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Academic Procrastination and Goal Accomplishment: A Combined Experimental and Individual Differences Investigation

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Abstract

This study examined the relationship between academic procrastination and goal accomplishment in two novel ways. First, we experimentally tested whether undergraduate students ($N = 177$) could reduce their academic procrastination over a course of three weeks after performing goal-related exercises to set so-called SMART goals and/or to prepare those students with specific strategies to resist their temptations (forming implementation intentions). Second, we conducted systematic regression analyses to examine whether academic procrastination at baseline uniquely predicts later goal-related outcomes, controlling for various correlated variables, including personality traits (e.g., impulsivity), motivational factors (e.g., motivation for the generated goals), and situational factors (e.g., memory for the goals). Results indicated that neither the SMART-goal nor implementation-intention intervention significantly reduced academic procrastination in the three-week interval, even when relevant moderating variables were examined. Initial levels of academic procrastination, however, were predictive of the success of accomplishing the goals generated during the initial exercises, above and beyond a wide range of other candidate correlates. These results provided new correlational evidence for the association between academic procrastination and goal accomplishment, but suggest a need for further research to understand what interventions are effective at reducing academic procrastination.

Keywords

academic procrastination; goal management; SMART goals; implementation intentions

1. Introduction

Academic procrastination—the voluntarily delay of action on academic tasks despite expecting to be worse off for that delay—is so pervasive that, according to some estimates, 50–80% of college students procrastinate moderately or severely (Day, Mensink, & O'Sullivan, 2000; Gallagher, Golin, & Kelleher, 1992). Moreover, almost all students who procrastinate report the desire to reduce their procrastination (Gallagher et al., 1992). Such

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prevalence of academic procrastination suggests a need for systematic research that documents the extent to which procrastination negatively contributes to the achievement of students' academic goals and that explores potential ways to reduce procrastination.

A starting point for this study is some recent work that highlights goal-management abilities as an important factor for individual differences in procrastination. Recent theoretical accounts, for example, have suggested that various aspects of goal management, such as goal setting (Steel & König, 2006) and goal focus (Krause & Freund, 2014a), may influence procrastination. Some of these theoretical claims have also received support from a growing set of empirical studies (e.g., Blunt & Pychyl, 2000, 2005; Gröpel & Steel, 2008; Gustavson, Miyake, Hewitt, & Friedman, 2014, 2015; Krause & Freund, 2016).

Our own research has focused on specifying the cognitive and genetic influences underlying the association between procrastination and goal-management abilities. In large-scale twin studies (Gustavson et al., 2014, 2015), we have found, at the level of latent variables, a substantial correlation between procrastination and goal-management failures in everyday life ($r = .67-.76$). Further, this association was primarily due to shared genetic influences, which also explained substantial variation in impulsivity (Gustavson et al., 2014) and executive functions (Gustavson et al., 2015), a set of higher-level cognitive abilities that support goal-directed behaviors and regulate one's thought and action (Friedman & Miyake, 2017; Miyake & Friedman, 2012). Such prior evidence for a common goal-management factor accounting for individual differences in procrastination, impulsivity, and executive functions have led us to conclude that procrastination and goal-management abilities are deeply intertwined.

Although it has become clear that goal management is an important contributing factor to procrastination, it is not clear whether helping students set and manage their goals can lead them to actually reduce their academic procrastination. Furthermore, self-report measures of procrastination have been shown to be correlated with academic achievement, such as course grades (e.g., Kim & Seo, 2015; Morris & Fritz, 2015), and with levels of success at fulfilling one's academic intentions, as measured with study time (Steel, Brothen, & Wambach, 2001) or the amount of reading assignments completed (Glick & Orsillo, 2015). However, little is known about whether academic procrastination is related to the achievement of academic goals generated by students themselves that more directly reflect their specific needs.

To make an initial step toward filling such gaps in the literature, we conducted a two-session laboratory study that combined experimental and individual differences approaches. In the first session, college students completed the initial baseline assessment of their academic procrastination and other related individual differences measures. They then completed two goal-related exercises that required them to create personal academic goals to be accomplished in the next few weeks and to identify anticipated temptations that might distract them from making progress on those goals. Specifically, students were assigned to one of four groups resulting from crossing two types of interventions (creating SMART goals and forming implementation intentions). They returned to the lab about three weeks later to provide postintervention measures of academic procrastination (how much they

procrastinated since the initial session) and goal accomplishment (whether they accomplished those goals they had set).

1.1. Goal-Related Interventions for Procrastination

Due to its high prevalence, many popular-press books have been written about procrastination (e.g., Burka & Yuen, 1983; Ferrari, 2010; Pychyl, 2013; Steel, 2010). Because delaying action on long-term goals in favor of short-term temptations is a central component of procrastination (Steel, 2007), these books highlight the importance of identifying specific goals to be accomplished, breaking these goals down into smaller subgoals, and following a time-defined schedule. Despite the sensibility of such advice, little research has directly tested the effectiveness of these goal-related strategies in reducing procrastination, academic or otherwise.

In fact, over two decades ago, Ferrari, Johnson, and McCown (1995) pointed out “an absence of double-blind attention-placebo trials [...] necessary to establish demonstrated efficacy of a treatment” on reducing procrastination (p. 187). After summarizing preliminary results from some intervention studies that targeted altering students’ misconceptions about academic procrastination (e.g., underestimation of task demands, overestimation of motivation and time left to complete task), Ferrari et al. (1995) stated that “our hope is that these clinically derived interventions can be eventually subjected to empirical testing” (p. 187).

Responding to this call, a small but growing number of studies published since have examined procrastination-related interventions (e.g., Rozental, Forsell, Svensson, Andersson, & Carlbring, 2015; Rozental, Forsstrom, Tangen, & Carlbring, 2015). However, intervention studies that have targeted academic procrastination are still limited in number (e.g., Ariely & Wertenbroch, 2002; Giesemann, Pietrowsky, 2016, Toker & Avci, 2015; Tuckman, 1998; Tuckman & Schouwenburg, 2004). Moreover, although some intervention studies on academic procrastination have focused on cognitive behavioral strategies, such as identifying and challenging irrational thoughts (Ozer, Demir, & Ferrari, 2013; Toker & Avci, 2015; Wang et al., 2015), only a few have targeted goal-management processes (Glick & Orsillo, 2015; Häfner, Oberst, & Stock, 2014).

In the Häfner et al. (2014) study, for example, 96 college students selected an important academic task to complete (e.g., writing a thesis) in the next 4 weeks and received 2 hours of either (a) time-management training that targeted some goal-related processes (e.g., developing a strategy for achieving the goal, identifying the next steps to take) or (b) control training that involved simply discussing their own time-management problems. All participants were then asked to record the time they spent for their respective academic goals every day, and the records from those subjects who kept their time diaries for all four weeks were analyzed (n 's = 22 and 23 in the experimental and control groups, respectively). Results indicated that subjects in the control group indeed spent more time working toward their goals in Week 4 than those in the experimental group. Importantly, however, the times the two groups spent on their goals in Weeks 1–3 did not differ, thus providing little evidence that the experimental group successfully reduced their procrastination by spending more time on their goals early on. In light of the small final sample sizes due to high drop-out

rates (~50%), this study provides limited evidence for the positive influence of time-management training on academic procrastination.

More recently, Glick and Orsillo (2015) compared the effectiveness of two different procrastination interventions delivered online via a 20-min video to 117 college students: (a) an acceptance-based intervention that targeted mindfulness and emotion regulation (e.g., anxiety) and (b) a time-management intervention that more directly targeted goal-management skills, such as setting a schedule and preparing for last-minute obstacles. Although there was some evidence that the time-management intervention led to greater goal accomplishment (operationalized as the amount of reading assignments completed) than the acceptance-based intervention, there were no group differences in actual academic procrastination (operationalized as the actual/ideal ratio) after the interventions. There was, however, some evidence for the moderating influence of self-reported academic values, suggesting that the acceptance-based intervention was most effective for those students with high academic values.

Taken together with other intervention studies that similarly offered some promising but limited evidence (e.g., Ariely & Wertenbroch, 2002; Ozer et al., 2013; Tuckman, 1998; Tuckman & Schouwenburg, 2004; Wang et al., 2015), these studies (Glick & Orsillo, 2015; Häfner et al., 2014) suggest that, although it may not be easy to reduce academic procrastination, interventions that target goal-related processes may help students achieve specific academic goals.

In this study, we tested the effectiveness of two goal-related interventions in reducing academic procrastination: creating SMART goals and forming implementation intentions. Although not extensively examined in the context of procrastination, these goal-related activities are often touted as effective ways to reduce the so-called intention-behavior gap, a fundamental problem underlying procrastination. Because, as noted shortly, these two interventions target different aspects of goal-management processes, we crossed them to test whether their positive influences, if any, would be additive or interactive.

