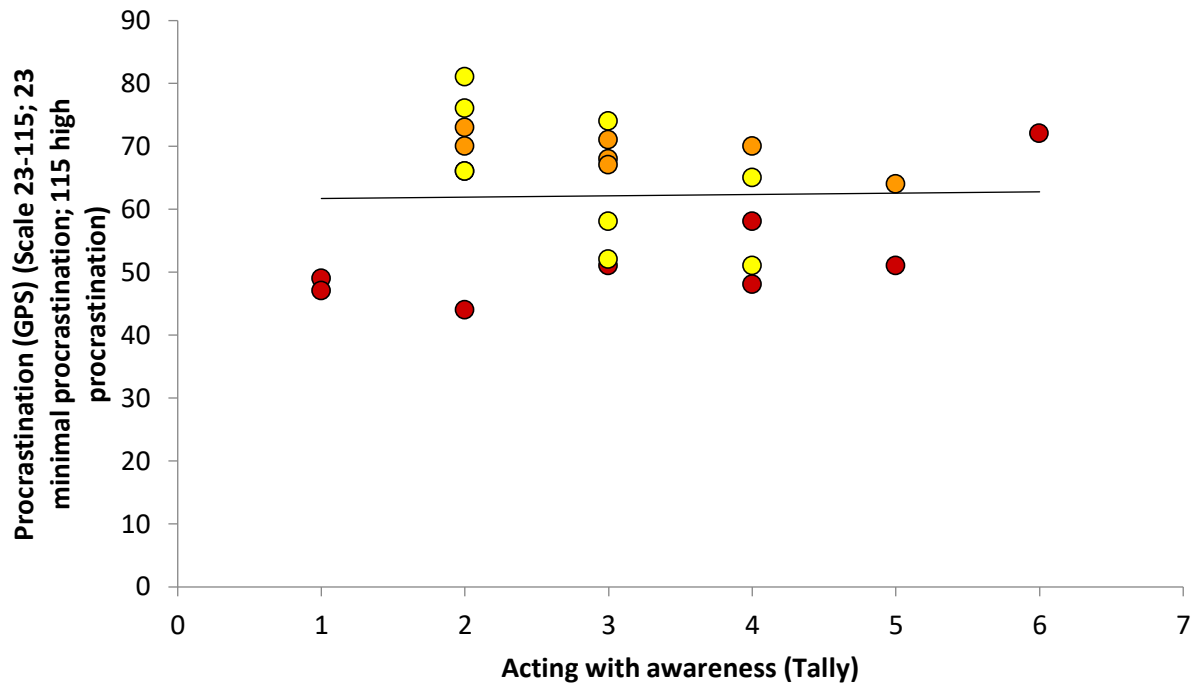
Notes. Marker colour differentiates participants: red = participant #1, orange = participant #2, and yellow = participant #3. Some data might not