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Study Habits and Procrastination: The Role of Academic Self-Efficacy

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ABSTRACT

Inefficient study skills increase the probability that study work is perceived as difficult and aversive, with procrastination as a likely result. As a remedy, more effective study skills and habits may be encouraged. However, research indicates that good study skills and habits may not by themselves be sufficient to remedy problems, as this relationship may be mediated by efficacy beliefs related to academic functioning. We investigated this hypothesis across three student samples (total $N = 752$). As predicted, structural equation modeling (SEM) indicated that study self-efficacy mediated the study habits—procrastination relation. The mediation effects were medium to large. We conclude that training of, and advice on, study skills and habits should be accompanied by measures that build study self-efficacy.

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Study habits; study skills; academic procrastination; study self-efficacy; self-efficacy

University students confront a challenging situation as they enter academic life, as adapting to a relatively unguided and complex educational environment requires skills and competencies related to study work, planning, and others. However, only a minority of students have received instruction on such skills (e.g., Dunlosky & Rawson, 2015; Dunlosky et al., 2013). Although research on effective study skills is becoming increasingly more available, universities seem to be slow in adopting them (Goffe & Kauper, 2014; Wieman & Gilbert, 2015). Moreover, academic work also benefits from skills related to planning, organization of own learning, and self-motivation, generally referred to as strategies for self-regulated learning (SRL; e.g., Pintrich & De Groot, 1990; Zimmerman, 1990). As is the case for study skills, SRL strategies are not normally part of the study curriculum, and when they are offered, it is often in one-off seminars. Still, they are important for academic success (Kreber et al., 2005). In sum, many students do not possess the sufficient levels of skills and competencies needed for efficient academic work, negatively affecting academic performance and retention (Robbins et al., 2004).

In the absence of formal training in study skills and skills related to SRL, academic staff and advisors resort to a more straightforward solution—they advise students on behaviors and habits beneficial in the study situation. Such advice is often provided at lectures and seminars, with summaries occasionally published on university websites. For example, our university has published a list of smart study habits, recommending study habits such as practicing self-test, preparing before lectures, and participating actively in seminars and discussion groups. Such advice cannot replace

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formal training, but it is an easy way of communicating insights from research, with an expectation that students following the advice presented will be better off in their academic work.

However, even when students possess knowledge of sound study habits beneficial to academic work, they may not practice them (e.g., Jairam, 2019). For example, in a study of university students in Austria, Foerst et al. (2017) found a discrepancy between students' knowledge of SRL strategies and their actual use of such strategies. Specifically, even if students demonstrated knowledge of SRL strategies, they did not necessarily put this knowledge effectively into action. Foerst et al. (2017) traced the discrepancy between knowledge and actual use of effective skills to several sources, such as lack of time and doubt about their effectiveness. Notably, one reason for this gap reported by the students was a lack of perceived ability to use such strategies. Thus, it seems that knowledge of efficient study habits is a necessary but not sufficient factor for practicing them effectively. Students' efficacy beliefs in their capabilities to carry out, organize, and perform student skills successfully (e.g., Bandura, 1997; Pajares & Valiante, 1997; Zimmerman, 1990) may be vital in translating knowledge of efficient study habits into action (Schunk, 2012).

Efficacy beliefs are positively and moderately related to academic outcomes (e.g., grades) but demonstrate considerable heterogeneity and complex relations to other relevant variables (e.g., Honicke & Broadbent, 2016, for review). This complexity is to be expected, as academic self-efficacy affects outcomes in direct as well as indirect ways. For example, self-efficacy for self-regulated learning, closely related to self-efficacy for academic achievement (Zimmerman et al., 1992) helps the student to accomplish long-term tasks through the use of self-regulation strategies such as self-monitoring, self-evaluation, goal setting, and planning (Zimmerman, 1990). An important characteristic of self-efficacy is domain-specificity (Bandura, 1997), meaning that efficacy beliefs (confidence in achieving a desired outcome) relate to a specific domain (e.g., academic efficacy beliefs) that do not easily generalize.

In the present paper, we focus on these topics from the perspective of another issue challenging the success of a student, procrastination—the habit of voluntarily putting off tasks despite expecting to be worse off (Steel, 2007). Students are especially prone to dilatory behavior (Schouwenburg, 2004; Tice & Baumeister, 1997), often delaying academic tasks unnecessarily (Pychyl et al., 2000). Procrastination is maladaptive in the long run, with negative consequences such as missing deadlines (Zarick & Stonebraker, 2009), increased stress and anxiety (Tice & Baumeister, 1997), lower academic achievement (Kim & Seo, 2015), and dropping out of studies (Grau & Minguillon, 2013). Prior research has documented a relatively strong negative relation of procrastination with self-efficacy and self-efficacy to self-regulate (Klassen et al., 2008), and lack of academic skills and self-regulated learning strategies are often listed as reasons for not starting intended tasks in time (Grunschel et al., 2013; Klingsieck et al., 2013; Van Eerde, 2003).

However, the question of how the use of study skills is affected by self-efficacy beliefs in the context of procrastination has not received much attention in the research literature. Specifically, if students do not receive formal training in study skills, they will likely perceive study tasks as difficult, with increased procrastination as a predictable outcome (Grunschel et al., 2013; Klingsieck et al., 2013; Schraw et al., 2007). When universities then offer advice on sound study habits, adopting such habits should make study work appear as easier, with reduced procrastination as a likely outcome. However, as discussed, that effect should be expected to be dependent on the self-efficacy beliefs that students hold toward their study work. Some students may follow study advice without necessarily believing that their efforts will succeed, whereas others may hold stronger study self-efficacy beliefs. It is not known whether such self-efficacy differences influence the effect of practicing recommended study habits, but we find it likely. Given the extensive literature on self-efficacy as an important factor or moderator variable in many forms of motivated behavior, including self-regulation (e.g., Bandura, 1997; Klassen et al., 2008), it may be expected that habit execution is also moderated by self-efficacy beliefs. For example, Prat-Sala and Redford (2010) demonstrated that students low in self-efficacy in academic work (reading and writing tasks) were more likely to adopt a

surface approach (less time and effort put into school-related work), whereas those high in self-efficacy adopted a deep or strategic approach to studying (more time and effort).

The Present Studies

In three studies, we assess the importance of academic study habits in procrastination, given study self-efficacy as a possible mediating factor. Because Norwegian universities do not provide formal study skills training but rather convey advice regarding recommended study habits, we approached this issue by asking students to report their use of such recommended habits in their study situation. We compiled a list of five habits often recommended by teaching staff and advisors into an index, a Study Skill Habits (SSH) scale. Examples are "I practice self-testing" and "Before every lecture, I prepare by making myself familiar with the topic." Students who endorse more of these statements should be able to manage a variety of academic challenges better than students who endorse fewer of these statements. Thus, we expected that the SSH scale should demonstrate a positive correlation with study performance (e.g., self-reported grades). Furthermore, as procrastination is more likely when facing difficult and aversive tasks, we expected—consistent with prior research (Grunschel et al., 2013; Jung, 2013; Klingsieck et al., 2013; Schraw et al., 2007)—that students scoring low on the SSH scale would also demonstrate an increased probability of academic procrastination.