The first intervention—creating SMART goals—targets the goal-setting process and involves clarifying what students want to achieve by developing concrete personal goals that are Specific, Measurable, Achievable, Realistic, and Time-defined (Bovend'Eerd, Botell, & Wade, 2009; O'Neill, 2000; Resnick, 2009).¹ SMART goals are prominently featured in various self-help books and online sources, but little research has been conducted to test the effectiveness of creating SMART goals on reducing procrastination. Some component characteristics of SMART goals (i.e., specificity, measurability, and time-defined schedules), however, have been highlighted as important for goal accomplishment in popular-press books (Burka & Yuen, 1983; Ferrari, 2010; Grant Halvorson, 2010; Pychyl, 2013) and in long-held theoretical accounts of goal setting (Locke & Latham, 2002, 2006). We thus reasoned that asking students to create SMART goals would provide a good starting point

¹Some sources use different labels for the SMART abbreviation (e.g., A = Actionable, R = Relevant). In this study, the instructions for the goal-setting exercise emphasized creating Achievable and Realistic goals because we wanted to ensure that subjects would generate goals that could be achieved in the allotted three-week time window.

for exploring whether goal-setting interventions could help reduce their academic procrastination.

The second intervention—forming implementation intentions—targeted a different aspect of goal management that requires the effective maintenance and retrieval of long-term goals: resisting temptations. Previous research has established impulsivity as a substantial correlate of procrastination (Ferrari, 1993; Steel, 2007), perhaps because impulsive individuals may be more likely to lose sight of their long-term goals by favoring short-term temptations (Gustavson et al., 2014). Thus, we reasoned that, in addition to setting good goals, it may also be important to prepare individuals for likely distracting temptations by providing specific strategies to combat them. A good candidate for such an intervention is implementation intentions, which involve forming if/then rules that can be targeted at specific temptations (Gollwitzer & Brandstatter, 1997; Gollwitzer & Sheeran, 2006). Moreover, forming implementation intentions have been shown to be effective in reducing the intention–behavior gap in the domains of health psychology (for recent meta-analyses, see Adriaanse, Vinkers, De Ridder, Hox & De Wit, 2011; Bélanger-Gravel, Godin, & Amireault, 2013).

Despite such promise, the existing evidence regarding potential benefits of implementation intentions for reducing procrastination is highly limited, especially when it comes to academic procrastination (e.g., Howell, Watson, Powell, & Buro, 2006; Van Hooft, Born, Taxis, van der Flier, & Blonk, 2005). Moreover, the existing evidence for the relationship between implementation intentions and procrastination tends to be correlational in nature (perhaps with an exception of Owens, Bowman, & Dill, 2008), thus necessitating an experimental investigation that directly tests the effectiveness of implementation intentions in reducing academic procrastination.

1.2. Procrastination and Goal Accomplishment

The second aim of this study was to examine whether individual differences in academic procrastination uniquely predict the extent to which students successfully achieve their self-generated academic goals, above and beyond the influence of other relevant correlates. Much of research examining the association between academic procrastination and achievement has focused on global measures like course grades and has demonstrated that higher levels of self-reported procrastination are generally associated with lower grades (see Kim & Seo, 2015, for a recent meta-analysis). Although students clearly want to receive as high course grades as possible, such global measures cannot serve as a direct measure of their goal accomplishment.

Other work has focused on more specific and more direct indices of students' academic accomplishment, such as the amount of reading assignments completed (Glick & Orsillo, 2015) and the gap between intended and actual study hours (Steel et al., 2001). These studies have also produced some evidence for significant associations between academic procrastination and goal accomplishment, but, in these studies, the goals generated by the students were simple numerical values (e.g., intended study hours), rather than individually tailored descriptions of what they wanted to achieve (e.g., SMART goals). In fact, little research has examined how academic procrastination is related to the achievement of

personal goals that students themselves generated in light of their own specific academic needs. Moreover, the existing evidence is limited as to whether this hypothesized association between academic procrastination and goal achievement is uniquely attributable to individual differences in procrastination per se, rather than other correlated factors (e.g., personality, motivation, and situational factors).

To address these issues, we asked subjects to report, in the second session, the extent to which they accomplished the goals they set in the first session and examined what specific individual differences variable(s) uniquely predicted self-reported goal achievement. We hypothesized that if procrastination is uniquely associated with the accomplishment of self-generated goals, this association should remain significant even after controlling for other potential correlates of procrastination. As a secondary question, we also examined what individual differences variable(s) would uniquely predict other outcome measures in this study, such as levels of success at resisting distracting temptations and postintervention levels of academic procrastination. To make the testing of our hypotheses rigorous, we included a wide range of candidate correlate variables, which we briefly summarize and justify below.

As for personality measures, we assessed trait levels of impulsivity, conscientiousness, and perfectionism because they are some of the most widely studied correlates of procrastination (Steel, 2007). They may also be relevant to goal accomplishment because impulsive individuals are more prone to give into their distracting temptations and avoid work (Gustavson et al., 2014; Pychyl, 2013), whereas conscientious individuals tend to be better organized and persevere until tasks are completed (Costa & McCrae, 1992). A component of perfectionism, known as personal standards (having high standards for oneself), has also been associated with less procrastination (Steel, 2007) and will likely be related to stronger goal accomplishment. In addition, we assessed subjects' everyday procrastination outside academic domains.

As a novel addition, we included a measure of mindset on procrastination—a growth versus fixed mindset for procrastination—to assess the extent to which one believes that procrastination is a malleable (rather than immutable) trait. When studied in the context of positive traits such as intelligence, a growth mindset has been associated with various positive outcomes (Dweck, 2006). For example, a recent meta-analysis (Burnette, O'Boyle, VanEpps, Pollack, & Finkel, 2013) suggests that growth mindsets (e.g., of intelligence) predicts multiple self-regulatory behaviors, such as better goal setting, goal operating, and goal monitoring. We adapted the mindset questionnaire of intelligence for procrastination to examine whether one's belief about procrastination may be associated with levels of goal achievement and academic procrastination. This variable was potentially an important one to explore, because there was some suggestion that one's beliefs might moderate the effect of an intervention (e.g., Valentiner, Jencius, Jarek, Gier-Lonsway, & McGrath, 2013). For example, the benefit of intervention effects could be greater for those students who believe in the malleability of procrastination.

As for motivational factors, we included two trait-like aspects of motivation: (a) internal academic motivation—the drive to do well for oneself—which has known to be negatively

correlated with procrastination and (b) external academic motivation—the drive to do well because to impress parents, teachers, or peers—which has known to be positively correlated with procrastination (Senécal, Koestner, & Vallerand, 1995; Steel, 2007). We also included more specific aspects of motivation, including (a) motivation to achieve the specific academic goals generated during the intervention exercise and (b) confidence (or self-efficacy) for being able to achieve their self-generated goals.

Finally, we assessed subjects' memory for their self-generated goals, specifically, the extent to which subjects accurately remembered the specific goals and implementation intentions they had formed three weeks ago. We judged that this variable could be important for resisting short-term temptations and/or accomplishing self-generated goals, because individuals who cannot retrieve and maintain their goals when needed may have great difficulty completing them.

Although our selection of the variables is not exhaustive, the wide range of variables included in this study should help us better differentiate those variables that uniquely predict procrastination and goal accomplishment from those that are not unique predictors once controlling for other predictors.

1.3. The Current Study

We conducted a two-session intervention study that also included various individual differences measures. Our intervention procedure was modeled after the Personal Project Analysis approach (Little, 1983), in which subjects generate personal goals in an initial brainstorming session and then choose some of their most important goals (Blunt & Pychyl, 2000, 2005). We supplemented this approach by introducing two different goal-related interventions after these initial goal-setting brainstorming exercises.

The procedure for this study is summarized in Figure 1. In the first session, subjects completed measures of baseline academic procrastination, personality, motivation, and other situational factors. They then completed the goal-setting exercises in which they brainstormed multiple academic goals (9 total), chose the most important academic goals (3 total), and elaborated on the importance of accomplishing these goals. Half of the subjects also honed their goals into SMART goals. Afterward, they brainstormed and identified key temptations that they would likely encounter in the next three weeks, and half of the subjects additionally formed implementation intentions for these temptations. Finally, subjects completed motivation and confidence ratings for their personal academic goals.

In the second session, which occurred approximately three weeks later, subjects completed postintervention measures of academic procrastination. They were also assessed with their memory for the specific academic goals they had set earlier and reported whether they were able to accomplish those self-generated goals.