be visible in the figure due to overlapping markers.
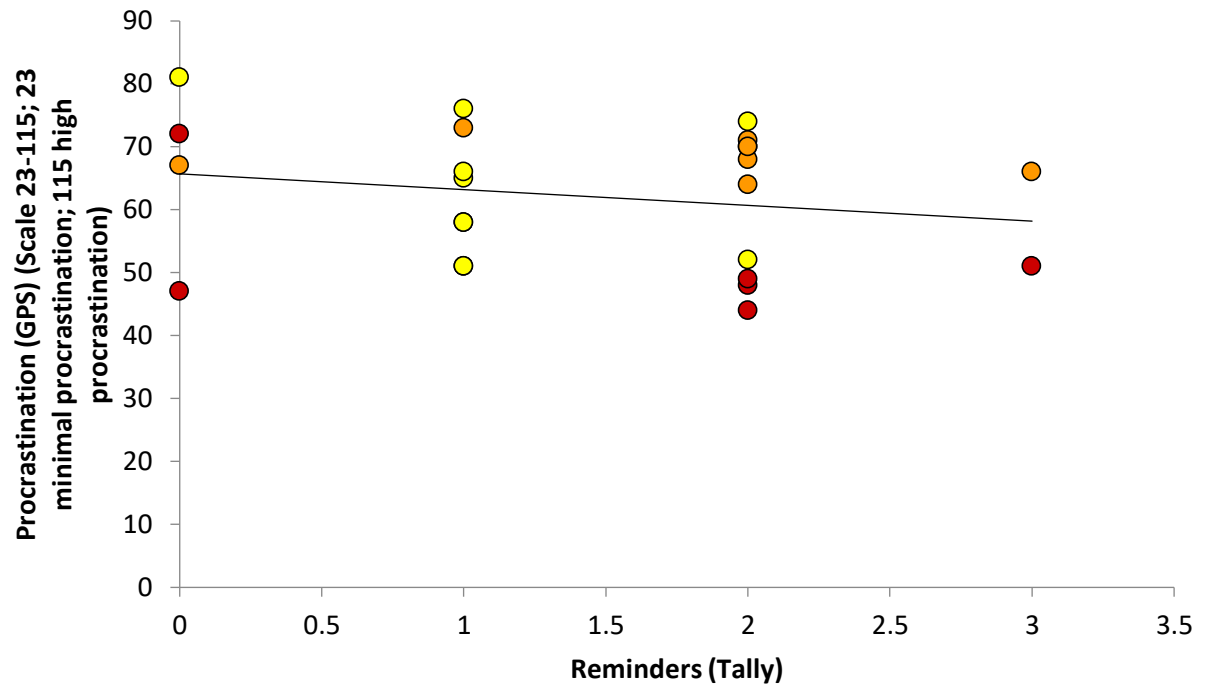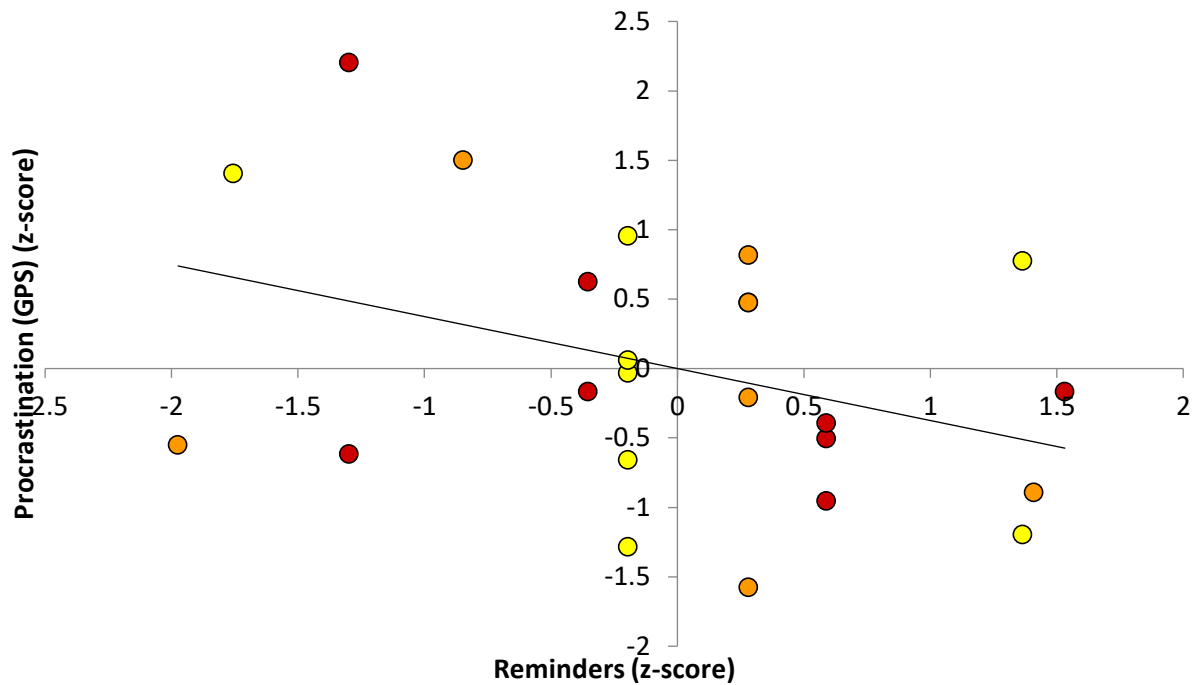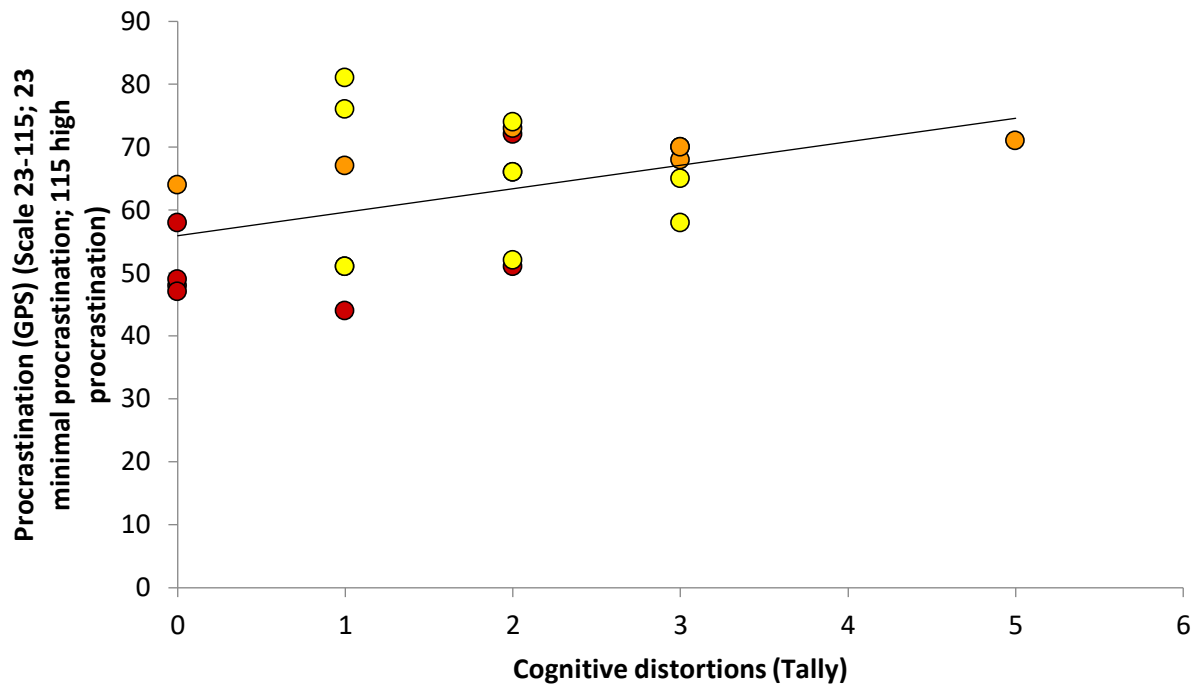
Figure 2

