Research Article

Longitudinal Examination of Procrastination and Anxiety, and Their Relation to Self-Efficacy for Self-Regulated Learning: Latent Growth Curve Modeling[*]

Sündüs Yerdelen[1]
Kafkas University

Adam McCaffrey[2]
University of Alberta

Robert M. Klassen[3]
University of York

Abstract

This study investigated the longitudinal association between students' anxiety and procrastination and the relation of self-efficacy for self-regulation to these constructs. Latent Growth Curve Modeling was used to analyze data gathered from 182 undergraduate students (134 female, 48 male) at 4 times during a semester. Our results showed that procrastination significantly increased over the semester, while academic anxiety decreased. Students' procrastination and anxiety were positively correlated at the beginning of the semester; however, the trajectories of procrastination and anxiety were not predicted from initial levels of these variables. Moreover, at the initial measurement period, high levels of anxiety and procrastination were significantly related to low levels of self-efficacy for self-regulation, whereas the rate of change in anxiety and procrastination over time were not predicted by students' initial levels of self-efficacy for self-regulation.

Keywords

Procrastination • Anxiety • Self-efficacy for self-regulated learning • Longitudinal study • Latent growth curve modeling

Life in school and university is burdened with deadlines and seemingly endless amounts of work. Students must cope with stressful timeframes and manage their academic anxiety (Misra & McKean, 2000). Ironically, one of the greatest challenges in the academic realm is not the quantity of assignments but the tendency of students to delay the process of working towards their goals. By this logic, it is not necessarily the difficulty of the work that students struggle with but instead their ability to self-regulate, stay on track, and complete their work. Procrastination has been defined as a failure to self-regulate to achieve intended goals, which results in a time delay (Steel, 2007). Procrastination has been seen as a universal phenomenon that hinders people's ability for accomplishing their goals (Steel, 2007). Academic procrastination specifically looks at the delay and postponing of academic tasks (Sirin, 2011). According to Yong (2010), academic procrastination is "an irrational tendency to delay at the beginning or completion of an academic task" (p. 63). Indeed, many students do not have sufficient drive to start their academic work, even when they intend to complete it by the deadline. Academic procrastination has been seen to relate to students missing deadlines, delaying studying, lower grades, and even withdrawing from courses (Beswick, Rothblum, & Mann, 1988). The prevalence rates for academic procrastination at the university level are high, and countering procrastination is considered to be one of the most important factors to student success (Steel, 2007). It is estimated that 80% to 95% of students at the university or college level suffer from academic procrastination (Ellis & Knuas, 1977). Others estimate 30% to 50% of students reporting that they have troubles with primary tasks such as writing a term paper, preparing for exams, and doing weekly readings (Clark & Hill, 1994; Solomon & Rothblum, 1984). In a large-scale sample, Steel and Ferrari (2013) found that procrastination was associated with lower education levels, showing the importance of self-regulation skills in achieving higher education goals. Solomon and Rothblum (1984) stated that the primary reasons that college students procrastinate is related to task aversiveness, fear of failure, evaluation anxiety, low self-confidence, perfectionistic standards for success, and difficulty in decision making.

The Link between Anxiety and Procrastination

Anxiety is defined as "an emotion based on the appraisal of threat, an appraisal which entails symbolic, anticipatory, and uncertain elements" (Lazarus & Averill, 1972, p. 487). Anxiety is closely related to a fear of future harm or potential future threats (Reiss, 1991). Prior studies have shown that anxiety can have a debilitating effect on academic performance (Macher, Paechter, Papousek, & Ruggeri, 2012). In an earlier study of anxiety relating to procrastination, Lay (1989) found that state anxiety was associated with perceptions of threat, harm, and emotion-focused coping. It has been found that in graduate students academic procrastination is significantly and positively related to anxiety, with a majority of it related to tasks such as writing,

studying, and weekly readings (Onwuegbuzie, 2004; Onwuegbuzie & Jiao, 2000). Rothblum, Solomon, and Murakami (1986) stated that academic procrastination usually included a problematic level of anxiety. Although most studies found positive correlations between academic procrastination and academic anxiety, these studies do not emphasize a causal relationship (Onwuegbuzie, 2000). That is, the cross-sectional correlational analyses from these studies reveal that there is a positive and significant relationship between procrastination and the interpretation of anxiety, including test and class anxiety. Therefore, anxiety and procrastination have—for the most part—been measured at single time points, revealing only these relations within a narrow temporal time point. However, interestingly, studies have linked procrastination with a decline in physical and mental health, with some studies arguing that stress and illness are higher for procrastinators but only at the end of a semester (Tice & Baumeister, 1997). Furthermore, procrastinators may suffer from less stress than others in the early parts of the school year due to spending less time on tasks; however, they experience much greater stress afterward. The complex relationship between procrastination and anxiety must consider both the bidirectional relationship between factors, and the influence of time.