Our assessment of intervention-related changes in procrastination focused on 3 of 6 possible academic domains that each student chose as their most problematic areas (e.g., studying for exams, writing term papers), thereby maximizing the likelihood of observing reductions in procrastination due to the intervention. Subjects reported levels of their academic

procrastination for the 3-week period prior to the intervention in the first session (baseline) and then for the 3-week period prior to the second session (postintervention). If the two interventions can help students reduce their academic procrastination, then the postintervention measures of academic procrastination should be significantly lower than their baseline counterparts, especially for the three academic domains targeted by the goal-setting exercises (Aim 1).

In addition, we collected a postintervention measure of goal accomplishment (how well they were able to achieve the goals they had set for themselves). If academic procrastination is a unique predictor of the actual accomplishment of self-generated goals, then the initial levels of academic procrastination should still be a significant predictor of goal accomplishment even after controlling for those candidate correlates included in the study (Aim 2). As a secondary question, we also explored what individual differences variables would significantly predict (a) the extent to which subjects were successful at resisting the specific temptations they had identified as potentially problematic and (b) postintervention levels of academic procrastination.

2. Method

2.1. Subjects

The participants were 177 college students (110 women and 67 men) from an introductory psychology course who participated for course credit and completed both sessions. They were randomly assigned to the four between-subjects groups ($n = 45$ in the SMART-goal/implementation-intention group, 46 in the SMART-goal/temptations-only group, 39 in the control-goal/implementation-intention group, and 47 in the control-goal/temptations-only group). Thirteen additional subjects participated in both sessions, but their data were excluded for the following reasons: failing to complete the key intervention exercises due to time constraints ($n = 2$), having participated in a pilot study ($n = 1$), or failing to generate at least two acceptable temptations ($n = 1$) or implementation intentions ($n = 9$), as judged by independent raters (see Section 2.3. regarding the coder ratings).

2.2. Design and Procedure

This experiment used a 2 (SMART vs. control) \times 2 (implementation intentions vs. control) between-subjects design. Almost all questionnaires and intervention exercises were administered on Macintosh computers using Qualtrics software, although some measures required paper-and-pencil responses.² All procedures were approved by the Institutional Review Board of the University of Colorado Boulder.

²For full disclosure, we additionally administered the following individual differences measures: (a) working memory capacity (the reading span and letter-rotation span tasks), assessed in Session 1; (b) two other subscales of perfectionism (the Discrepancy and Order subscales of the Almost Perfect Scale), also assessed in Session 1; (c) measures of nonacademic procrastination and impulsivity, assessed in Session 2; and (d) subjects' perceptions of the effectiveness of each of their implementation intentions, also assessed in Session 2. These measures will not be reported here for the following reasons: (a) Working memory measures were not correlated with any key outcome measures; (b) only the Personal Standards subscale is typically discussed in procrastination research and seems most directly relevant to the second aim of the study; (c) there was no reason to expect any changes in the trait-level everyday procrastination and impulsivity after the intervention; and, finally, (d) ratings for the perceived effectiveness of implementation intentions were completed by only those subjects assigned to the implementation-intention conditions and did not allow any meaningful statistical comparisons (subjects, however, reported that they found forming implementation intentions generally useful, $M = 3.75$ on a 1–5 scale, $SD = 1.28$).

2.2.1. Session 1: Individual differences measures—Virtually all questionnaire items asked subjects to indicate how each statement was true of them “in general” so that they would serve as trait-level individual differences. The important exception was the primary dependent measure of academic procrastination, which asked about the level of their academic procrastination during the “past three weeks.” This change was made to ensure that the postintervention responses for academic procrastination could reflect intervention effects, if any, and would also be directly comparable to their baseline counterparts.

As the primary measure of academic procrastination, we used a modified version of the Procrastination Assessment Scale for Students (PASS; Solomon & Rothblum, 1984). In addition to the time-frame change noted above, the measures also deviated from typical use in another way: Because subjects chose 3 out of the 6 PASS domains to focus on before the goal-setting exercise, the primary independent variable for baseline academic procrastination was the average score of responses for only those 3 target domains. For each of the 3 target domains, subjects responded to 2 items³ relating to the degree of their procrastination on a 1–5 scale. Thus, each subject received a score for academic procrastination in their target domains based on 6 items. A second scale was created based on self-reported procrastination in the 3 domains that were not chosen for the intervention (nontarget domains), also based on 6 items (2 per domain).

Six other questionnaires were also administered in Session 1. Domain-general, nonacademic procrastination was measured (on a 1–5 scale) with the 15-item Adult Inventory of Procrastination (McCown, Johnson, & Petzel, 1989). Impulsivity was measured with the 30-item Barratt Impulsivity Scale (Patton, Stanford, & Barratt, 1995), and conscientiousness was measured with the 9-item conscientiousness subscale of a short version of the Neo-Five Factor Inventory (Costa & McCrae, 1992), both on a 1–5 scale. Perfectionism was measured (on a 1–7 scale) with the standards subscale of the Almost Perfect Scale (Slaney, Rice, Mobley, Trippi, & Ashby, 2001). Academic motivation was measured (on a 1–5 scale) with the 33-item Internal/External Motivation Scale (Lepper, Corpus, & Iyengar, 2005).

Finally, mindset about procrastination was measured with a 4-item scale, adapted from previous assessments of fixed versus growth mindsets of intelligence (Blackwell, Trzesniewski, & Dweck, 2007; Dweck, 1999). These items were: People can always change how much they procrastinate; You can learn new habits, but you can't really change whether or not you are a procrastinator (reverse scored); Someone's procrastination is a part of them that they can't change (reverse scored); and You can change your procrastination tendencies considerably. These procrastination mindset items were on a 1 (Strongly Disagree)–6 (Strongly Agree) scale.

2.2.2. Session 1: Goal-setting exercise—Subjects were randomly assigned to one of two conditions: SMART goals or control. Both the SMART and control exercises can be found in the supplemental material. First, subjects were given a list of six academic

³The two questions included in our analyses were: *To what degree do you procrastinate on this task?* and *To what degree is procrastination a problem for you?* A third PASS question (*To what extent do you want to decrease your tendency to procrastinate?*) was excluded because it was about subjects' desire to reduce procrastination, rather than their actual levels of procrastination. The results remained the same, however, even if the third item was also included in the analyses.

domains, corresponding to the six domains of the PASS, and asked to rank order the domains in order of how much they typically procrastinate on them. These responses were used to create the primary measures of academic procrastination in target and nontarget domains (ranked 1–3 and 4–6, respectively). Afterward, all subjects were instructed to brainstorm, for each target academic domain, three goals that they would like to accomplish before the second session (3 domains × 3 goals = 9 goals total) before selecting their top goal for each of their most problematic domains.

Next, for the SMART-goal condition only, subjects were given a worksheet with an explanation of each of the SMART criteria, as well as examples of how to hone a general goal into a SMART goal (see the supplement for this worksheet). Although the examples featured general health-related goals, subjects were instructed to make sure that all of their academic goals were related to their top three academic domains and could be accomplished before the next session of the study (approximately within the next 3 weeks).

Both groups then completed a few final questions for each of their goals, which encouraged subjects to elaborate on the importance of these academic goals (e.g., Which course(s) does this goal apply to?; Why is it important that you accomplish this goal?). Finally, the experimenter checked over their goals to ensure that they were related to an academic goal (control condition) or that they met the SMART criteria (SMART goal condition). If not, the experimenter instructed the subject to continue to work, giving suggestions only if the subject still struggled to complete the exercise. Pilot testing revealed that this checking process was important because creating SMART goals was not necessarily easy for all subjects.

2.2.3. Session 1: Temptation identification exercise—Subjects were also randomly assigned to one of two conditions: temptations only or temptations plus implementation intentions. The implementation intentions exercise can be found in the supplemental material. In this exercise, subjects were instructed to brainstorm six different temptations that typically distract them from accomplishing goals related to their top three academic domains (from the previous step). To be acceptable, subjects' temptations had to be concrete activities that actively distract them from accomplishing goals (e.g., boredom, lack of interest, or anxiety was not acceptable). These instructions ensured that all subjects generated temptations that could be targeted, regardless of condition, with implementation intentions. From the six possible temptations they generated, subjects selected the three temptations that they thought would likely distract them the most.

Afterward, in the implementation intentions condition only, subjects were instructed to form specific implementation intentions for each of these top three temptations. They were given a brief explanation of implementation intentions and two illustrative examples related to health goals. The subjects in the temptations-only group skipped this step.

Finally, the experimenter completed a preliminary check of all responses to make sure that the temptations were acceptable. In the implementation-intention condition, the experimenter also checked whether each implementation intention specified some real action that the subject could take, rather than simply stating that he/she would not give in to his/her

temptation. Again, the experimenter instructed the subject to continue to work if they did not deem the temptations and/or implementation intentions acceptable.