Association Between Acting with Awareness and Procrastination Using Pooled Standardized
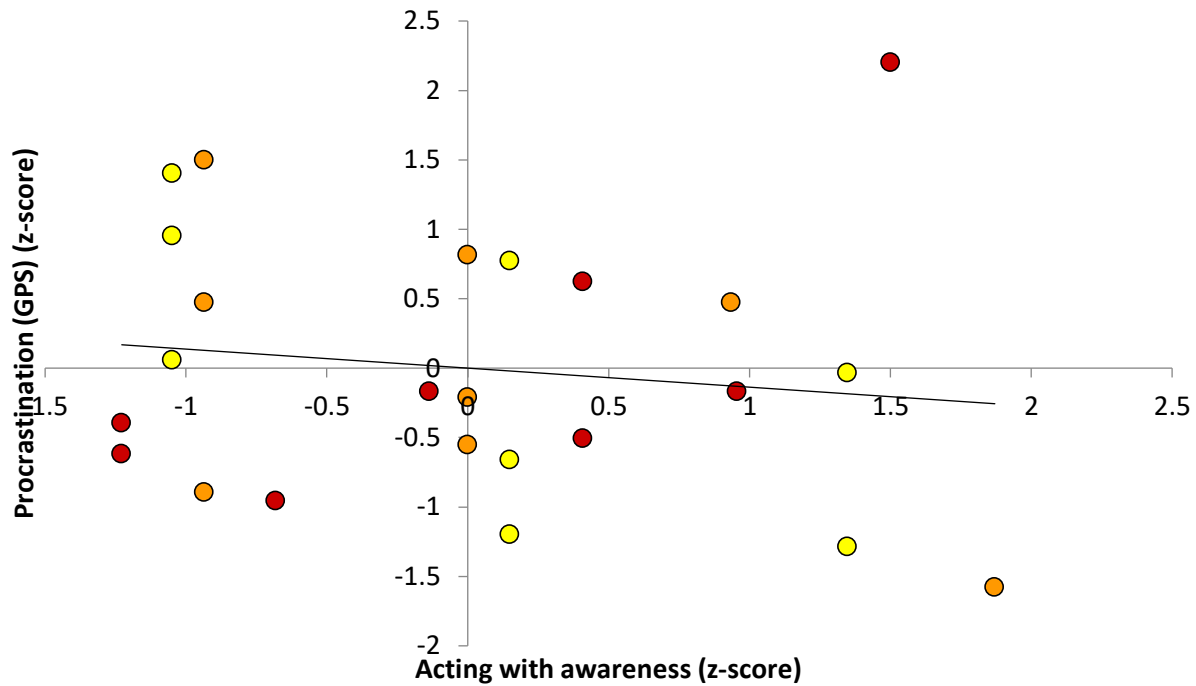
   Data