In Steel's (2007) meta-analysis on procrastination, anxiety appears in a number of different capacities. In one respect, anxiety is seen as similar to neuroticism; those who are anxious procrastinate because they feel stressed and this creates task aversion (Burka & Yuen, 1983; Ellis & Knaus, 1977). It is even suggested that highly anxious people catastrophize small situations and that this causes their need for emotional coping. In another domain, anxiety is suggested to be a result of irrational beliefs or maladaptive thought patterns similar to those associated with neuroticism (Aitken, 1982; Ellis, 1973). Anxiety of a neurotic origin is also thought to relate to a fear of failure, self-consciousness, and perfectionism (Steel, 2007). Steel points to another line of research and suggests that the anxiety–procrastination relation may emerge from the individual's attempt to improve their temporal mood, thus, relating to emotion-focused coping. For example, those who feel upset or anxious about their current workload can engage in a short-term mood repair (doing something else), thus helping themselves feel better in the present (Sirois & Pychyl, 2013).

Steel (2007) suggests that procrastination exists in a more complicated formulation, whereas previous research primarily looks at simple relations. Specifically, Steel' (2007) developed the Temporal Motivation Theory which suggests that time is a critical factor in goal motivation. This model attempts to understand the impact of time and whether approaching deadlines increases or decreases motivation to achieve a goal. Steel's model refers to how an individual is motivated based on their cognitive estimate of the utility of a task or choice. Utility refers to "how desirable a task or choice is for an individual" (Steel, 2007, p. 71). In this equation, utility can be

determined by the expectancy and value of the task in the numerator with the element of time in the denominator (see Steel, 2007). Expressed in these terms, people tend to like tasks that provide a high value and take little time to achieve, while they also prefer to delay aversive tasks. Steel suggests that anxiety causes an individual to delay tasks to a later time, however, as the deadline approaches, the utility of procrastination increases to the point of delaying up until the "last minute." However, there are very few repeated measures studies looking at how this relation exists in terms of anxiety and procrastination. Rothblum et al. (1986) found that those having a high level of procrastination tended to be more anxious during the whole school semester; however, they also tended to have lower stress levels in the early parts of the semester. Other studies have found similar results in which the procrastination and anxiety relation increased towards the end of the semester (Assur, 2003; Lay & Schouwenburg, 1993). These studies suggest that there is a relationship between anxiety and procrastination across a semester. However, the extent and direction of this relation across a semester remains unexamined. Additionally, this relation may be complicated by the fact that anxiety is based on an appraisal of threat, such that one's belief of self-efficacy in dealing with a threat to self-regulation may be a promising element for further examination.

The Importance of Self-efficacy to Self-regulate Learning

Self-efficacy in self-regulating learning is a relatively new construct, while self-efficacy itself has been extensively studied since the 1970's (Bandura, 1997; Klassen, Krawchuk, & Rajani, 2008). Bandura (1997) defines self-efficacy as, "the belief in one's capabilities to organize and to execute the courses of actions required to produce given attainments" (p. 3). Much research has shown the powerful relation self-efficacy has with performance across a wide variety of domains. Bandura (1997) states that self-efficacy is best determined when it is measured relative to the performance variable of interest (for example, matching a student's writing ability to his/her self-efficacy in writing). Studies show that the relation between procrastination behavior and beliefs about the self are strong, especially among college students (Klassen & Kuzucu, 2009). Self-efficacy for self-regulation has been described as one important variable relating to academic procrastination (Klassen et al., 2008; Klassen et al., 2009). Self-regulation is defined as the "self-directive process by which learners transform their mental abilities into academic skills" (Zimmerman, 2002, p. 65). Self-efficacy for self-regulated learning then represents the belief that one has to engage in self-regulatory behaviors. That is, a highly self-efficacious self-regulated learner sets goals, monitors their behaviors, and reflects on their performance. These strategies improve their motivation to succeed in academic tasks (Usher & Pajares, 2008). High levels of academic procrastination can be regarded as indicating a lack of self-regulation or a lack of confidence in the possibility of success (Klassen et al., 2008; Solomon & Rothblum, 1984; Wolters, 2003). In a cross-

cultural examination of procrastination, Klassen et al. (2009) found that adolescents—across diverse cultural settings—who had greater belief in their capacity to organize and control their work on academic tasks were less prone to procrastinate.