2.2.4. Session 1: Final phase—In the final phase of Session 1, subjects were instructed to reproduce from memory their top three goals and temptations (and implementation intentions) they generated earlier. They were told that rewriting these goals and temptations would make them more likely to remember them over the coming weeks. Because subsequent rater judgements indicated that subjects remembered their goals and temptations essentially perfectly at this point, these data will not be discussed further. Importantly, subjects then answered two questions that assessed, respectively, their motivation for each goal (*How motivated are you to achieve this goal?*) and confidence for being able to achieve each goal (*How confident are you that you will achieve it?*).

Finally, subjects were asked two manipulation-check questions: (a) How much do you think the exercises will help you reduce your academic procrastination? and (b) How much do you think the exercises will help you resist your temptations? These items were included to assess whether subjects in the intervention conditions (SMART goals and/or implementation intentions), as a whole, felt that those intervention exercises would be more helpful for achieving goals and resisting temptations than did those in the control conditions. All of these ratings completed in this final phase of Session 1 were based on a 1–7 scale.

2.2.5. Session 2—Subjects returned approximately 2.5 weeks after the first session ($M = 17.48$ days; $SD = 4.50$ days; Range = 12–38 days). At the beginning of Session 2, subjects completed individual differences measures for academic procrastination for all 6 domains (3 target and 3 nontarget domains) using the same scale as the baseline (PASS) and the same instructions as to the timeframe of academic procrastination (i.e., regarding procrastination in the past three weeks, regardless of the actual time between sessions). Subjects were then asked to write down, from memory, their top three goals, temptations, and implementation intentions (if applicable) from Session 1 as best they could remember. This recall exercise was completed to obtain a measure of subjects' memory for their goals, as determined by three raters.

Finally, subjects were shown their actual responses at Session 1 and answered the three questions about the effectiveness of the goal-generation exercises (all on a 1–5 scale). For each goal, subjects were asked: *Was your goal accomplished?* (our primary dependent measure of goal accomplishment). For each temptation, they were asked: On average, how much per week did this temptation arise? and When this temptation arose, what percent of the time did it distract you? The responses to the latter question formed the primary measure of successfully resisting temptations (the response was on a 1–5 scale, although the question mentioned percentage).

2.3. Coding Criteria and Procedures for Rater Judgments

Before conducting the primary analyses, we used raters' judgments to assess relevant study-level variables of interest. All rater judgments were made by three raters, who were blind to condition with the following exception. During rater judgements of subjects' memory for their goals, temptations, and implementation intentions, raters could readily tell whether the

subject was in the implementation-intention condition or not (because subjects wrote all responses on a single worksheet and the section for recalling implementation intentions was either absent or present). Raters were always blind to the SMART condition.

Three raters independently evaluated whether each goal was accurately recalled at the start of Session 2, using the following 0–3 scale:

- a score of 0 indicated that the subject wrote nothing;
- a score of 1 indicated that the subject wrote something, but his/her response was not about the same PASS domain as the goal;
- a score of 2 indicated that the subject correctly identified the PASS domain that his/her goal was written about, but did not remember any more significant details;
- a score of 3 indicated that the subject remembered the correct domain and at least one significant detail of his/her academic goal (e.g., studying for a calculus exam).

The kappa interrater reliability estimate for each of the three memory ratings was high ($> .95$). Similar memory ratings were also provided for temptations and implementation intentions, but they are not discussed further because memory for temptations were near ceiling for most subjects ($M = 2.53$ out of 3, $SD = .50$ averaged across all 3 temptations) and only half of the sample wrote implementation intentions.

Raters also judged the compliance of responses to the exercises (i.e., SMART goals, temptations, and implementation intentions). They coded whether each goal met each of the five SMART criteria (0 or 1 for each SMART criterion), whether each temptation was a real distraction (0 or 1 for each temptation), and whether each implementation intention was a real action that they could take toward resisting the temptations (0 or 1 for each implementation intention). Kappa reliability estimates for the individual SMART goal ratings were high ($> .91$). The kappa estimates for the ratings for temptations (.66–.89) and implementation intentions (.64–.74) were lower, likely due to the high rate of compliance, but were still acceptable.

3. Results

All analyses were conducted with ANOVA or multiple regression procedures using SPSS or R, with an alpha threshold of .05.

3.1. Descriptive Statistics and Session 1 Individual Differences

Table 1 displays the academic domains chosen as target domains for the goal-setting exercise. Subjects chose *writing term papers* as their most problematic academic domain for procrastination (75% of subjects ranked it as one of their top three domains). *Studying for exams* (62%) and keeping up with weekly reading and homework assignments (55%) were also chosen by over half of the subjects as one of their top three domains. The other three domains, though chosen less frequently, were still ranked in the top three by at least 30% of the sample.

Descriptive statistics for the measures of procrastination and other individual differences variables are displayed in Table 2. Important to note, mean levels of academic procrastination in this sample were similar to those reported by other studies that used the PASS scale (Corkin, Shirley, & Lindt, 2011; Glick & Orsillo, 2015; Howell et al., 2006).

The zero-order correlations between these individual differences measures are shown in Table 3. As expected, initial levels of procrastination assessed in Session 1 were correlated with the other individual differences measures (except for memory for goals), whether procrastination was assessed in the target or nontarget academic domains or in nonacademic domains.

3.1.1. Manipulation checks—First, we checked whether there were any group differences at the pretest between the four conditions in the study. The four groups showed neither baseline differences in academic procrastination (target domains), $F(3, 173) = 1.18, p = .320, \eta_p^2 = .02$, nor in other individual differences variables obtained in Session 1, $F(3, 173) < 1.71, ps > .167$, suggesting that random assignment was successful.

Second, analyses of rater judgments of compliance revealed that subjects in the SMART conditions were creating goals that met more SMART criteria ($M = 4.25$ out of 5 per goal, $SD = .60$) than did those in the control group ($M = 3.05, SD = .85$), $F(1, 202) = 204.71, p < .001, \eta_p^2 = .50$. This result suggests that the intervention successfully encouraged subjects in the SMART goal condition to set more specific, measurable, and time-defined goals than those who simply self-generated goals without any guidance. Of note, there was no variability in the rater judgments for the Achievable ($M = 3.0, SD = .00$, out of 3 goals) and Realistic ($M = 2.99, SD = .08$) criteria across subjects, suggesting that the goals generated in the two conditions differed primarily for the three other SMART criteria: Specific ($M = 1.77, SD = .96$), Measureable ($M = 1.54, SD = 1.05$), and Time-Defined ($M = 1.57, SD = 1.19$). Rater judgments also indicated high compliance with the instructions for the temptations ($M = 2.94$ out of 3, $SD = .09$) and implementation intentions ($M = 2.61, SD = .66$).

Third, we conducted a 2 (SMART vs. control) \times 2 (implementation intentions vs. temptations only) ANOVA to examine group differences in responses to the two final questions of Session 1, which asked subjects how much they expected that the intervention exercises they just completed would be associated with success at (a) reducing academic procrastination and (b) resisting the urge to give into their temptations in the coming weeks. Although no subjects were aware of the specific experimental manipulations, we hypothesized that those subjects who received the experimental manipulations should perceive those intervention exercises to be likely more effective in reducing their academic procrastination and/or in resisting specific temptations they identified. These expectations were confirmed.

For reducing procrastination, individuals in the SMART-goal condition expected to reduce their procrastination more than those in the control group, $F(1, 166) = 4.64, p = .033, \eta_p^2 = .03$, as did individuals who wrote implementation intentions (compared to those who did not), $F(1, 166) = 12.69, p < .001, \eta_p^2 = .07$. As for giving into temptations, there were no

group differences between the SMART-goal and control conditions, $F(1, 166) < 1$, but, importantly, those in the implementation-intention condition expected to resist their temptations more successfully than those who simply identified their temptations, $F(1, 166) = 5.14$, $p = .025$, $\eta_p^2 = .03$. There was no two-way interaction for either type of expectations, $F_s(1, 166) < 2.84$, $p_s > .094$. These results suggest that the subjects in the respective intervention conditions judged those intervention exercises to be likely helpful, at least at the time of the intervention.

3.2. Aim 1: Effects of the Intervention Exercises

First, we examined whether the two interventions administered in Session 1 reduced academic procrastination or increased the likelihood of goal achievement, assessed at Session 2.