Notes. Marker colour differentiates participants: red = participant #1, orange = participant #2, and yellow = participant #3. Some data might not be visible in the figure due to overlapping markers.

Figure 3

Association Between Reminders and Procrastination Using Pooled Raw Data

Notes. Marker colour differentiates participants: red = participant #1, orange = participant #2, and yellow = participant #3. Some data might not be visible in the figure due to overlapping markers.

Figure 4

Association Between Reminders and Procrastination Using Pooled Standardized Data

Notes. Marker colour differentiates participants: red = participant #1, orange = participant #2, and yellow = participant #3. Some data might not be visible in the figure due to overlapping markers.

Figure 5

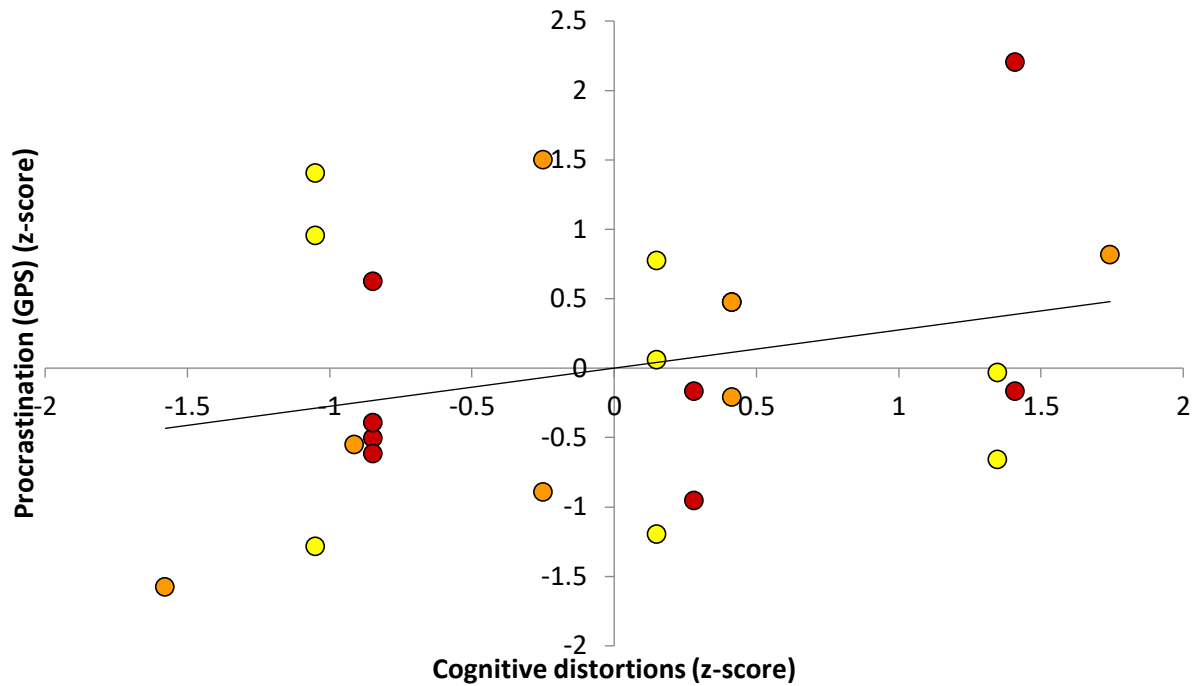*Association Between Cognitive Distortions and Procrastination Using Pooled Raw Data*