However, as discussed, even if students practice relatively healthy study habits, the students' beliefs in the efficacy of executing these habits, their *study self-efficacy,* may tell a different story. Specifically, lower study self-efficacy may hamper performance, dictate lower ambitions, reduce effort and persistence (Bandura, 1997), and, in sum, represents a handicap for the student even when practicing recommended study habits. Hence, even if there is an overall negative relationship between the study habit measure and academic procrastination, that link could be affected by study self-efficacy.

These relationships were investigated across three studies with study skill habits and study self-efficacy used as predictors of procrastination. We had two expectations for the present data: First, the Study Skill Habits and Study Self-Efficacy measures should be negatively correlated with procrastination (Ferrari et al., 1992; Haycock et al., 1998; Steel, 2007; Tuckman, 1991; Wolters, 2003). Second, given the literature discussed, we expect that Study Self-Efficacy significantly mediates the effect of Study Skill Habits on procrastination. In Study 1, relatively young students from a single study discipline participated; Studies 2 and 3 included a more diverse range of students, varying in study experience (Study 2) and academic discipline (Study 3). In this way, the roles of Study Skill Habits and Study Self-Efficacy were assessed in relatively heterogeneous samples, ensuring the robustness of findings.

Method

Participants

Three samples were included in the present paper. In **Study 1**, 86 students (76.7% female) from an introductory psychology course participated. Most were first-year students invited to participate via a closed website (total number of students was approximately 140). Age ranged from 18–41 with a mean age of 21.14 years (SD = 3.45). Participants in **Study 2** were 483 students (68.7% female) in different stages of their studies at the university: first year (22.5%), second-year (23.4%), third-year (26.5%), fourth-year (13.3), fifth-year (7%) and six years or more (7.3%). Age ranged from 19–55, with most being less than 26 years old (70%), with a mean of 24.9 years (SD = 5.74). Finally**,** participants in **Study 3** were 183 students (67.6% female) studying medicine/odontology (65%), humanities/social sciences (17.5%) and natural sciences/other (17.5%). Age ranged from 19–57, most being less than 26 years old (90.2%),

with a mean age of 22.47 years (SD = 5.40). Participants in Studies 2 and 3 were recruited through lectures, invitations on open university websites, and social media announcements via student assistants.

Materials

Study Skill Habits (SSH)

We developed a custom scale focusing on study habits, *Study Skill Habits*, based on advice typically given at Norwegian universities. All authors discussed possible items to include and agreed on a list containing assertions addressing skills that have been demonstrated to be effective (e.g., "I test myself in the material I read") as well as study habits actively encouraged by teaching staff without specific research basis (e.g., "I am active in seminars and study groups"). Items rated on a five-point Likert scale (1–5), with higher scores indicating more usage of study recommended study habits. See Appendix for the complete list of questions.

Items in this scale address a variety of different indicators that sum up to a *formative construct* (Roberts & Thatcher, 2009). Constructs can be termed reflective or formative depending on the nature and direction of relationships between a construct and its indicators. Reflective indicators represent reflections or manifestations of a latent construct, which means that variation in the construct leads to variation in its indicators. That is, constructs are viewed as causes of reflective indicators, and indicators are interchangeable implying that removal of an indicator does not change the construct. Hence, internal consistency among indicators is expected. On the other hand, constructs can be formed or induced by their indicators. Such indicators are termed formative indicators and are viewed as causes of the constructs. Commonly, formative constructs are regarded as composites of specific component variables or dimensions. Indicators are not interchangeable, and omitting an indicator is omitting part of the construct. Therefore, correlations among indicators may not have a specific pattern that produces internal consistency.

To determine whether a construct should be regarded as reflective or formative, decision rules can be applied (Jarvis et al., 2003). Roberts and Thatcher (2009) describe these rules as (1) to assess the theoretical causal direction from the construct to indicators; (2) to examine the interchangeability of the indicators; (3) to assess if the indicators covary with one another; (4) to determine whether or not the indicators have the same antecedents and consequences. In the present context, the Study Skill Habits (SSH) measure, which encompasses a variety of different behaviors, may not be appropriately specified as reflective indicators. For example, the SSH includes different indicators referring to self-testing, working with fellow students, and preparation before lectures, making it quite evident that the construct includes indicators that are formative in nature. As formative indicators are not expected to be highly correlated (opposite of reflective indicators), Diamantopoulos and Siguaw (2006) suggest addressing the issue of a formative or reflective model by testing for multicollinearity among indicators. The variance inflation factor (VIF) statistic can help determine if the formative indicators are too highly correlated (i.e., a VIF value greater than 3.3 indicates high multicollinearity among formative indicators) and, thus, should be modeled as reflective indicators (or both). In the current three studies, the highest VIF is 2.46, and most VIF values are below 1.70. Therefore, the Study Skill Habits measure is specified as a formative construct, indicated by the causal direction going from the indicators to the construct (see Appendix, Studies 1–3).

Self-Ratings of Study Skills

Studies 1 and 2 also included a question asking respondents to evaluate the quality of their study skills: "I think that I have good study skills" rated on a scale from 1–5 (1 = "does not apply at all to me"—5 = "applies very well to me"). This item constituted an independent alternative measure of study skills. Due to few respondents at the first and last levels, levels 1–2 and 4–5 were merged,

resulting in a measure of three levels (i.e., 1 = does not apply well to me; 2 = applies sometimes; 3 = "applies very well to me"). The self-rated study skill item correlated positively with the SSH scale (Study 1, $r = .39$; Study 2, $r = .44$).

Self-Reported Grades

We also recorded self-reported grades (range 1-6, higher numbers = better grades). As expected, the SSH scale correlated positively with grades (Study1, $r = .44$; Study 2, $r = 24$, Study 3, $r = .25$), indicating support for the assumption that adherence to advice about study habits is positively associated with performance (e.g., Robbins et al., 2004).[1] Similarly, the self-rated study skill item correlated positively with grades (Study 1, $r = .35$; Study 2, $r = .30$).