3.2.1. Basic effects of the interventions—The main results are displayed in Table 4, which shows mean levels of baseline and postintervention academic procrastination in target (Table 4a) and nontarget (Table 4b) domains. We conducted mixed ANOVAs with one within-subjects variable and two between-subjects variables—2 (baseline vs. postintervention) \times 2 (SMART vs. control goals) \times 2 (implementation intentions vs. temptations only)—separately for the target and nontarget academic domains.

As expected for the nontarget domains (Table 4b), there was no evidence that individuals in the SMART condition reduced their academic procrastination across sessions more than those in the control condition, $F(1, 173) < 1$. Nor was there any evidence that creating implementation intentions led to a greater reduction in procrastination, $F(1, 173) = 1.16$, $p = .283$, $\eta_p^2 = .01$. There was also no evidence for the three-way interaction, $F(1, 173) < 1$, or main effect of session, $F(1, 173) < 1$. These results confirm that academic procrastination in nontarget domains did not change over the three-week interval.

More important, as shown in Table 4a, there was no change in academic procrastination for the target domains, either. The two-way interaction between session and SMART condition was not significant, $F(1, 173) < 1$, nor was the interaction between session and implementation-intention condition, $F(1, 173) = 2.27$, $p = .134$, $\eta_p^2 = .01$, providing no evidence that subjects in either condition successfully reduced their procrastination more than those in the control groups. The three-way interaction (session \times SMART condition \times implementation-intention condition) was also not significant, $F(1, 173) < 1$. Such lack of significant effects of either intervention on the postintervention levels of academic procrastination presents a stark contrast to the manipulation-check results noted in Section 3.1.1., which suggested that subjects in the SMART and/or implementation-intention conditions expected that they would benefit more from those interventions than those in the control condition.

Finally, there was no main effect of session, $F(1, 173) < 1$, suggesting that there was no overall change in academic procrastination even when collapsing across the four conditions. This last finding rules out the possibility that our use of “active” control groups in this study masked potential benefits of going through these intervention exercises. More specifically, there was no evidence that the lack of significant intervention effects were observed because

subjects in the control conditions benefitted from the exercises involving generating academic goals and identifying possible temptations and thereby successfully reduced their procrastination as much as the experimental groups did.

In addition to the postintervention levels of academic procrastination, we also examined whether the intervention exercises resulted in higher endorsement of the items related to the accomplishment of self-generated goals as well as levels of success in resisting the temptations they identified. Because there were no baseline measures of goal accomplishment, these analyses were conducted with between-subjects 2 (SMART condition) \times 2 (implementation-intentions condition) ANOVAs. These results are summarized in Table 5.

Like academic procrastination, analyses of each of these dependent measures revealed no main effects of either intervention on the self-reported measures of goal accomplishment, $F_s(1, 172) < 1$, or success at resisting temptations, $F_s(1, 173) < 1.43$, $p_s > .233$, η_p^2 s $< .01$. There was also no two-way interaction effect (SMART \times implementation-intentions) for either goal accomplishment or resisting temptations, $F_s(1, 179) < 2.77$, $p_s > .097$, η_p^2 s $< .02$.

3.2.2. Exploratory follow-up analyses—Given the lack of significant effects for the two interventions, we conducted a series of exploratory analyses to examine the possibility that (a) one or more of the baseline individual differences variables moderated the effect of the interventions or that (b) the interventions were effective only for certain academic domains (e.g., writing term papers).

3.2.2.1. Moderation analyses. First, in regression analyses treating each potential moderator as a continuous variable, we tested whether any variable demonstrated significant interaction effects with one or both of the experimentally manipulated (intervention) variables. In these exploratory analyses, we tested two categories of what we judged to be most likely candidate moderators. The first category included individual differences variables from Session 1 that were significantly predictive of the key dependent measures in the multiple regression models described below (see Section 3.3 and Table 6): Session 1 academic procrastination (target domains), impulsivity, fixed versus growth mindset, and motivation for the goals generated in Session 1. The second category consisted of study-specific variables that we judged could be associated with the effectiveness of the interventions: rater judgements of the number of SMART criteria met per goal (i.e., the quality of the generated goals), rater judgements for subjects' memory for their goals, and the number of days between sessions (which could be associated with the scope of the goals generated and/or the amount of time available to make progress toward their goals).

The results of these exploratory moderation analyses are summarized in the Appendix for all three dependent measures (Session 2 academic procrastination in top domains, goals accomplished, and temptations resisted). As is clear from Table A1, the analyses revealed little evidence for any moderating effects of individual difference variables in this study.

Of all the analyses we conducted, only two effects emerged as significant. The first is the moderating effect of baseline procrastination (target domains) on implementation intentions

for the measure of the success at resisting temptations, $F(1, 170) = 4.80, p = .030, \eta_p^2 = .03$, indicating that implementation intentions were more effective for individuals with greater baseline procrastination. The second is the moderating effect of subjects' memory for their goals on SMART intervention for academic procrastination, $F(1, 165) = 4.11, p = .044, \eta_p^2 = .03$, indicating that better memory for goals were associated with less procrastination in the control group, $F(1, 80) = 4.69, p = .033, \eta_p^2 = .06$, but not in SMART group, $F(1, 83) = .60, p = .443, \eta_p^2 = .01$. Although these two moderating effects were significant, they were not predicted a priori, and at least the latter effect is not readily interpretable. Thus, we tend to think that they likely reflected Type I errors due to the large number of statistical tests performed (in fact, we would expect about two Type I errors in the 42 tests summarized in Table A1). Overall, then, we found little evidence that the lack of significant intervention effects was due to some moderating variables masking the main effects for the intervention manipulations.

3.2.2.2. Academic domains chosen in Session 1.: We also examined the possibility that the benefits of the two interventions may have been specific to certain academic domains. Because over 60% of the sample chose writing term papers and/or studying for exams as their target domains (see Table 1), we conducted two ANOVAs, one for each domain, to examine whether we see any evidence for the reduction in procrastination in these broadly problematic domains.

Even when focusing on these specific domains, however, there was no evidence for any intervention effects. For writing term papers (chosen by 75% of the sample, $n = 132$), there was no main effect of SMART condition, $F(1, 128) = 2.34, p = .129, \eta_p^2 = .02$, no main effect of implementation-intention condition, $F(1, 128) = .26, p = .613, \eta_p^2 < .01$, and no interaction between conditions, $F(1, 128) = 1.00, p = .319, \eta_p^2 < .01$. Similarly, for studying for exams (chosen by 62% of the sample, $n = 109$), there was no main effect of SMART condition, $F(1, 105) = .07, p = .794, \eta_p^2 < .01$, or implementation-intention condition, $F(1, 105) = 1.22, p = .271, \eta_p^2 = .01$. There was no two-way interaction, either, $F(1, 105) = .17, p = .683, \eta_p^2 < .01$. These results provide no evidence that the interventions reduced academic procrastination in only those specific, commonly chosen academic domains.

3.3. Aim 2: Procrastination and Goal Success

The second aim of this study was to test whether initial levels of academic procrastination uniquely predicted the actual achievement of the personal academic goals subjects generated themselves, above and beyond the effects of other possible correlates. We also examined which individual differences variables uniquely predicted the levels of success at resisting the specific temptations they had identified as well as the postintervention levels of academic procrastination.

The zero-order correlations between the three primary dependent measures and individual differences variables included in the study are reported in Table 6. As shown in the table, higher initial levels of procrastination in the target domains were associated with less success in accomplishing goals and with more difficulty resisting temptations when they arose. As expected, however, many other measures were also significantly correlated with

the three dependent measures. Thus, for each dependent measure, we conducted simultaneous regression analyses, including all of the independent variables listed in Table 6. Because the two interventions had no effect on the dependent measures assessed here, we did not include in the models the experimental effects of the SMART-goal and implementation-intention interventions. The results from these regression analyses are summarized in Table 7.

For the primary dependent measure of goal accomplishment, two variables emerged as significant predictors.⁴ Most important, as hypothesized, higher initial levels of academic procrastination in target domains were uniquely associated with less goal accomplishment (standardized $\beta = -.20$). Subjects' memory for their goals was additionally associated with more goal accomplishment ($\beta = .15$). However, because this variable was not significant by itself (see Table 6) and became significant only when the effects of the other variables were controlled for, this result for the memory-for-goals variable should be interpreted with caution. In contrast, the significant effect for baseline academic procrastination in the target domains was hypothesized a priori and was observed even when other candidate measures were included in the analysis.

We also conducted analogous regression analyses for the secondary outcome variable of success in resisting temptations when they arose. As shown in Table 7, the only significant predictor was motivation to accomplish their self-generated goals ($\beta = .29$), suggesting that motivational factors, especially the motivation to achieve those specific goals (rather than general academic motivation), uniquely predicts the success at resisting temptations.