Notes. Marker colour differentiates participants: red = participant #1, orange = participant #2, and yellow = participant #3. Some data might not be visible in the figure due to overlapping markers.

Figure 6

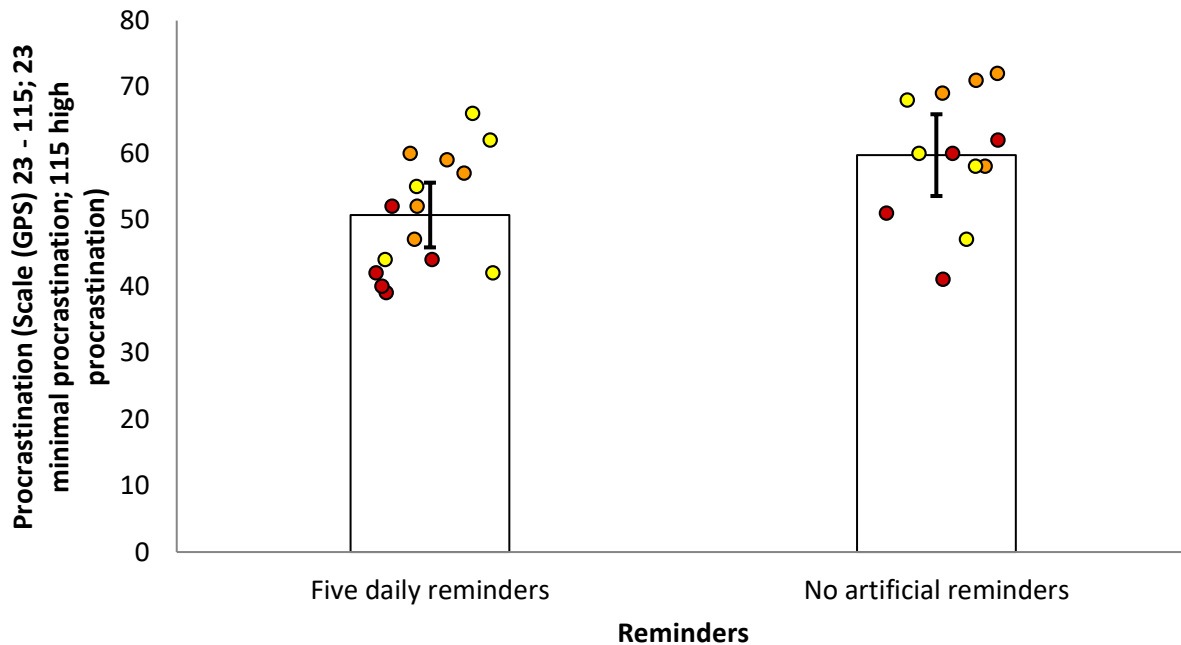*Association Between Cognitive Distortions and Procrastination Using Pooled Standardized*