Few studies have been conducted on the effect of self-efficacy of self-regulation and its relation to procrastination. Interestingly, Spada, Hiou, and Nikcevic (2006) found that there was a significant positive relation between anxiety, depression, and behavioral procrastination (delay of concrete actions) and decisional procrastination (delay in making decisions). Follow-up multiple regression analysis found that depression and beliefs about confidence could predict behavioral procrastination, while depression and beliefs about worry could predict decisional procrastination. These results suggest that confidence about one's metacognitive skills is important in understanding behavioral procrastination. Furthermore, Haycock, McCarthy, and Skay (1998) looked at how efficacy expectations, anxiety, and procrastination related to a specific academic project. They found that efficacy expectations (the level to which the individual felt that they possessed the skills needed for the task) were negatively and significantly related to anxiety and procrastination. In a follow-up regression model, these researchers found that only efficacy strength was a predictor of procrastination, suggesting that anxiety is less important in predicting procrastination. Klassen et al. (2008) looked at how self-efficacy for self-regulation related to academic procrastination. Out of the variables of self-regulation, academic self-efficacy, self-esteem, and self-efficacy for self-regulation, self-efficacy for self-regulation was most predictive of procrastination. In a follow-up study, Klassen et al. (2008) found that students who were characterized to be negative procrastinators (those students who were seen as being the most adversely affected by procrastination) had lower grades, higher procrastination levels, and lower self-efficacy for self-regulation. When controlling for grades, self-efficacy for self-regulation significantly predicted the negative effects of procrastination. Klassen et al. (2008) highlights the importance of studies looking at self-efficacy as it pertains to self-regulation for future research in understanding the negative effects of procrastination. Wachle, Allgaier, Lachner, Fink, and Nuckles's (2014) study suggests that the relation between procrastination and self-efficacy represents a vicious cycle. Specifically, the researchers found that across a university semester, students reacted to their perceptions of low goal achievement through further procrastinating in working toward their goals. Furthermore, they found that this created a cycle with the student feeling less self-efficacy and being caught in a vicious cycle of procrastination. This surprising result prompts the need for further exploration of the relationship between students' efficacy levels in self-regulating their learning and trajectories of anxiety and procrastination across a semester.

In sum, the result of studies on procrastination shows that it is associated with lower levels of self-efficacy for self-regulation and higher levels of anxiety (Klassen et al.,

2008; Klassen et al., 2009; Solomon & Rothblum, 1984; Wolters, 2003). Bandura's (1997) theory suggests that self-efficacy for self-regulated learning may influence the appraisal that one has of anxiety and in turn relate to how one suffers (or not) from problem behaviors such as procrastination. In this sense, the feeling of self-efficacy that one has in regard to self-regulation may change the appraisal that one has for being motivated to engage in tasks that cause anxiety. However, when considering the student's level of self-efficacy for self-regulation, there is little research addressing the longitudinal relation between anxiety and procrastination. Therefore, our study focuses on exploring this gap in the literature and proposes the following research questions:

(1) In what direction and to what extent do undergraduate students' academic anxiety and procrastination change throughout the semester?

(2) To what extent can students' initial level of self-efficacy for self-regulation predict their academic anxiety and procrastination at time 1 (week 2)?

(3) To what extent can students' initial level of self-efficacy for self-regulation predict the rate of change in academic anxiety and procrastination over time?

Method

Participants

The sample comprised 195 undergraduate students from a university in Canada studying during the winter semester of 2010. However, because of missing data and outliers, 13 cases were excluded. In total, 182 (135 females, 46 males, and 1 not answered) students aged from 18 to 37 years (M = 21.61, SD = 3.49) participated in the study. Students' were from their 1st to 6th year at the university with 40% in their 2nd year. The participants were from a variety of departments (e.g., Art, Chemistry, Biology, Music, General Education, Elementary Education, and Linguistics) with GPAs ranging from 1.3 to 4 (M = 3.06. SD = .455). The participants were recruited through the Educational Psychology participant pool. The participant pool was introduced to the students on the first day of class. Students had an incentive to participate, as 5% of the student course marks can be acquired by participating in various research studies. The surveys were e-mailed throughout the semester to specific students who signed up, and they had one week to fill out each survey.

Data Collection Tools

Procrastination. Ackerman and Gross's (2005) procrastination scale was used to assess students' task delay behaviors for each week. The scale included 3 items and responses based on a 7-point Likert scale ranging from 1 (not at all true) to 7 (very true), and focused on the propensity that one feels toward procrastinating on schoolwork. A sample item was

"This week, I waited until the last minute to work on assignments." Higher scores on this scale indicated a higher level of procrastination. The reliability coefficients obtained from the 4 weeks ranged from .94 to .97 indicating high internal consistency.

Academic anxiety. Pekrun, Goetz, and Perry's (2005) Achievement Emotions Questionnaire (AEQ) was used to assess the feelings that students experienced before classes each week. The AEQ involves many different emotional variables related to achievement in learning; however, for this study, we exclusively examined anticipatory anxiety for classroom learning for each week. Although test anxiety has been studied extensively in the academic realm, this study focused on a generalized academic anxiety that one may feel in anticipation of doing academic work. AEQ includes 7 items related to students feeling anxiety in anticipation of class or school work and responses based on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Sample items within the "Before classes" stream included "I worry whether I'm sufficiently prepared for the classes" and "Thinking about my classes makes me feel uneasy." Higher scores on this scale represent higher feelings of anxiety. The reliability coefficients ranged between .89 and .94 across the four measures.