Finally, Table 7 also summarizes the results of the regression model predicting Session 2 academic procrastination in target domains. Not surprisingly, initial levels of procrastination in those same target domains were the best predictor of academic procrastination ($\beta = .44$), but, above and beyond this expected effect, levels of postintervention academic procrastination were uniquely predicted by nonacademic procrastination ($\beta = .18$), impulsivity ($\beta = .17$), and mindset about procrastination ($\beta = .18$). Specifically, individuals who reported the most academic procrastination in Session 2 were those who procrastinated the most in the previous three weeks (in not only academic but also nonacademic settings), were more impulsive, and were more likely to hold the belief that procrastination is malleable. This final result is perhaps the most surprising, because, contrary to the results from other domains (e.g., intelligence), individuals who tended to believe that procrastination is malleable procrastinated the most. The results of these regression analyses will be further discussed later (Section 4.2).

4. Discussion

The two aims of this study were (a) to provide an initial test of whether goal-related interventions (SMART goals and implementation intentions) could help students reduce their academic procrastination and (b) to examine whether baseline academic procrastination

⁴The results of the regression models involving goal accomplishment and resisting temptations remained the same even when postintervention levels of academic procrastination are substituted for baseline levels of procrastination. This result is not surprising, given that the baseline and postintervention levels of procrastination correlated substantially ($r = .60$).

is uniquely predictive of success in achieving self-generated goals. The main results of the study were clear-cut for both aims. As for the first aim, there was no evidence that the SMART-goal or implementation-intentions intervention helped reduce academic procrastination or achieve their self-generated academic goals, at least as implemented in the current study. As for the second aim, we found that initial levels of academic procrastination were a unique and substantial predictor of the later achievement of self-generated goals, even after controlling for other personality, motivational, and situational correlates. In the rest of this article, we will discuss the implications of these findings for each aim.

4.1. Aim 1: Implications for Procrastination Interventions

The current study was one of the few empirical attempts at testing whether academic procrastination could be reduced by interventions that target specific goal-related processes such as goal setting (creating SMART goals) and resisting temptations (forming implementation intentions). Although both interventions are often mentioned as useful strategies in popular press, we were not able to obtain any evidence that either intervention resulted in significant reductions in academic procrastination, despite the fact that the intervention exercises led subjects to expect more beneficial effects for the interventions. Furthermore, we were unable to identify any evidence for key moderating variables or domain-specific intervention effects. Taken together, these results suggest that reducing academic procrastination may not be as simple as identifying the important goals to accomplish, turning them into SMART goals, and planning how to react when distracting temptations arise.

The lack of significant intervention effects we observed are generally in line with the existing intervention research on academic procrastination reviewed earlier (e.g., Glick & Orsillo, 2015; Häfner et al., 2014). For example, Glick and Orsillo (2015) found that neither a time-management intervention that emphasized goal-related strategies nor a mindfulness-based intervention that emphasized emotion regulation led to a significant reduction in academic procrastination. Moreover, although forming implementation intentions may be successful at reducing intention-behavior gaps in certain situations (e.g., Owens et al., 2008), existing studies have not yet provided causal evidence that forming implementation intentions actually reduces procrastination. Thus, our finding of no significant effects of the SMART-goal or implementation-intention interventions on academic procrastination might not be entirely inconsistent with the prior evidence.

Nevertheless, it is important to emphasize that this is only one study and that the lack of evidence for the hypothesized intervention effects should not be interpreted to mean that these goal-related interventions have no beneficial effects whatsoever. In fact, as we will discuss shortly, other ways of implementing and testing SMART-goal and implementation-intention interventions could prove to be more effective in reducing academic procrastination. More generally, additional intervention studies targeting goal-related processes are clearly needed to further test the idea that the often hypothesized relationship between procrastination and goal management is causal in nature. In this regard, we acknowledge here some limitations of the current study and discuss possible ways to overcome them in the future.

First, as with some previous studies (e.g., Glick & Orsillo, 2015; Häfner et al., 2014), the two goal-related interventions we used were relatively short (subjects had only 30–45 min to complete the two intervention exercises). Similarly, the time lag between the first and second sessions was fairly short (approximately 3 weeks), which likely limited the types of self-generated academic goals. Given that procrastination shows some traitlike characteristic (e.g., Schouwenburg & Lay, 1995; Steel, 2007), it is possible that successful interventions may require more intensive and longer treatment programs to produce measurable improvements in academic procrastination. Unfortunately, some existing studies (Rozental et al., 2015a, 2015b; Toker & Avci, 2015; Wang et al., 2015) that administered extended interventions (e.g., 8–10 weeks) trained participants on multiple cognitive and/or acceptance-based behavioral strategies (e.g., cognitive restructuring, addressing distortions and irrational thoughts, and accepting emotions as natural). Thus, it is currently unclear whether the training gains demonstrated in these studies were due to the length of training, the breadth of the skills trained in the intervention, or both.

Second, we did not provide to subjects any records or reminders of the specific goals, temptations, and implementation intentions that they generated during the intervention exercises. Because their memory for those goals were in part predictive of goal accomplishment in this study, it is possible that sending concrete reminders of the goals and implementation intentions (or at least letting subjects take home a written copy of their intervention exercise) might have made the interventions more successful. In light of recent research highlighting the importance of reminders for following through on one's intentions (Rogers & Milkman, 2016), combining the current interventions with timely reminders might be effective.

Third, the main dependent measures we used were retrospective self-reports, rather than (or in addition to) behavioral measures of academic procrastination that could be objectively verified and free from self-report biases such as social desirability (Gustavson et al., 2015). Although the existing evidence regarding the relative benefits of self-report versus objective measures of procrastination is limited (e.g., Krause & Freund, 2014b; Moon & Illingworth, 2005), using more objective and precisely quantifiable behavioral measures may be more sensitive to the effects of interventions. For example, such behavioral measures of procrastination may include the difference between intended study hours and actual study hours (DeWitte & Schouwenburg, 2002; Steel et al., 2001) and the time lag between when online tests/quizzes are posted and when students actually attempted them (Moon & Illingworth, 2005). Given the increasing popularity of online pedagogical platforms that automatically record when each student completed a particular assignment, this latter type of behavioral measures could be particularly useful for future research on academic procrastination.

In summary, although it is not clear how these limitations acknowledged above might have contributed, either individually or jointly, to the lack of significant intervention effects on academic procrastination in the current study, addressing these limitations in future studies will provide more rigorous tests of the effectiveness of SMART-goals and implementation-intentions interventions in reducing academic procrastination. Thus, even though we were

not successful in demonstrating significant intervention effects, the current study still provides as a useful basis for future intervention efforts to build on.

4.2. Aim 2: Implications for Procrastination and Goal Accomplishment

The current study also provided further evidence that academic procrastination is uniquely associated with goal accomplishment. Previous studies have linked levels of procrastination to different types of measures related to goal achievements, such as course grades (Kim & Seo, 2015; Morris & Fritz, 2015), individual differences in self-reported frequencies of goal setting (Gröpel & Steel, 2008), and actual studying behaviors (Glick & Orsillo, 2015; Steel et al., 2001). The current study extends these earlier results by demonstrating that baseline levels of academic procrastination were significantly associated with the accomplishment of academic goals that subjects generated themselves in light of their specific academic needs and formulated in the form of explicit verbal descriptions.

Moreover, we demonstrated that this significant association between baseline academic procrastination and goal accomplishment was still present even after statistically controlling for other candidate correlates (e.g., personality traits, motivational factors, and/or situational factors). These candidate variables were wide-ranging and were correlated significantly (and in some cases even substantially) with the measures of both academic procrastination and goal accomplishments. Therefore, this result points to the unique and important (but not necessarily causal) role of students' propensity for academic procrastination in their failures to achieve their personally relevant academic goals.

We acknowledge here that, though reasonably broad, our selection of the candidate correlates was not exhaustive. Thus, it is possible that the addition of some other candidate variables, such as fear of failure, task aversion, and emotion regulation (e.g., Krause & Freund, 2014a; Steel & Klingsieck, 2016), would change the pattern of regression results. Despite this limitation, the current results provide a useful basis for deriving more specific, a priori predictions for future research examining the relationship between academic procrastination and goal achievement.

Although our primary focus for Aim 2 was to predict individual differences in the achievement of specific self-generated goals, the study design also allowed us to address two additional questions: (a) whether baseline levels of procrastination would also uniquely predict the success at resisting distracting temptations and (b) what individual differences variables uniquely predict postintervention levels of academic procrastination. With regard to resisting temptations, academic procrastination was correlated with less success at avoiding anticipated temptations, but did not emerge as a significant predictor in the full model. Instead, the only significant variable in that analysis was self-reported levels of motivation for those academic goals that subjects set for themselves. As for the predictors of postintervention levels of procrastination, we observed that, besides the baseline levels of academic procrastination, nonacademic procrastination and impulsivity were also significant predictors, suggesting that domain-general factors (general procrastination and trait-level tendency to give into desires and temptations) are also relevant to individual differences in academic procrastination.