Data

Notes. Marker colour differentiates participants: red = participant #1, orange = participant #2, and yellow = participant #3. Some data might not be visible in the figure due to overlapping markers.
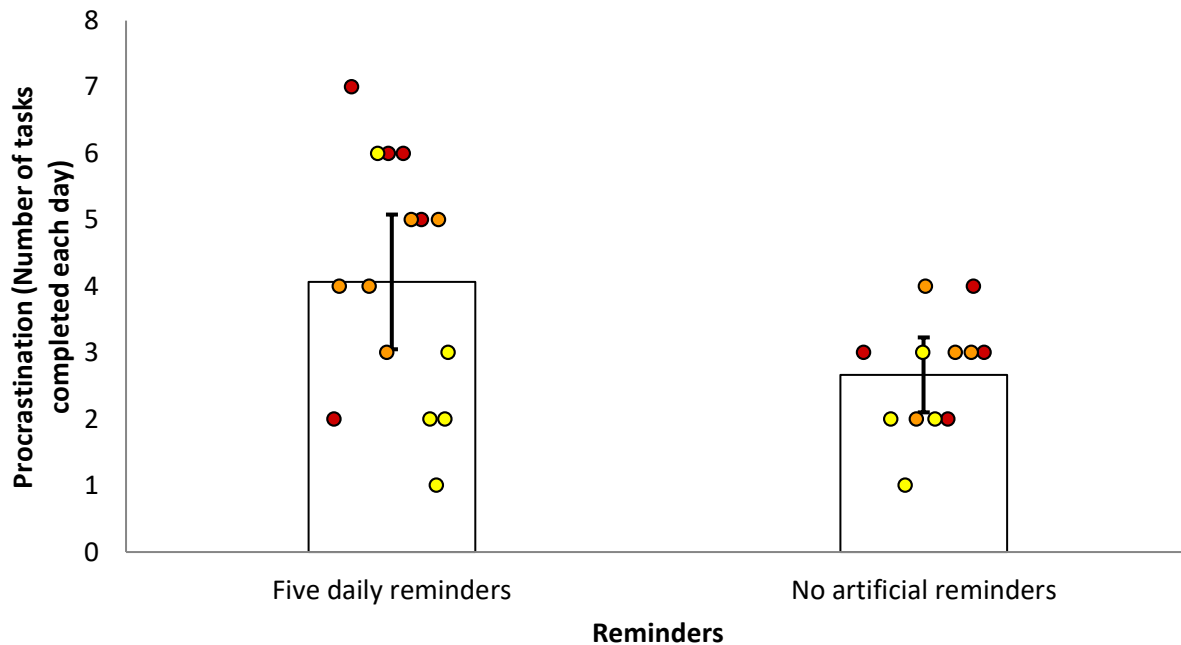
Figure 7

Average Procrastination (Measured by GPS) Across Different Reminder Conditions Using

Pooled Raw Data

Notes. Procrastination scores are shown for five daily reminders and no experimental reminders

conditions using pooled raw data from all participants. Errors bars show ± 95% confidence

levels. Overlapping scatterplot shows data from each participant. Marker colour differentiates