Study Self-Efficacy scale (SSE)

This scale measures students' confidence in their ability to achieve desired academic outcomes. Items were adapted from the general self-efficacy scale by Schwarzer and Jerusalem (1995), rephrased to tap academic self-efficacy specifically. Items addressed confidence in the utility of study skill habits (items 1, 2, 3, i.e., "study habit self-efficacy"), general outcome expectations (items 4 and 6), as well as one persistence item (5). We avoided explicit comparisons to other students (cf. the Motivated Strategies for Learning Questionnaire, MSLQ; Pintrich & De Groot, 1990), and items were formulated to address academic tasks but still intended to remain neutral to specific study contents. In Study 1, items included were (1) "When I get a study task to work with, I have a hard time finding a solution," (2) "I have little faith in my ability to study effectively," and (3) "It is difficult for me to follow the study curriculum when something unexpected happens." Three items were added in Studies 2 and 3: (4) "I am capable of learning the course contents for this year," (5) "When I have decided to complete something important to me, I continue even if it proves more difficult than I believed," and (6) "I am sure that I will accomplish the academic goals I have set for myself." Items were rated on a five-point Likert scale (1–5), higher scores indicating higher academic self-efficacy (three first items reverse coded). Cronbach's alphas across the three studies were .63, .75, and .66, respectively. Of note, Honicke and Broadbent (2016, p. 67) pointed out that higher levels of internal reliability in self-efficacy measures are observed in content-specific scales compared to more global measures. In the present studies, item 5 demonstrated the lowest factor loadings (.33 in Study 2; .28 −.30 in Study 3).

Procrastination

All studies measured procrastination by the six non-reversed items from the Irrational Procrastination Scale (IPS, Steel, 2010) using the Norwegian version translated by Svartdal (2017). Items are rated on a five-point Likert scale, with higher scores indicating more procrastination. These items have been documented to measure procrastination similarly to the full scale (Svartdal & Steel, 2017). The IPS often is taken to measure trait procrastination, and as such, reflects a relatively stable tendency to delay unnecessarily. To be used as a dependent variable in the present context, it must be assumed that this scale reflects procrastination in the study context (i.e., measures academic procrastination) and that answers in principle can be affected by the predictor variables. As for the first requirement, studies (e.g., Steel et al., 2018) have demonstrated a high correlation between the IPS and more direct measures of academic procrastination. Also, several of the items in the IPS address delays of activities that are important to the person, which for students include academic work. Thus, examination of the individual items of the IPS reveals that most items address habitual, context-specific tendencies to put things off (e.g., item 5 "At the end of the day, I know I could

[1]Although not part of the present study, we note that the correlation between self-reported grades and procrastination (IPS) confirmed to prior research (Kim & Seo, 2015), with correlations across the three studies at $r = -.22$, $-.35$, and $-.29$. The correlations between study self-efficacy and grades were $r = .51$, .65, and .48.

have spent the time better"). Hence, for students asked to rate the items in an academic context, this scale should tap academic procrastination. This assumption was further assessed in Study 3, which included both academic procrastination and the IPS scales. The correlation between the IPS and the academic procrastination scale was $r = .85$. Second, the IPS has been used previously as an indicator of changed procrastination after interventions (e.g., Rozental et al., 2015), suggesting that this scale can reflect changes when controlling variables are changed.[2] Cronbach's alpha ranged from .90 – .94 across the three studies.

Academic Procrastination Scale

In Study 3, a subset of six items from the Academic Procrastination Scale (APS; McCloskey & Scielzo, 2015; Yockey, 2016) measured academic procrastination (e.g., "I get distracted by other, more fun, things when I am supposed to work on schoolwork"). The items were translated to Norwegian with backward translations and discussion/correction (Nordby, unpublished). All scale items are rated on a five-point Likert scale, with higher scores indicating more procrastination. Cronbach alpha was .88.

Procedure and Ethics

Respondents answered all questions in a web-based survey (www.qualtrics.com). Participation was anonymous and voluntary. All were informed that they could withdraw at any time and agreed to participate by actively pressing a start survey button after reading general information about the study. Only completed surveys were included.

The current project is part of a study on procrastination with ethical approvals from the Regional Committee for Medical and Health Research Ethics in Northern Norway (REC North 2014/2313).

Model Specification and Estimation

The conceptual model, shown in Figure 1, assumes that the influence of Study Skill Habits on academic procrastination is mediated by Study Self-Efficacy. The SSH construct is specified as a formative latent construct, whereas SSE and procrastination are specified as reflective latent constructs. In Studies 1 and 2, sensitivity analysis was employed using an alternative measure of study skills (i.e., "I think that I have good study skills") that was specified as the observed independent variable. Responses were "does not apply well to me" (1), "applies sometimes" (2), and "applies very well to me" (3). Gender (Male = 0; Female = 1) was included as a control variable in all studies, as gender differences have been observed in procrastination (e.g., Gröpel & Steel, 2008; Mandap, 2016; Steel & Ferrari, 2013; Washington, 2004), study skills (e.g., Ekuni et al., 2020; Khan & Rasheed, 2019), and self-efficacy (e.g., Huang, 2013). In Study 2, university experience (first year = 1; second year = 2; third year = 3; fourth year = 4; fifth year or more = 5) was added as a control variable. As the factors included in our model may be affected by study experience, it is of great interest to assess the relations between these variables among students with varying degrees of study experience. For example, deep and strategic approaches to learning have been shown to be affected by study experience (e.g., Brown & Murdolo, 2016; Richardson, 2010), and the effect of study self-efficacy tend to vary as a predictor of performance at early versus later study stages

[2]Scales measuring academic procrastination may include no or very few items addressing academic tasks. For example, the GPS – probably the most used scale to measure procrastination (see Svartdal & Steel, 2017) – has 20 items, and comes in two versions: One general, and a student version which includes 4 unique "academic procrastination" items. Thus, the general and student versions have 16 non-academic items in common. Similarly, an often used student procrastination scale, the Tuckman scale (35 items, often reduced to a 16-item scale based on the top loading items from the complete scale) has no items that specifically address academic procrastination (item 7 mentions studying, though: "I put the necessary time into even boring tasks, like studying"). These observations indicate that academic and general procrastination are very similar constructs, and that a valid assessment of academic procrastination is possible using a general procrastination scale focusing on implemental delay, like the IPS.

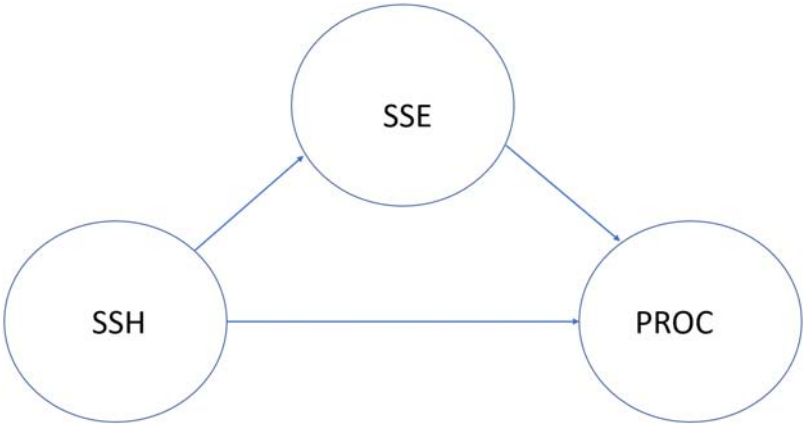

Figure 1. Conceptual model. SSH = Study Skill Habits; SSE = Study Self-Efficacy; PROC = Academic procrastination.