Finally, a novel and somewhat surprising finding of our regression analyses was that, although it was not predicted a priori, a growth mindset for procrastination—the belief that an individual's procrastination is malleable—was associated with higher, not lower, levels of academic procrastination. Moreover, the moderation analyses revealed no evidence that the interventions benefitted only those individuals who held the growth mindset for procrastination. Given that previous research has repeatedly shown that believing in the malleability of positive traits (e.g., intelligence) is more beneficial (Burnette et al., 2013; Dweck, 2006), this negative effect of the growth mindset on procrastination may initially seem counterintuitive. However, this result could be interpreted in the following way: The belief in the malleability of procrastination may lead to the unrealistic and counterproductive thought that one can stop procrastinating at any time, which, in turn, may ironically lead to more procrastination. Future research is needed to test this speculative interpretation of why the growth mindset was negatively associated with academic procrastination.

More generally, this mindset finding suggests that, when it comes to reducing procrastination, it may not be sufficient (or might even be harmful) to simply hold a belief that procrastination is malleable, without personally internalizing that belief. Rather, what may matter more might be an individual's willingness or readiness to actually change his/her procrastination. In this regard, it might be informative to examine the effects of such willingness- and readiness-to-change variables, together with the mindset variable included in this study.

4.3. Concluding Remarks

The current study adds to a small but growing body of research that have investigated whether (and how) intervention exercises may help individuals reduce their procrastination and achieve their personal goals. Although we obtained further correlational evidence for the relationship between academic procrastination and goal accomplishment, we were not able to obtain any evidence for the causal influence of the two goal-related interventions (SMART goals and implementation intentions) on reducing academic procrastination. Thus, identifying reliably effective ways to reduce academic procrastination and establishing a causal link between goal management and procrastination remains elusive. Nevertheless, the current study provides a useful basis for future intervention efforts targeting goal-related processes. More generally, future studies will benefit from combined individual differences and experimental approaches in better elucidating the nature of the association between procrastination and goal accomplishment.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Appendix

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Table A1

Summary of the Results of the Exploratory Moderation Analyses

	Procrastination in Target Domains (Session 2)		Goals Accomplished		Temptations Resisted	
	F	P	F	P	F	P
Session 1 Individual Differences Measures						
<i>Academic Procrastination (Target Domains)</i>						
SMART Condition × Procrastination	0.42	0.518	1.30	0.256	0.01	0.939
Implementation Intention Condition × Procrastination	0.61	0.438	0.01	0.933	3.94	0.049
<i>Impulsivity</i>						
SMART Condition × Impulsivity	0.97	0.327	0.04	0.845	0.13	0.719
Implementation Intention Condition × Impulsivity	<.01	0.996	0.28	0.600	2.15	0.145
<i>Fixed vs. Growth Mindset</i>						
SMART Condition × Beliefs	0.85	0.358	0.15	0.694	0.77	0.381
Implementation Intention Condition × Beliefs	0.10	0.750	2.26	0.135	0.35	0.557
<i>Motivation for Goals</i>						
SMART Condition × Motivation	0.29	0.592	0.93	0.337	0.56	0.454
Implementation Intention Condition × Motivation	0.24	0.626	0.16	0.214	3.49	0.064
Study-Specific Variables						
<i>Memory for Goals (Start of Session 2)</i>						
SMART Condition × Memory	4.77	0.030	0.01	0.922	0.03	0.871
Implementation Intention Condition × Memory	3.76	0.054	0.67	0.413	0.09	0.770
<i>Number of SMART Criteria Met</i>						
SMART Condition × Criteria Met	0.66	0.419	0.05	0.821	1.18	0.280
Implementation Intention Condition × Criteria Met	0.46	0.500	0.73	0.393	1.72	0.191
<i>Days Between Sessions</i>						
SMART Condition × Days	0.02	0.902	0.83	0.365	0.11	0.737
Implementation Intention Condition × Days	0.92	0.340	1.26	0.264	0.03	0.865

Note: Moderation analyses were performed, treating each potential moderator as a continuous variable interacting with the SMART (vs control) or implementation intentions (vs. temptation only) condition. The main effects of the intervention conditions are not shown in this table, but none reached statistical significance ($p < .05$). In all analyses involving procrastination in target domains at Session 2 (the first column), we controlled for baseline levels of procrastination (also in target domains), but did not allow that variable to interact with conditions (except in the first row where these effects were directly tested). In all analyses, we did not include, in the models, the two-way interaction between both intervention conditions or the three-way interaction between both conditions and the moderator, because there was no evidence for condition interactions in the primary analyses. Degrees of freedom vary in part because the z s were different for different measures (see Table 2) and also because baseline procrastination was controlled for only when postintervention procrastination was the dependent measure (the first column).

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Highlights

This study tested two goal-related interventions: SMART goals and implementation intentions.

The study uniquely combined experimental and individual differences approaches.

Neither goal-related intervention significantly reduced academic procrastination.

Baseline academic procrastination, however, uniquely predicted achieving self-generated goals.

Believing in the malleability of procrastination was associated with greater procrastination.

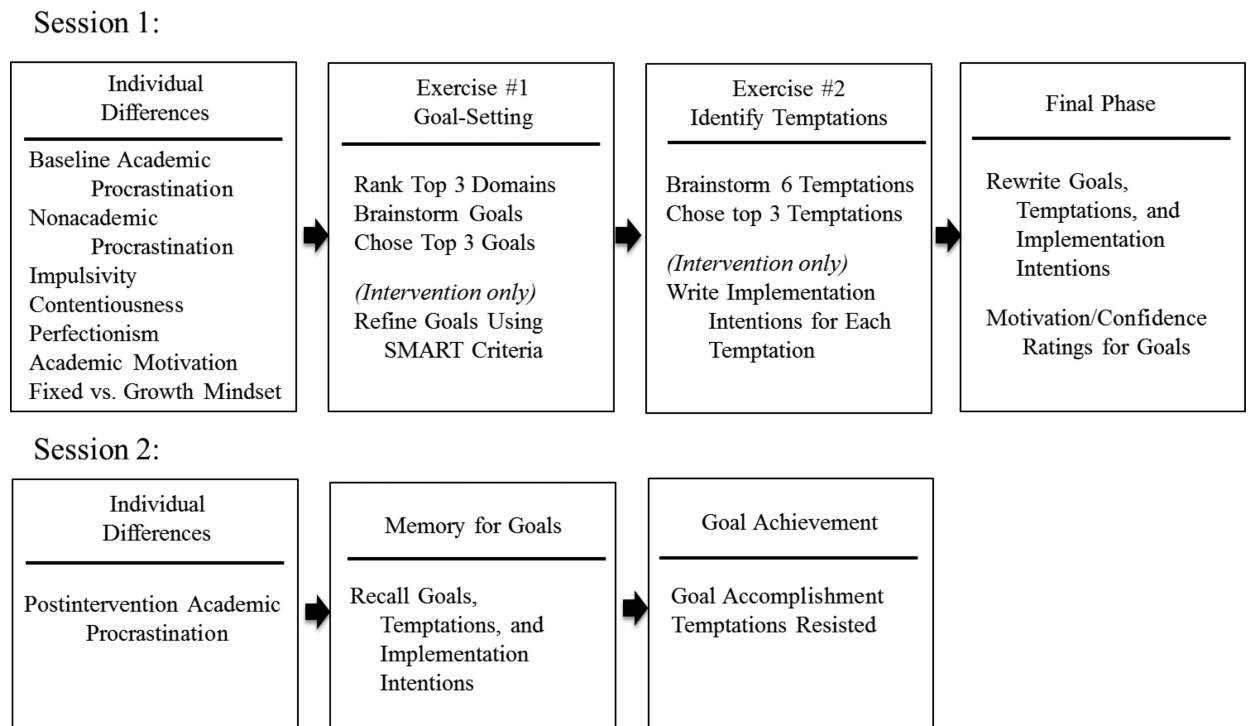


Figure 1. Summary of the procedure of the two-session study.

Table 1

Academic Domains Ranked as Most Problematic in Session 1

Domains	Rank 1	Rank 2	Rank 3	Sum (%)
Writing Term Papers	64	36	32	132 (74.6)
Study for Exams	24	48	37	109 (61.6)
Reading/Homework	37	27	35	99 (55.9)
Administrative Tasks	16	20	18	54 (30.5)
Attendance Tasks	20	24	23	67 (37.9)
Activities in General	16	22	32	70 (39.5)

Note: Ranks 1, 2, and 3 indicate the academic domains chosen as problematic in terms of procrastination during Session 1 (and for which their academic goals were written about in the goal-setting exercise). $N = 177$ for Ranks 1, 2, and 3. $N = 531$ for the sum. % = the percent of subjects who ranked this domain in any of their top three (i.e., sum / 177).