participants: red = participant #1, orange = participant #2, and yellow = participant #3.
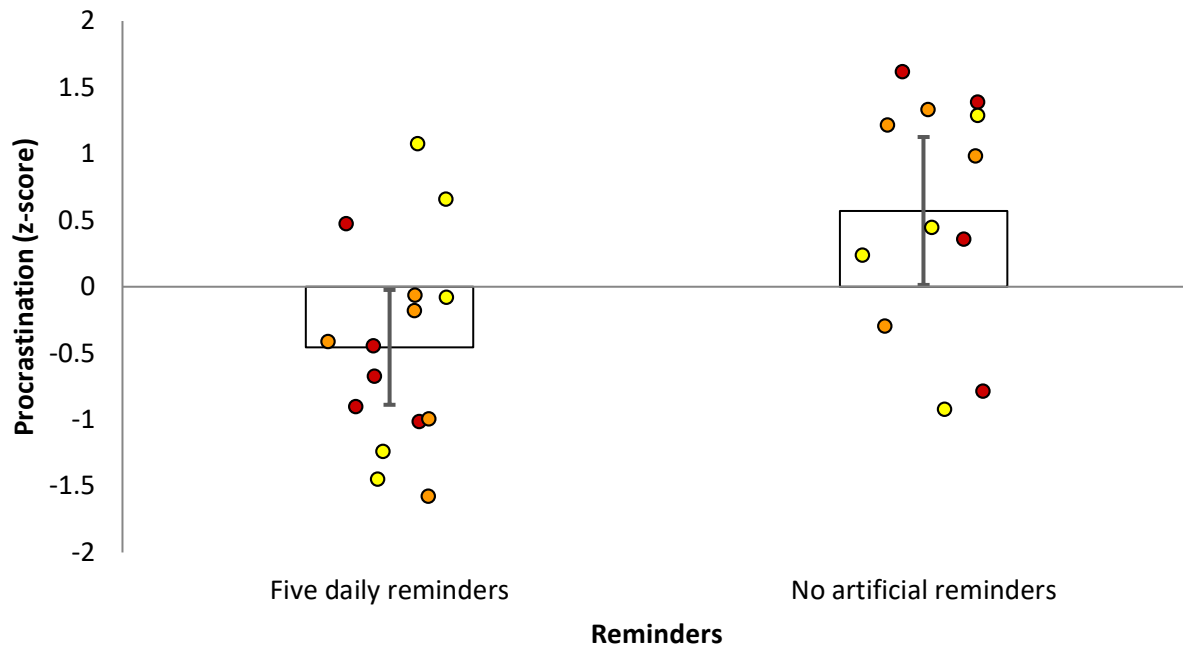
Figure 8

Average Procrastination (Measured by Tasks Completed) Across Different Reminder Conditions

Using Pooled Raw Data

Notes. Procrastination scores are shown for five daily reminders and no experimental reminders

conditions using pooled raw data from all participants. Errors bars show ± 95% confidence

levels. Overlapping scatterplot shows data from each participant. Marker colour differentiates

participants: red = participant #1, orange = participant #2, and yellow = participant #3. Note that

higher number of tasks completed should be interpreted as less procrastination.
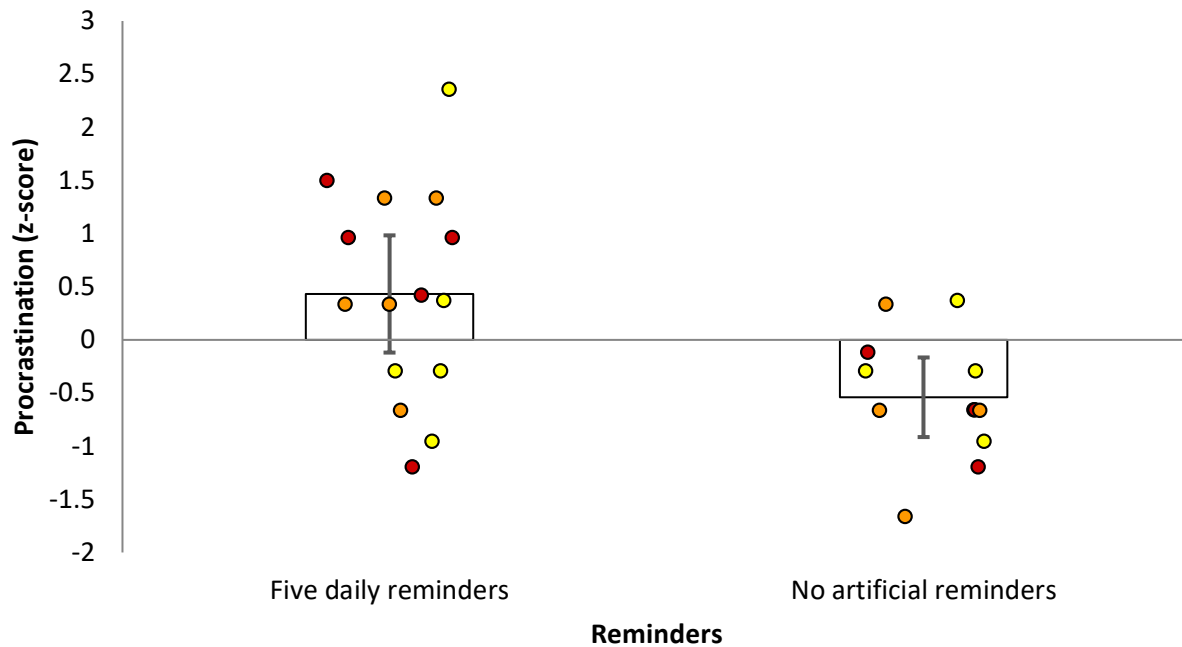
Figure 9