(e.g., Gore, 2006; Phan, 2013; Zeegers, 2004). Procrastination also differs as a function of study experience. For example, in a study by Stewart et al. (2016), procrastination levels were higher in the second year than first-year students. Finally, in Study 3, study topic (Medicine/odontology = 1; social sciences/humanities = 2; Natural sciences/other = 3) was added as a control variable. Previous research (Nordby et al., 2017) has demonstrated that students from various study disciplines (e.g., medicine, social sciences, humanities) differ in procrastination, motivating a closer assessment of the factors included in our model over different study fields. Hence, study discipline, in addition to gender, was included as control variables in Study 3.

Post-hoc power analysis (Kenny, 2017), given the sample size (Study1, $n = 85$; Study 2, $n = 483$; Study 3. $n = 183$), an alpha level of .05, and the betas in the model revealed a power level virtually at 1, except for the direct path c' that was .754 (Study 1) and .789 and .125 (Study 3).

A structural equation model using weighted least squares parameter (WLSMV) estimation was employed. The WLSMV estimation is appropriate when manifest variables are categorical or ordinal. Model fit to data was examined using standard fit indices, i.e., chi-square test, the comparative fit index (CFI), the Tucker-Lewis index (TLI), the root-mean-square error of approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). CFI and TLI values greater than 0.95 and an SRMR less than 0.08 indicate good fit (Hu & Bentler, 1999), and RMSEA less than 0.05 indicate close fit (MacCallum et al., 1996). Standardized parameter estimates across main variables are reported with bias-corrected bootstrap confidence intervals based on 10000 bootstrap draws (MacKinnon et al., 2004). However, since the interpretation of standardized estimates of categorical variables is difficult, only the continuous outcome variable was standardized for the sensitivity analysis. For control variables, unstandardized estimates are reported. Missing values were left open, with pairwise deletion of cases. In line with Preacher and Kelley (2011), kappa-squared (k^2) values at 0.01, 0.09, and 0.25 are interpreted as small, medium, and large mediation effect sizes, respectively. All analyses were performed with Mplus version 8.1.

Results and Discussion

Study 1

Table 1 presents the means, standard deviations, and bivariate correlations between procrastination (IPS), Study Skill Habits (SSH), and Study Self-Efficacy (SSE). As expected, there was a negative correlation between the outcome variable procrastination and the predictor variables SSH ($r = -0.49$) and SSE ($r = -0.59$), and a positive correlation between SSH and SSE ($r = 0.42$).

Table 1. Descriptive statistics and correlations.

	N	Mean	SD	1	2	3	4
1. Procrastination (IPS)	83	3.09	1.00	1			
2. Study Skill Habits (SSH)	83	3.56	0.67	−0.49	1		
3. Study Self-efficacy (SSE)	83	2.94	0.76	−0.59	0.42	1	
4. Self-rated study skills	83	2.19	0.76	−0.60	0.39	0.44	1

Note: Correlations based on $N = 83$. For all correlations, $p < .01$.

Table 2. Standardized model estimates ($n = 85$).

	Coefficient (β)	Boot SE	*p*
Direct effects		*Model 1*	
SSH -> SSE	0.560	0.140	<0.001
SSH -> IPS	−0.236	0.205	0.250
SSE -> IPS	−0.603	0.158	<0.001
Indirect effects			
SSH via SSE	−0.337	0.152	0.027
Total effect	−0.573	0.205	<0.001

SSH = Study Skill Habits; SSE = Study Self-Efficacy; IPS = procrastination.

The overall model fit was very good, chi-square = 77.942, df = 72, $p = 0.296$, CFI = 0.996; TLI = 0.995; RMSEA = 0.031 (0.000–0.071); SRMR = 0.065. The model results are presented in Table 2. The direct effect from SSH to SSE was significant ($\beta = 0.560$, SE = 0.140, $p < .001$), indicating that self-efficacy increases as a function of study skills, whereas procrastination decreases as a function of self-efficacy ($\beta = -0.603$, SE = 0.158, $p < .001$). The direct effect from SSH to procrastination was non-significant ($\beta = -0.236$, boot SE = .205, $p = .250$), while the indirect effect of study skills on procrastination via SSE was significant ($\beta = -0.219$, 95% Bias-corrected CI [−0.662, −0.093], boot SE = 0.152, $p = .027$), indicating that SSE fully mediates the relationship between SSH and procrastination. Gender was not a significant predictor. The mediation effect was large ($k^2 = .35$).

Overall, as is seen in Table 2, these results support the conceptual model depicting that the effect of Study Skill Habits on procrastination is facilitated by Study Self-Efficacy. In effect, good Study Skill Habits by themselves are not enough to reduce academic procrastination. Study Self-Efficacy is a crucial component of how study habits impact academic procrastination.

Results from a sensitivity analysis specifying the item "I think I have good study skills" as the independent variable revealed similar results both in terms of model fit (i.e., chi-square = 66.760, df = 47, $p = .031$; CFI = 0.986; TLI = 0.981; RMSEA = 0.070 (90% CI 0.022–0.106); SRMR = 0.058) and structural relationships. Model estimates are reported in Appendix (Table 1).

Study 2

Study 1 examined a relatively small sample of young students from an introductory course in psychology. Study 2 used a larger sample with study experience ranging from short (first-year students) to long (more than five years). All variables were measured with similar scales as in Study 1, except that Study 2 added three items to the Study Self-Efficacy scale (see Methods section).

Descriptive statistics and correlations are displayed in Table 3. Compared to Study 1, mean scores were quite similar across variables, but Study Self-Efficacy was higher. This makes sense considering that the Study 1 sample comprised first-year psychology students, whereas Study 2 included students with long experience as well. Correlations were also similar to those of Study 1 in that SSH and SSE were negatively correlated with procrastination and positively correlated with each other.

The conceptual model produced a significant chi-square test (chi-square = 291.923., df = 110, $p < .001$). However, the chi-square test statistic is commonly significant in larger samples (Hooper

Table 3. Descriptive statistics and correlations.

	N	Mean	SD	1	2	3	4
1. Procrastination (IPS)	483	3.04	0.99	1.00			
2. Study Skill Habits (SSH)	483	3.30	0.64	−0.40	1.00		
3. Study Self-Efficacy (SSE)	483	3.77	0.60	−0.48	0.35	1.00	
4. Self-rated study skills	483	2.41	0.69	−0.48	0.44	0.50	1.00

Note: For all correlations, $p < .01$.

Table 4. Standardized model estimates ($N = 483$).