Self-efficacy for Self-regulated Learning (SESRL). Seven items adapted from Usher and Pajares' (2008) Self-Efficacy for Self-Regulated Learning Scale were used to assess students' beliefs in their capability to implement self-regulation strategies. Students' responses were based on a 7-point Likert scale ranging from 1 (not well at all) to 7 (very well). A sample item from the "How confident are you that you can…" stream is "Motivate yourself to do coursework." Higher scores indicate higher efficacy for self-regulation. The Cronbach Alpha coefficient of this scale was found to be .75 indicating adequate reliability.

Procedure

Data was collected via convenience sampling methods at eight times during a semester with students being asked to complete a survey including measures of anxiety and procrastination. These eight weeks cover the time when the classes started and nearly ended. After this time period, participants would have been comfortable in their classes and would have already had assignments due. The eight-week time point marks the heart of the course, without capturing the increased anxiety that might have been provoked at the very end of the course as exams drew close. SESRL questions were asked in the first measurement only. Since it was expected that discernible changes in procrastination and anxiety would take place over time intervals greater than one week, measurements for this study were taken at two-week intervals. Therefore, data from the second, fourth, sixth, and eighth weeks were included in the analysis.

This study aimed to explore the following points: (*1*) to what extent the rate at which self-reported academic procrastination and academic anxiety changes across time and

(*2*) to what extent these changes can be explained by undergraduate students' levels of confidence for self-regulation. Given this, Latent Growth Curve Modeling (LGCM) analysis was conducted to assess longitudinal effects. The advantage of LGCM is that while other methods test the change using two-wave panel data, LGCM provides richer information by allowing the use of multi-wave data and takes systematic individual differences in change into account (Byrne, 2010). Furthermore, the relationship between different domains (e.g., anxiety and procrastination) can also be computed using LGCM. In the present study, academic procrastination and anxiety data were obtained from 4 time points. Thus, using LGCM analysis enables accurate determination of the trajectory for each individual, inter-individual difference in their anxiety and procrastination changes, the relationship between anxiety and procrastination, and the role of SESRL in students' anxiety and procrastination changes over the semester. The proposed models for research questions 1, 2, and 3 are represented in Figures 1 and 2, respectively.
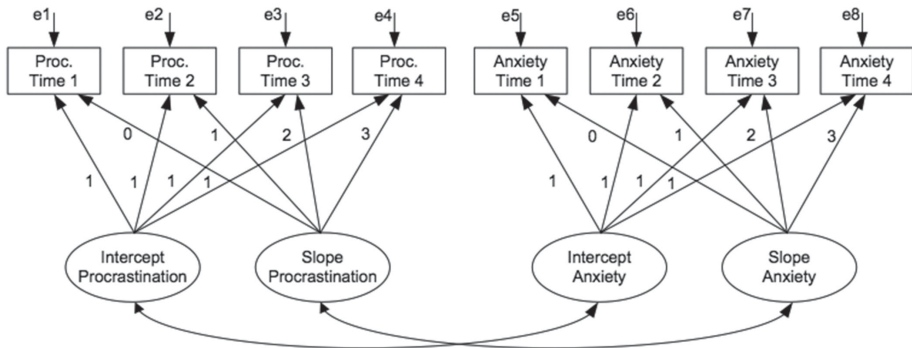

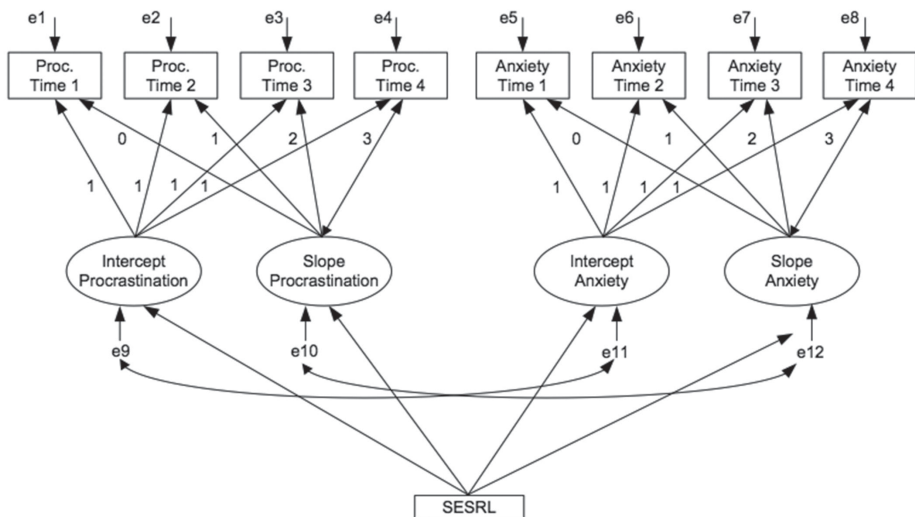*Figure 1*: The proposed model for research question 1.