Average Procrastination (Measured by GPS Scores) Across Different Reminder Conditions

Using Pooled Standardized Data

Notes. Procrastination scores are shown for five daily reminders and no experimental reminders conditions using pooled raw data from all participants. Errors bars show ± 95% confidence levels. Overlapping scatterplot shows data from each participant. Marker colour differentiates participants: red = participant #1, orange = participant #2, and yellow = participant #3.

Figure 10

Average Procrastination (Measured by Tasks Completed) Across Different Reminder Conditions

Using Pooled Standardized Data

Notes. Procrastination scores are shown for five daily reminders and no experimental reminders conditions using pooled raw data from all participants. Errors bars show ± 95% confidence levels. Overlapping scatterplot shows data from each participant. Marker colour differentiates participants: red = participant #1, orange = participant #2, and yellow = participant #3. Note that higher number of tasks completed should be interpreted as less procrastination.

Appendix

The General Procrastination Scale (GPS)

The General Procrastination Scale was developed by Lodha et. (2019). With 23 items in total, the scale measures procrastination in 4 domains- academic, workplace, medical and civic responsibilities related procrastination. All items are required to be rated on a 5-point Likert scale ranging from 1 to 5. The scores reveal a Procrastination Quotient (PQ).

Items 5, 8, 12, 16, 18, 21 and 23 are reversed scored. Scores are obtained as a sum of response to each item and they range from 23 to 115. A higher sum of scores obtained on all items indicates higher level of procrastination for the individual test taker in term of a higher Procrastination Quotient (P.Q.) obtained.

Scores of each item are calculated according to the following order:

Never	Rarely	Sometimes	Often	Always
1	2	3	4	5

The following is to be answered only pertaining to the last 24 hours:

1. I often try to avoid doing a task that I have little or no interest in. ☐
2. I often delay tasks that are desirable to me. ☐
3. When a task is highly stressful, I'm likely to put in more effort. ☐
4. I think that certain problems can subside or be solved on their own, with a passage of time. ☐

☐
☐

5. I begin work immediately on a task once it has been given to me. ☐
6. I have often had services terminated because of unpaid bills. ☐
7. I often delay attending to medical issues concerning my health. ☐
8. I prefer submitting an assignment before the deadline. ☐
9. I generally don't start working on a project or assignment immediately. ☐
10. I am usually late when I have to go out and meet friends for a movie or dinner or other such plans. ☐
11. I often put off doing tasks until urgency develops. ☐
12. Whenever I make a plan of action, I follow it. ☐
13. I think too much about things I would like to do but rarely get around to doing them. ☐
14. I tend to work at the eleventh hour for a task or project. ☐

15.   I postpone my chores to a later time when something more interesting comes up.

16.   I prefer planning ahead for tasks and events.

17.   I needlessly delay finishing jobs, even when they're important.

18.   I prefer working on one assignment at a time.

19.   I do not complete tasks until I am insisted to complete them. ☐

20.   I am generally late at the workplace or college ☐

21.   I try to avoid any backlog of work. ☐

22.   I delay the tasks that distress me. ☐

23.   I feel guilty when I delay doing tasks. ☐