	Coefficient (β)	Boot SE	*p*
Direct effects			
SSH -> SSE	0.415	0.062	<0.001
SSH -> IPS	−0.220	0.058	<0.001
SSE -> IPS	−0.529	0.057	<0.001
Indirect effects			
SSH via SSE	−0.220	0.044	<0.001
Total effect	−0.439	0.045	<0.001

SSH = Study Skill Habits; SSE = Study Self-Efficacy; IPS = procrastination.

et al., 2008). Other alternative fit indices indicated that the model produces a good fit to the data, CFI = 0.989; TLI = 0.987; RMSEA = 0.043 (0.035-0.051); SRMR = 0.074. As seen in Table 4, SSH was positively associated with SSE ($\beta = 0.415$, boot SE = 0.062, $p < .001$), which, in turn, was negatively associated with procrastination ($\beta = -.529$, boot SE = 0.057, $p < .001$). The direct effect of SSH on procrastination was significant ($\beta = -0.220$, boot SE = .058, $p < .001$). The indirect effect of study skills on procrastination via SSE was significant ($p < .001$), $\beta = -0.220$, boot SE = 0.044, 95% bias-corrected CI [−0.309, −0.137]. This represents a medium effect size ($k^2 = .23$).

Overall, Study 2 repeated the findings from Study 1, further supporting the notion that study self-efficacy is an important factor that facilitates the effect of Study Skill Habits on academic procrastination. However, in the present results, the direct SSH—procrastination effect remained significant, whereas Study 1 indicated full mediation.

The results revealed that study experience had no effect on procrastination ($p > .05$), but Study Self-Efficacy generally increased with increasing study experience. This result was significant for the more experienced students (i.e., four years at university, $\beta = 0.546$, $p = .002$; five years or more at university, $\beta = 0.839$, $p < .001$), corresponding well to previous research (e.g., Gore, 2006; Phan, 2013; Zeegers, 2004). Also, gender was a significant predictor of procrastination ($\beta = 0.285$, $p = .001$) and of self-efficacy ($\beta = 0.314$, $p < .01$), indicating more procrastination and higher self-efficacy among males.

Results from sensitivity analysis specifying the item "I think I have good study skills" as the independent variable revealed similar results in terms of model fit (i.e., chi-square = 246.912, df = 120. $p < .001$; CFI = 0.989; TLI = 0.986; RMSEA = 0.047 (0.038–0.055); SRMR = 0.047). Estimates among main variables were also similar to those in the main model (see Appendix, Table 2). Similar to the above results, study year was a significant predictor of SSE for the most experienced students (i.e., fourth year at university $\beta = 0.313$, $p = .051$; fifth year at university, $\beta = 0.625$, $p < .001$).

Study 3

In Studies 1 and 2, procrastination was measured by the IPS (Steel, 2010). This scale addresses habitual, context-specific tendencies to put things off. As discussed, administering this scale in an academic context should tap academic procrastination. In Study 3, we included a scale that measures academic procrastination specifically, allowing us to assess the relationship between these two procrastination measures. A high correlation between them would support the

Table 5. Descriptive statistics and correlations.

	N	Mean	SD	1	2	3	4
1. Procrastination (APS)	178	2.62	0.95	1.00			
2. Procrastination (IPS)	183	2.99	0.97	0.85	1.00		
3. Study Skill Habits (SSH)	181	3.21	0.67	−0.46	−0.37	1.00	
4. Study Self-Efficacy (SSE)	180	3.64	0.60	−0.50	−0.53	0.45	1.00

Note: Correlations are based on $N = 172$. For all correlations, $p < .01$.

Table 6. Standardized model estimates ($n = 180$).

	Coefficient (β)	Boot SE	*p*
Direct effects			
SSH -> SSE	0.462	0.088	<0.001
SSH -> APS	−0.217	0.110	0.049
SSE -> APS	−0.664	0.104	<0.001
Indirect effects			
SSH via SSE	−0.307	0.097	0.002
Total effect	−0.524	0.057	<0.001

SSH = Study Skill Habits; SSE = Study Self-Efficacy; APS = academic procrastination.

assumption made in Studies 1 and 2 that IPS is a valid measure of academic procrastination. Also, participants for this study were selected from rather diverse fields of study.

Descriptive statistics and correlations are displayed in Table 5. Of particular interest here is the high correlation between general procrastination (IPS) and academic procrastination (APS), $r = .85$, indicating that IPS is a context-specific measure reflecting academic procrastination when administered in the study context. Note that the APS scores were markedly lower compared to the IPS scores, indicating that IPS scores may be somewhat exaggerated when used as an index of academic procrastination.

The conceptual model, using APS at the dependent variable, produced good fit to the data: chi-square = 169.330 df = 136, $p = .03$, CFI = 0.970; TLI = 0.964; RMSEA = 0.037 (0.013–0.054); SRMR = 0.074. The direct, indirect, and total effects are shown in Table 6. SSE increased as a function of SSH ($\beta = 0.462$, boot SE = 0.088, $p < .001$), which was in turn is negatively related to procrastination ($\beta = -0.664$, boot SE = 0.104, $p = .001$). The direct effect of SSH to procrastination was marginally significant ($\beta = -0.217$, boot SE = .110, $p = .049$). This indirect effect of SSH on procrastination via SSE was significant ($\beta = -0.307$, 95% Bias-corrected CI [−0.484 −0.126], SE = 0.097, $p < .001$). This represents a large effect, $k^2 = .32$.

Similar results were found when IPS was applied as a measure of procrastination. Chi-square = 188.451, df = 137, $p = .002$, CFI = 0.976; TLI = 0.971; RMSEA = 0.046 (0.028–0.061); SRMR = 0.073. Estimates are reported in Appendix (Table 3). SSE increased as a function of SSH ($\beta = 0.485$, boot SE = 0.085, $p < .001$), which was in turn negatively related to procrastination ($\beta = -0.804$, SE = 0.105, $p < .001$). The direct effect from SSH to procrastination was non-significant ($\beta = -0.057$, SE = .120, $p = .633$). The indirect effect of study skills on procrastination (IPS) via SSE was significant ($\beta = -0.390$, 95% bias-corrected CI [−0.541, −0.268], boot SE = 0.108, $p < .001$), which represents a large effect, $k^2 = .40$.

As for the control variables in both models, study discipline was a significant predictor of academic procrastination when measured by APS ($\beta = 0.410$, $p = .03$), indicating more procrastination among social science students, but non-significant measured by IPS. Gender was significant in both models when predicting procrastination ($p < .001$) and Study Self-Efficacy ($p < .001$), indicating more procrastination and higher self-efficacy among males.

In summary, Study 3 repeated the results of Studies 1 and 2, indicating support for the conceptual model suggesting that study self-efficacy mediates the study skill habit – procrastination relation. In Study 3, results were similar using an academic procrastination scale (APS) and a

trait procrastination measure (IPS) as outcome variables, indicating support for the appropriateness of using IPS as a measure of academic procrastination in Studies 1 and 2. However, note the higher mean scores for the IPS scale compared to the APS. This probably reflects the fact that APS scores focus on academic tasks specifically.