Figure 2: The proposed model for research questions 2 and 3.

Note. SESRL: Self-Efficacy for Self-Regulated Learning.

In these models, the paths from intercept factors to observed variables are constrained to 1, which means that the intercept values remained constant across 4 measurement times for each individual (see Byrne, 2010). Additionally, the paths from slope factors to the observed variables were constrained to 0, 1, 2, and 3, indicating that the second factor can be interpreted as a slope (see Byrne, 2010). However, 1, 2, and 3 represent equal time intervals (4th, 6th, and 8th weeks), with 0 represent the starting point of linear growth (2nd week).

Results

The means, standard deviations (SD), and correlations among variables included in the analyses are presented in Table 1. The association of SESRL with academic anxiety and procrastination was negative as expected. There were some high correlations observed within variable measurement times (e.g., for the academic anxiety variable, the relationship between the 3rd and 4th test was .82). As the same constructs were assessed across these two different measurement times, high correlations were expected.

Table 1
Means, Standard Deviations, and Correlations among Variables (N = 182)

	Mean	SD	1	2	3	4	5	6	7	8	9
1. SESRL	4.74	1.01	1								
2. Procrastination Time 1	3.15	1.83	-.25**	1							
3. Procrastination Time 2	3.17	1.93	-.26**	.46**	1						
4. Procrastination Time 3	3.30	1.81	-.26**	.53**	.54**	1					
5. Procrastination Time 4	3.41	2.02	-.35**	.57**	.48**	.57**	1				
6. Anxiety Time 1	1.86	.81	-.25**	.16*	.20**	.02	.17*	1			
7. Anxiety Time 2	1.79	.85	-.24**	.22**	.24**	.15*	.20**	.73**	1		
8. Anxiety Time 3	1.74	.82	-.21**	.18*	.23**	.15*	.25**	.71**	.81**	1	
9. Anxiety Time 4	1.73	.85	-.26**	.20**	.16*	.17*	.29**	.66**	.79**	.82**	1

**$p < .01$, *$p < .05$.
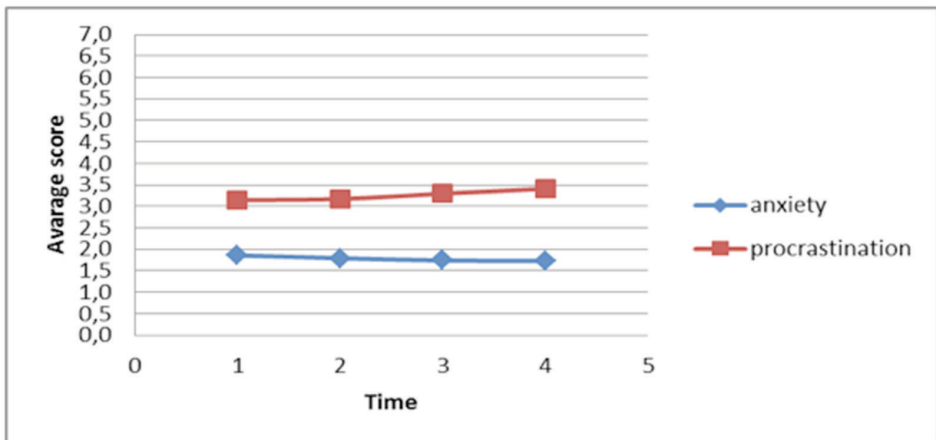Note. SESRL: Self-Efficacy for Self-Regulated Learning.

Figure 3: Changes in procrastination and anxiety across the four measurement times.

Before constructing the whole model, preliminary analyses were performed for the linearity of procrastination and anxiety levels of students across the 4 measurements. As shown in Figure 3, the mean values of procrastination and anxiety across the 4 measurement times reflected linear lines.

Separate linear growth curve models were tested for both procrastination and anxiety. The results showed a good model fit to the data ($\chi^2 = 9.718$, df = 6, $p = .137$, CFI = .984, RMSEA = .059) for the academic procrastination model. Similarly, for the academic anxiety model, the results revealed a good model fit to the data ($\chi^2 = 5.421$, df = 5, $p = .367$, CFI = .999, RMSEA = .022). Therefore, the linear growth curve model was used to test the whole model and the models were tested using AMOS 19 (Analysis of Moment Structures) software. In these models, it was also found that the correlation between intercept and slope factors of procrastination (r = .30) and anxiety (r = -.061) were not statistically significant, which indicated that differences in students' individual growth within each domain were not related to their level of procrastination or anxiety at the beginning of the semester. Therefore, the covariance path of intercept and slope factors within both domains were removed from the following models.