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Table 2

Descriptive Statistics of Individual Differences Variables and Dependent Measures

	N	Mean	SD	Range	Skewness	Kurtosis	Reliability
Individual Differences (all measured at Session 1)							
Academic Procrastination							
Target Domains	177	3.05	0.65	1.00–4.67	–0.40	0.71	0.79
Nontarget Domains	177	2.33	0.61	1.00–4.00	0.20	–0.32	0.79
Everyday Procrastination	177	2.39	0.56	1.20–4.00	0.18	–0.32	0.83
Impulsivity	177	2.14	0.35	1.30–3.13	0.25	0.19	0.83
Conscientiousness	177	3.75	0.60	2.00–5.00	–0.16	–0.70	0.78
Perfectionism	177	5.99	0.72	3.29–7.00	–1.12	1.64	0.87
Fixed vs. Growth Mindset	177	2.41	0.77	1.00–4.50	0.12	–0.31	0.84
Academic Motivation							
Internal	177	3.55	0.50	2.00–4.82	–0.44	0.58	0.89
External	177	3.14	0.49	1.63–4.31	–0.29	0.27	0.83
Motivation for Goals	170	5.43	0.93	2.00–7.00	–0.82	1.29	0.64
Confidence for Goals	170	5.28	0.97	1.00–7.00	–0.60	1.42	0.68
Memory for Goals ^a	173	2.24	0.67	0.00–3.00	–0.58	–0.41	N/A
Dependent Measures (all measured at Session 2)							
Academic Procrastination							
Target Domains	177	3.07	0.59	1.67–5.00	0.37	0.30	0.79
Nontarget Domains	177	2.38	0.64	1.00–4.00	0.05	–0.41	0.81
Goals Accomplished	176	3.29	0.82	1.00–5.00	–0.22	–0.18	0.35
Temptations Resisted	177	2.42	0.73	1.00–5.00	0.49	0.13	0.41

Note: Means indicate the average response for all questionnaire items. Academic procrastination in the target domains refer to the responses for the three academic domains that were chosen as part of the goal-setting intervention. The score for nontarget domains refer to the responses for the other three academic domains that were not chosen as most problematic (see Table 1 for list of domains). Reliability estimates were computed using Cronbach's alpha.

^a scores were based on rater judgements for subjects' memory for their goals at the beginning of Session 2 rather than during Session 1.

Correlations Among Individual Differences at Session 1

Table 3

	1	2	3	4	5	6	7	8	9	10	11
1. Academic Procrastination (Target Domains)	1										
2. Academic Procrastination (Nontarget Domains)	.50	1									
3. Everyday Procrastination	.50	.43	1								
4. Impulsivity	.42	.39	.44	1							
5. Conscientiousness	-.48	-.50	-.56	-.62	1						
6. Perfectionism	-.19	-.36	-.15	-.26	.43	1					
7. Fixed vs. Growth Mindset	.25	.31	.21	.32	-.34	-.17	1				
8. Internal Academic Motivation	-.29	-.32	-.24	-.47	.41	.46	-.28	1			
9. External Academic Motivation	.15	.24	.27	.33	-.28	-.12	.17	.54	1		
10. Motivation for Goals	-.25	-.18	-.21	-.28	.26	.27	-.14	.25	-.04	1	
11. Confidence for Goals	-.39	-.30	-.26	-.26	.33	.34	-.22	.29	.05	.56	1
12. Memory for Goals ^a	.03	-.11	.00	-.15	.09	.11	.10	.10	-.15	.00	-.01

Note: Significant correlations are displayed in bold ($p < .05$).

^a scores were based on rater judgements for subjects' memory for their goals at the beginning of Session 2 rather than during Session 1.

Table 4

Condition Means for Academic Procrastination at Session 1 and Session 2

	Session 1 <i>M</i> (<i>SD</i>)	Session 2 <i>M</i> (<i>SD</i>)
A. Academic Procrastination in Target Domains		
<i>Control Goals</i>		
Temptations Only (<i>n</i> = 47)	3.00 (.10)	2.97 (.09)
Implementation Intention (<i>n</i> = 39)	2.99 (.12)	3.05 (.10)
<i>SMART Goals</i>		
Temptations Only (<i>n</i> = 46)	3.21 (.09)	3.17 (.09)
Implementation Intention (<i>n</i> = 45)	2.99 (.10)	3.07 (.08)
<i>Grand Average</i>	3.05 (.10)	3.07 (.09)
B. Academic Procrastination in Nontarget Domains		
<i>Control Goals</i>		
Temptations Only (<i>n</i> = 47)	2.18 (.08)	2.15 (.09)
Implementation Intention (<i>n</i> = 39)	2.45 (.09)	2.42 (.12)
<i>SMART Goals</i>		
Temptations Only (<i>n</i> = 46)	2.40 (.09)	2.42 (.10)
Implementation Intention (<i>n</i> = 45)	2.33 (.10)	2.40 (.09)
<i>Grand Average</i>	2.34 (.09)	2.35 (.10)

Note: Condition means for academic procrastination in (A) the three domains chosen as most problematic, and (B) the three domains chosen as least problematic. Means indicate the average response on a 1–5 scale.

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Table 5

Condition Means Goal Accomplishment and Success at Resisting Temptations

	Goal Accomplishment <i>M</i> (<i>SD</i>)	Temptations Resisted <i>M</i> (<i>SD</i>)
<i>Control Goals</i>		
Temptations Only (<i>n</i> = 47)	3.29 (.79)	2.38 (.75)
Implementation Intention (<i>n</i> = 39)	3.29 (.75)	2.42 (.66)
<i>SMART Goals</i>		
Temptations Only (<i>n</i> = 46)	3.18 (.96)	2.60 (.82)
Implementation Intention (<i>n</i> = 45)	3.39 (.75)	2.29 (.66)
<i>Grand Average</i>	3.29 (.82)	2.42 (.73)

Note: Condition means for posttest measures of goal accomplishment and success at resisting temptations. Means indicate the average response on a 1–5 scale.

Table 6

Zero-Order Correlations Between Various Individual Differences Measures (administered in Session 1) and the Main Dependent Measures of the Study (measured in Session 2)

	Goals Accomplished	Temptations Resisted	Academic Procrastination in Target Domains
Academic Procrastination			
Target Domains	-.32	-.18	.60
Nontarget Domains	-.22	-.19	.36
Nonacademic			
Procrastination	-.23	-.21	.48
Impulsivity	-.20	-.29	.43
Conscientiousness	.23	.28	-.43
Perfectionism	.16	.08	-.10
Fixed vs. Growth Mindset	-.20	-.16	.34
Academic Motivation			
Internal	.20	.20	-.19
External	-.02	-.14	.13
Motivation for Goals	.31	.31	-.25
Confidence for Goals	.32	.16	-.31
Memory for Goals	.11	.00	-.04

Note: Significant correlations are displayed in bold ($p < .05$). All variables listed on top were dependent measures taken in Session 2, and all variables on the left column were taken during Session 1 (except Memory for Goals, which was based on rater judgements for responses at the beginning of Session 2).

Table 7

Multiple Regression Models for the Main Dependent Measures of the Study

	Goals Accomplished		Temptations Resisted		Academic Procrastination in Target Domains	
	β	p	β	p	β	p
Academic Procrastination						
Target Domains	-.20	.046	.03	.764	.44	<.001
Nontarget Domains	.06	.543	-.07	.468	-.05	.483
Nonacademic Procrastination						
Impulsivity	-.02	.878	-.10	.352	.17	.046
Conscientiousness	.05	.654	.13	.288	-.01	.949
Perfectionism	-.08	.409	-.11	.281	.06	.423
Fixed vs. Growth Mindset	-.11	.165	-.07	.412	.18	.006
Academic Motivation						
Internal	.05	.581	.09	.384	.07	.396
External	.10	.267	.02	.871	-.01	.932
Motivation for Goals	.13	.143	.29	.002	-.04	.574
Confidence for Goals	.09	.342	-.09	.401	-.04	.655
Memory for Goals	.15	.042	-.02	.774	-.05	.452
Total R ² of model (Adjusted R ²)	.21 (.15)		.17 (.11)		.48 (.44)	

Note: Standardized beta coefficients (β) and significance values (p) for regression models of outcome measures at Session 2. Significant predictors are displayed in bold ($p < .05$).