General Discussion

Academic skills are important for academic performance. Unfortunately, many students do not possess the sufficient levels of academic skills and competencies needed for efficient academic work, negatively affecting their academic performance as well as the likelihood of completing their studies (Richardson et al., 2012; Robbins et al., 2004). The logical remedy for this problem would be to provide explicit training in study-related skills, but universities instead often rely on advising students on study habits believed to be of utility in the study situation. However, research (e.g., Foerst et al., 2017) has demonstrated a discrepancy between students' knowledge of SRL strategies and their actual use of such strategies: Even if students possess knowledge and skills of useful study strategies, they do not necessarily put this knowledge into action. One key factor for translating study skills into action is study self-efficacy (Klassen et al., 2008), the beliefs students have in their ability to plan and implement student activities successfully (Bandura, 1997; Pajares & Valiante, 1997; Zimmerman, 1990).

The current research explored these issues in the context of procrastination. First, we document that low study skills (in the present studies, low adherence to recommended study habits compiled in a Study Skill Habits index, SSH) were associated with increased procrastination. In three studies, we observed moderate negative correlations (−.38–−.49) between these measures. This result follows predictably from the assumption that low study skills make academic work appear difficult, boring, or even aversive. As difficult, boring, and aversive tasks are well-documented predictors of procrastination (Grunschel et al., 2013; Klingsieck et al., 2013; Schraw et al., 2007; Steel, 2007), the negative relation between the Study Skill Habits measure and procrastination is consistent with prior research.

As a remedy to this situation, study skills training, or – as in the present paper – adherence to recommended study habits, may be introduced. However, study habits are not automatically translated into good study performance, as study self-efficacy may be vital in translating knowledge of efficient study habits into action (e.g., Bandura, 1997; Pajares & Valiante, 1997; Schunk, 2012; Zimmerman, 1990). Using SEM, we tested a model proposing that study self-efficacy mediates the observed study habits – procrastination relation. The sample included in Study 1 was relatively homogeneous, whereas participants in Studies 2 and 3 varied in experience and study fields. All three studies indicated support for the model; Studies 1 and 3 indicated full mediation, whereas Study 2 indicated partial mediation. Thus, these results indicate that although Study Skill Habits index is negatively related to procrastination, one key factor in this relationship is study self-efficacy. To our knowledge, this is the first study to demonstrate that the study habits → procrastination relation is dependent on study self-efficacy beliefs.

One implication of the present results is that study skills training, as well as advice on recommended study strategies, should be accompanied by measures to increase study self-efficacy. Just sharing information on effective study habits is not enough. However, whereas academic skills are relatively easy to train, efficacy beliefs in the academic context are not easily trainable. Unfortunately, academic self-efficacy is related to preceding academic achievement (e.g., Bartimote-Aufflick et al., 2016; Diseth, 2011), making a negative academic history an effective detrimental factor for student performance. A negative academic history may reduce or even neutralize efforts to enhance study skills. Low self-efficacy also negatively affects ambition, motivation, and persistence (Bandura, 1997), putting students with low self-efficacy in an unfavorable situation compared to their student fellows. Fortunately, intervention studies indicate that educational programs may enhance self-efficacy (e.g., Van Dinther et al., 2011). These authors reviewed studies that demonstrate positive

effects of intervention efforts over different study types and domains. Interventions based on social cognitive theory demonstrated the best results, and enactive mastery experiences seemed to be important for success (Bandura, 1997). Also, combined self-efficacy sources are reported as effective in increasing student self-efficacy (Van Dinther et al., 2011, p. 105). Bartimote-Aufflick et al. (2016, p. 1930) suggest specific strategies that may enhance study self-efficacy.

Increasing the probability that students, in fact, *have* mastery experiences is important. Such self-efficacy training should also be specific and closely related to the nature of the learning tasks, how they are framed, and focus on positive habit formation and strategies for which self-efficacy beliefs are important (Bandura, 1986). Skills need to be practiced in the proper context in order to be mastered, and teaching students how to implement different study skills should therefore be an integrated part of the various subjects students learn (Purdie & Hattie, 1999). Accordingly, when educators plan to train students in study skills, such training should be closely related to specific study programs (Weinstein et al., 2000), and skills training should ensure feedback and mastery experiences, thereby building self-efficacy beliefs.

Limitations and Further Research

The relationships between study skills, study self-efficacy, and procrastination are complex, and the model tested in the present studies (see Figure 1) is one of several possible. For example, efficacy beliefs may themselves affect the use of study strategies (Diseth, 2011; Phan, 2011). Also, procrastination has been demonstrated to be negatively related to academic performance (Kim & Seo, 2015; see also Footnote 1 in the present paper), with procrastination measure, performance indicator, type of data (self-report vs. external observation), and demographic profile of the study sample as important moderator variables. The potential role of study self-efficacy was not examined in the Kim and Seo paper, but other research (e.g., Balkis, 2011) has demonstrated study self-efficacy as a moderator variable. The results of the present paper indicate that study self-efficacy should receive increased attention as a moderator or mediator variable in studies examining performance and performance-related factors in the academic context. Furthermore, our model is also a simplification, as (academic) procrastination, self-efficacy, and academic skills are complex constructs related to other factors important to student work, including value, motivation, and metacognition (e.g., Bartimote-Aufflick et al., 2016; Cerino, 2014; Steel & Klingsieck, 2016).

Some additional limitations of the present studies should be noted. First, the Study Self-Efficacy scale used included items adapted from a general self-efficacy scale, modified to specifically tap study habit self-efficacy. While the internal consistency was satisfactory in Studies 2 and 3, the low Cronbach alpha in Study 1 indicates that the results of this study should be interpreted with caution. Second, the Study Skill Habits measure used in the present studies is a simplified proxy of study skills. Although this measure correlated predictably with study performance (self-reported grades), it should not be seen as an alternative to scales addressing study skills. On the positive side, our measure is probably an ecologically valid measure of students' willingness to practice recommended study habits, which is the operational definition of "study skills" as practiced by many universities. Third, as most of the measures used in the present studies have not been assessed for measurement invariance (cf. Brown, 2015; Gregorich, 2006), results should be interpreted with some caution. In the present studies, threats to measurement invariance include study field differences and differences due to levels study experience. For example, it is possible that the understanding of items addressing study self-efficacy may depend on study experience and/or study field, so that a given item (e.g., "When I get an assignment to work with, I have a hard time finding a solution") is understood differently depending on these variables. Future research should address this issue.

The possibility that study skills training itself may increase study self-efficacy (e.g., Wernersbach et al., 2014) should also be explored. As noted, universities and high schools should train students in basic study skills, ensuring that skills training is accompanied by mastery experiences. Such training

requires repeated sessions of active student participation and feedback for success experiences that can help establish new habits as well as an understanding of when and why they are used (McCabe, 2011; Verplanken, 2006). Note that reliance on the use of advice on study habits only does not secure such a deeper understanding. Future research should explore appropriate interventions, preferably in close concert with specific study programs. In these efforts, the situational and contextual factors in academic student life should be taken into account. Universities often arrange academic environments as "procrastination friendly," especially for beginning students in open study programs (Svartdal et al., 2020). A large degree of individual freedom for the student, long deadlines, and ample opportunities to divert attention from academic tasks to more tempting alternatives easily induce procrastination, maybe especially so in students low in study skills and/or academic self-efficacy. Future studies should examine the role of such variables and the possibility of arranging academic life with less situational and contextual opportunities to procrastinate.