An investigation of the weekly mean scores showed that the level of academic procrastination for undergraduate students was lower than 3.5, the midpoint of the 7-point Likert scale. Additionally, the level of academic anxiety for students was lower than 2.5, the midpoint of the 5-point Likert scale. Although no clear cut-off point was determined for these variables, undergraduate students at this university were, for the most part, not dealing with high levels of procrastination, and experienced low levels of anxiety about their classes.

Results for the First Research Question

(1) In what direction and to what extent ds undergraduate students' academic anxiety and procrastination change throughout the semester?
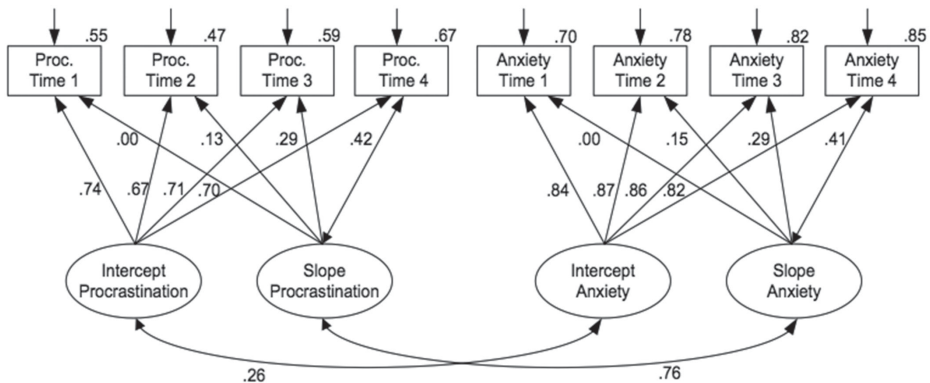

Figure 4: Two domains model with standardized coefficients (Model 1).

To examine this research question, a model (Model 1) was established using two domains (procrastination and anxiety) as shown in Figure 4.

The results showed evidence of a well-fitting model (χ^2 = 35.281 with 27 DF, p = .132, CFI = .990, RMSEA = .041). As the paths from intercept and slope factors were fixed—rather than regression weights—examination of this model was based on the intercept, slope parameters, and covariances. First of all, the intercept means revealed that the average score for academic procrastination was 3.122 (SE = .126, p < .05) and 1.840 (SE = .059, p < .05) for academic anxiety. The slope means indicated that average procrastination scores significantly increased over the semester (M = .092, SE = .044, p < .05), while academic anxiety scores significantly decreased (M = -.042, SE = .016, p < 0.05).

There were individual differences in baseline levels of procrastination and anxiety as indicated by significant variance in intercept factors of procrastination (σ^2 = 1.779, SE = .245, p < .05) and anxiety (σ^2 = 0.501, SE = .060, p < .05). Therefore, it can be said that students differed in their level of procrastination at the beginning of the semester (Time 1) (i.e., some students had a higher level of procrastination than others). Similarly, students differed in their level of anxiety at the beginning of the semester (Time 1) (i.e., some students had a higher level of anxiety than others). Moreover, by examining the significance of the variances associated with growth factors, we were able to determine if all participants followed the same growth pattern of procrastination and anxiety during the semester. The significant slope variance of procrastination (σ^2 = .071, SE = .030, p < .05) and anxiety (σ^2 = .014, SE = .005, p < .05) suggested that there were inter-individual differences in the pattern of procrastination and anxiety tendencies that students had over the semester. Namely, while some students had a higher rate of change, some students had lower rates of change in procrastination and anxiety over the semester.

Examining the significance of factor co-variation between the parameters of the two domains indicated that there is a low but significant correlation between students' initial levels of procrastination and anxiety (r = .261, p < .05) and there is a high and significant correlation between the growth patterns of students' procrastination and anxiety during the semester (r = .763, p < .05). Although students' procrastination and anxiety were positively correlated at the beginning of the semester, a decrease in academic anxiety during the semester was highly related to an increase in procrastination. Examination of the first model provides evidence of inter-individual differences. For further investigation of the variability in growth trajectories, SESRL will be incorporated into the model as a possible predictor of such heterogeneities.

Results for Research Questions 2 and 3

(2) To what extent can students' initial level of self-efficacy for self-regulation predict their academic anxiety and procrastination at time 1 (week 2)?

(3) To what extent can students' initial level of self-efficacy for self-regulation predict the rate of change in academic anxiety and procrastination over time?

To examine these research questions, which mainly focuses on explaining variabilities in trajectories (intercepts and slopes) of anxiety and procrastination, a second model (Model 2) was established with two domains (procrastination and anxiety) and SESRL added as a predictor variable (see Figure 5). Model 2 is an extension of Model 1 except with SESRL.