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Appendix

Study Skill Habits (SSH). English/Norwegian

(1) I test myself in the material I read/Jeg tester meg selv i det stoffet jeg leser
(2) I reread material I have read before/Jeg leser om igjen ting jeg har lest før
(3) Before each lecture I prepare myself by getting acquainted with the material/Før hver forelesning forbereder jeg meg ved å gjøre med kjent med stoffet
(4) I am active in seminars and study groups/Jeg er aktiv på seminarer og forelesninger
(5) I practice understanding difficult technical terms by explaining them to myself or others/Jeg trener på å forstå vanskelige begreper ved å forklare for meg selv eller andre

Study Efficacy Scale. English/Norwegian. (= added in Studies 2 and 3)*

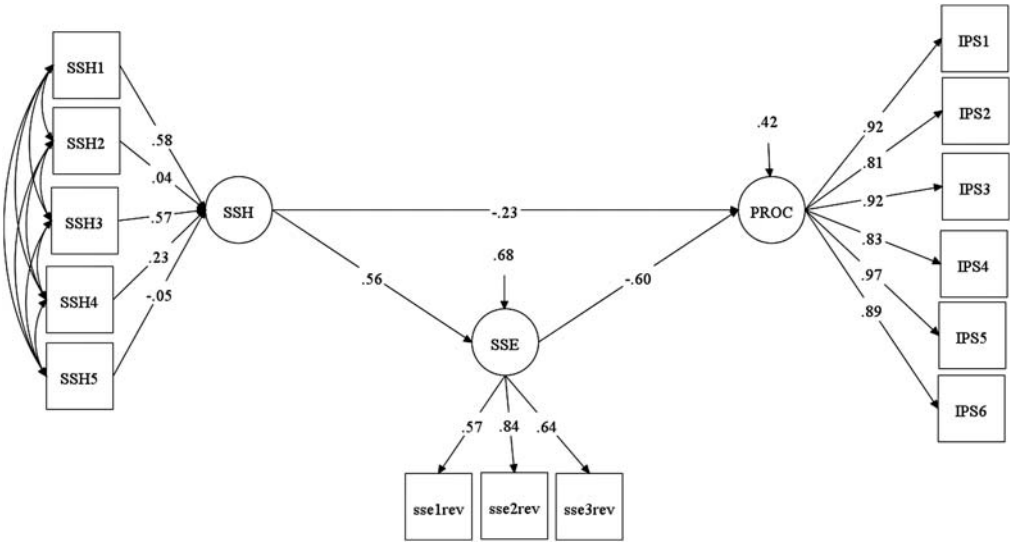
(1) When I get an assignment to work with, I have a hard time finding a solution/Når jeg får en studieoppgave å jobbe med, sliter jeg med å finne løsning
(2) I have little faith in my abilities to study effectively/Jeg har liten tiltro til mine evner til å studere effektivt
(3) It is difficult for me to follow the study curriculum when something unexpected happens/Det er vanskelig for meg å følge leseplanen når noe uventet skjer

(4) * I am capable of learning this year's course content/Jeg er i stand til å lære det som blir undervist i år
(5) * When I've decided to do something important to me, I keep working at it even when it is harder than I anticipated./Når jeg har bestemt meg for å gjennomføre noe som er viktig for meg, så fortsetter jeg å prøve, selv om det er vanskeligere enn jeg trodde
(6) * I am certain that I can achieve the academic goals I have set for myself/Jeg er sikker på at jeg klarer å oppnå de akademiske målene jeg har satt for meg selv

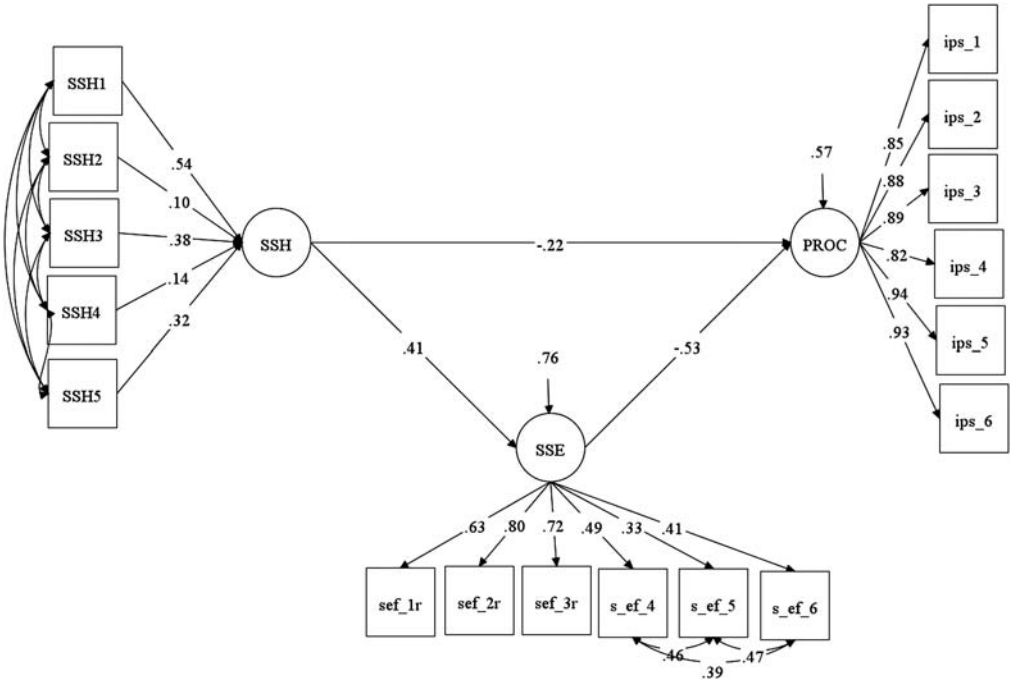
Six-item Version of Irrational Procrastination Scale. English/Norwegian

(1) I put things off so long that my well-being or efficiency unnecessarily suffers/Jeg utsetter ting så lenge at det går ut over velvære og effektivitet
(2) My life would be better if I did some activities or tasks earlier/Livet mitt ville vært bedre om jeg hadde gjort ting tidligere
(3) When I should be doing one thing, I will do another/Når jeg burde gjøre noe, gjør jeg gjerne noe annet i stedet
(4) At the end of the day, I know I could have spent the time better/Når jeg ser tilbake på dagen, vet jeg at jeg kunne utnyttet tiden bedre
(5) I delay tasks beyond what is reasonable/Jeg venter med å gjøre ting mer enn hva som er fornuftig
(6) I procrastinate/Jeg utsetter ting