This second model was well-fitted to the data ($\chi^2 = 38.633$ with 31 DF, $p = .163$, CFI = .991, RMSEA = .037); however, adding SESRL as a predictor variable did not cause a significant improvement in the model ($\Delta\chi^2 = 3.352$, $\Delta DF = 4$, $p > .05$). Since this model has information on whether the trajectories (intercepts and slopes) of procrastination and anxiety can be predicted by students' initial level of SESRL, the primary interest of this model was the regression weights of the paths from SESRL to intercept and slope factors. SESRL was found to be a significant predictor of initial anxiety status ($\beta = -.275$, $p < .05$) but not of the rate of anxiety change ($\beta = -.016$, $p > .05$). Similarly, SESRL was found to be a significant predictor of the initial status of procrastination ($\beta = -.322$, $p < .05$) but not of the rate of procrastination change ($\beta = -.307$, $p > .05$). These findings suggest that students who reported higher levels of confidence in using self-regulation strategies at the initial measurement period experienced lower levels of anxiety and procrastination initially, whereas students who
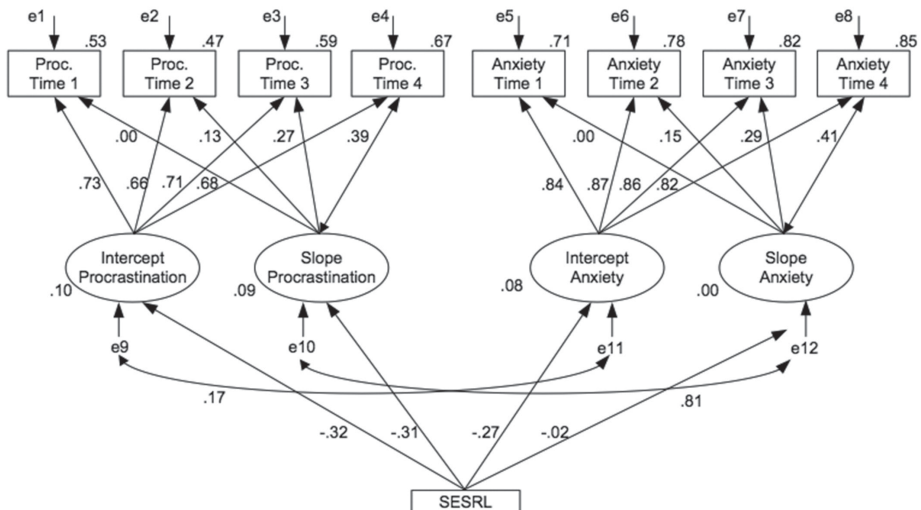

Figure 5: Two domains Model 2 with standardized coefficients.

reported lower level of confidence in self-regulation at the initial measurement period experienced higher levels of anxiety and procrastination in the beginning. In contrast, the rate of change in anxiety and procrastination over time were not predicted by students' initial SESRL level. Additionally, while the variance in intercepts explained by SESRL were excluded, the remaining variances were not significantly correlated (r = .17, p > .005). Namely, after controlling for SESRL, initial levels of anxiety and procrastination were found to be uncorrelated.

Discussion

Our study set out to examine three questions based on the relationship between anxiety, procrastination, and self-efficacy for self-regulated learning. Our first research question looked at the direction and extent to which academic anxiety and procrastination changed during a semester. As indicated by the significant intercept and slope variances of anxiety and procrastination at the first measurement, undergraduate students differ in their level of procrastination and anxiety (students' procrastination and anxiety scores varied significantly around the mean of the intercept factor) and in their change in procrastination and anxiety over the semester (students' growth over the semester varied significantly around the mean slope). It also means that there were inter-individual differences at the beginning and in growth trajectories of anxiety and procrastination. Moreover, the non-significant covariance between the intercept and slope factors revealed that students' rate of change in anxiety and procrastination were uncorrelated with their initial levels. This indicated that even if students had high or low levels of procrastination at the first measurement time, the rate of increase in their procrastination levels throughout the semester was random. That is, students' who had higher procrastination levels did not necessarily show greater increases in their procrastination levels or vice versa. This result suggests that Steel's (2007) equation of a student's utility to engage with their work differs from student to student, and in this case, shows that procrastination at the start of a semester does not predict future procrastination. Therefore, procrastination in isolation from other factors is not a good predictor of future procrastination.

In a similar fashion, the rate of decrease in students' anxiety was not dependent on their initial level of anxiety. The primary reasons for these random individual trajectories are perhaps the effect of other variables either within the environment or individualistic differences. For example, Klassen et al. (2008) found task difficulty to be an external cause of procrastination. The participants of this study were from different departments and had assignments each week that varied in difficulty level. Solomon and Rothblum (1984) found that students showed different levels of anxiety for writing assignments, weekly reading assignments, and studying for exams. Ackerman and Gross (2005) found that the characteristics of tasks, that the

participants engaged in, were important to the level of procrastination. Specifically, they found that tasks with clear instructions, involving rewards given for effort, offering independence, and that were interesting and used a variety of skills, were more commonly associated with less procrastination. They also found another factor which was the social or classroom norms that emerge from the standards that other students set within the classroom that could influence expectations in class. In the present study, there was no control over the type of task, and it is not surprising to find different individual trajectories during the semester. Individual differences among participants may include their levels of competence and strategies for coping. For example, Haghbin, McCaffrey, and Pychyl (2012) found that the relation between fear of failure and procrastination was dependent on the level of competence one felt towards their tasks. Other studies found similar results with the relationship between anxiety to procrastination being dependent upon other variables of coping, competence, or locus of control (Carden, Bryant, & Moss, 2004; Klassen et al., 2008; Klassen et al., 2009; Solomon & Rothblum, 1984; Wolters, 2003).