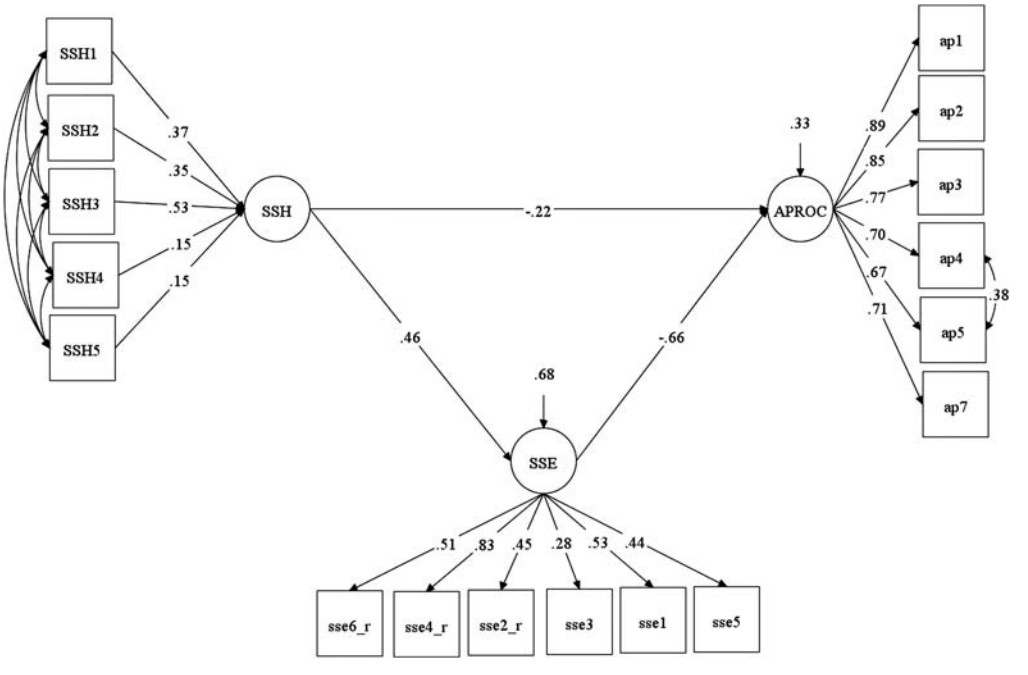
Appendix: Study 1



Appendix: Study 2



Appendix, Study 3 (APS)



Appendix, Study 3 (IPS)

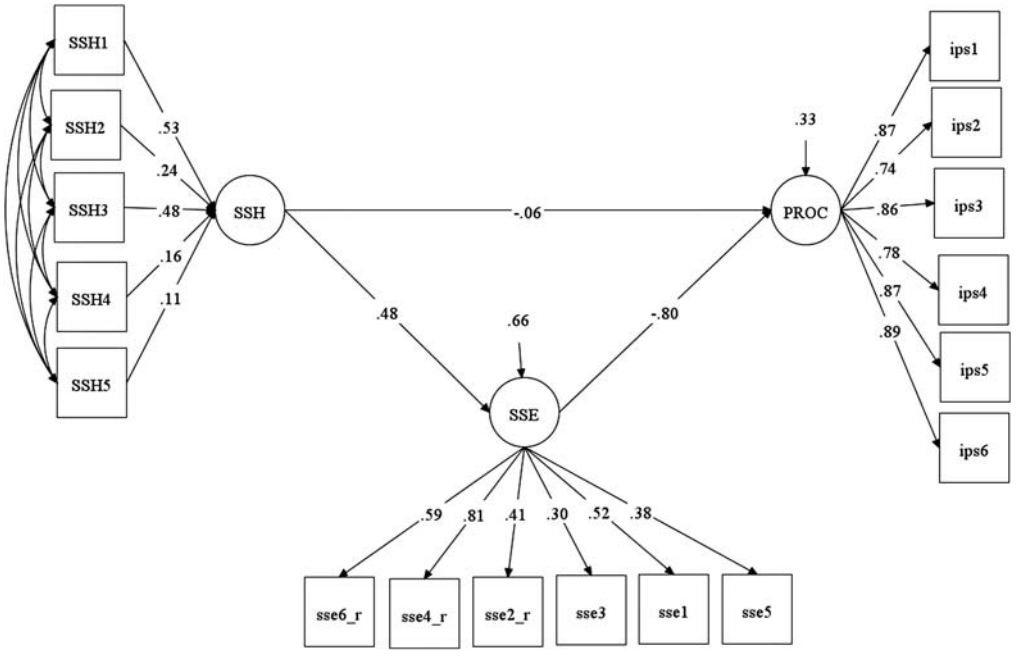


Table A1. Sensitivity analysis—model estimates ($n = 85$).

	Coefficient (β)	Boot SE	p
Direct effects		*Model 1*	
SS cat2 -> SSE	0.645	0.270	0.013
SS cat3 -> SSE	1.274	0.287	<0.001
SS cat2-> IPS	−0.499	0.242	0.039
SS cat3 -> IPS	−0.944	0.251	<0.001
SSE -> IPS	−0.538	0.110	<0.001
Indirect effects			
SS cat2 via SSE	−0.347	0.175	0.048
SS cat3 via SSE	−0.685	0.221	0.002
Total effects			
SS cat2 to IPS	−0.846	0.241	<0.001
SS cat3 to IPS	−1.629	0.175	<0.001

Note: Outcome variable standardized. SS = Study Skill Habits; SSE = Study Self-Efficacy; IPS = procrastination.

Table A2. Sensitivity analysis—model estimates ($n = 483$).

	Coefficient (β)	Boot SE	p
Direct effects		*Model 1*	
SS_cat2 -> SSE	0.530	0.156	0.001
SS_cat3 -> SSE	1.485	0.143	<0.001
SS_cat2-> IPS	−0.452	0.166	0.006
SS_cat3 -> IPS	−0.681	0.184	<0.001
SSE -> IPS	−0.500	0.065	<0.001
Indirect effects			
SS_cat2 via SSE	−0.265	0.091	0.003
SS_cat3 via SSE	−0.742	0.128	<0.001
Total effects			
SS_cat2 to IPS	−0.717	0.155	<0.001
SS_cat3 to IPS	−1.424	0.139	<0.001

Note: Outcome variable standardized.

Table A3. Standardized model estimates ($n = 180$).

	Coefficient (β)	SE	p
Direct effects			
SSH -> SSE	0. 485	0.085	<0.001
SSH -> IPS	−0.057	0.120	0.633
SSE -> IPS	−0.804	0.105	<0.001
Indirect effects			
SSH via SSE	−0.390	0.108	<0.001
Total effect	−0.447	0.063	<0.001

SSH = Study Skill Habits; SSE = Study Self-Efficacy; APS = academic procrastination.