The relationship between anxiety and procrastination at the beginning of the semester was positive but weak. Thus, it could be said that students who were frequent procrastinators were more likely to experience a high level of anxiety about their classes during that week. The positive relationship between the initial level of procrastination and anxiety was consistent with prior studies (e.g., Onwuegbuzie, 2000; Solomon & Rothblum, 1984). However, in terms of the direction of the change during the semester, those whose procrastination showed an increase also experienced a decrease in anxiety that they felt before classes. This result contradicts what other studies have found in cross-sectional designs where anxiety tends to increase procrastination (Steel, 2007). Although there tends to be a small effect with procrastination to anxiety at one point in time, prior studies do not examine how these relate across many points in time in the longitudinal method of study. This result may relate to how each individual copes with large workloads in different ways and dealing with this procrastination may be a method for coping with the anxiety that they feel. For example, Sirois and Pychyl (2013) suggest that procrastination actually works to help the individual with short-term mood repair. These results lead into our next two research questions that examined the possible role that self-efficacy may play for self-regulated learning. Another avenue to consider in the relation between anxiety and procrastination is the adaptive function that anxiety can play in helping individuals engage in work. This relates to the model described by Steel (2007) on the cognitive estimate of utility that increases as a deadline approaches. It may also relate to Yerkes–Dodson's Law (Yerkes & Dodson, 1908) which states that arousal and performance increase together only up until a point and that too much arousal or anxiety could decrease performance. As it relates to the present study, students may need a certain level of anxiety to progress well in their school work, while too much anxiety may result in avoiding work.

Our second research question looked at whether anxiety and procrastination were predicted by self-efficacy for self-regulation. This hypothesis is based on Lazarus and Averill's (1972) theory suggesting that stress results in anxiety through the process of interpretation made by the individual and their style of coping. In this study, we looked at the concept of self-efficacy postulated and researched by Bandura (1997) as a possible mediating variable. We looked at a specific type of self-efficacy in the area of the individual feeling confidence in their abilities to self-regulate throughout the semester, whereas procrastination is seen as a failure of self-regulation. Our results show that the initial level of self-efficacy for self-regulation predicts undergraduate students' initial level of procrastination and anxiety. That is, students who had higher confidence levels in using self-regulatory strategies showed less procrastination behaviors and experienced lower levels of anxiety. These findings are consistent with existing research (e.g., Klassen et al., 2008; Klassen et al., 2009; Wolters, 2003). Additionally, when the variances of the intercepts explained by SESRL were excluded, the remaining variances of the initial levels of procrastination and anxiety were found to not correlate with each other. This finding is consistent with Haycock et al.'s (1998) study which found that there was no relationship between anxiety and procrastination after controlling for the effect of self-efficacy. This result suggests that, while examining the relationship between anxiety and procrastination, future researchers must consider psychological constructs that understand an individual's beliefs about their abilities to self-regulate as a means of dealing with increasing workloads in a positive manner (i.e., engaging in the work) rather than a negative manner (i.e., procrastinating for short-term mood repair and avoidance of anxiety).

The third research question looked at whether students' initial level of self-efficacy for self-regulation was able to predict the rate of change in academic anxiety and procrastination. The results reveal that the heterogeneity in the rate of change in procrastination and anxiety were not predicted by students' level of SESRL. The reason for this parallels the reason of the random individual trajectories. Since students did not show a systematic growth in their procrastination and anxiety levels, it is hard to predict the changes. This result may reflect the fact that SESRL has been shown to change throughout a semester and that an individual's belief in their abilities is dependent upon the environment and time at which you ask them (Bandura, 1997). Bandura (1997) showed the process of mastery experience, observational learning, positive feedback, and physiological responses in maintaining one's sense of self-efficacy. Self-efficacy for self-regulated learning may be shown to be more salient in cross-sectional designs because it is measured at the same time as anxiety and procrastination. However, in our longitudinal design we found that SESRL is still important for the relation, but it may change across a semester. This concept may relate to Corkin, Yu, Wolters, and Wiesner's (2014) study which proposed that the classroom environment and instructional practices can influence one's self-efficacy.

Their study specifically found that self-efficacy mediated the effect of an instructors support on procrastination, suggesting that support works through increasing a student's self-efficacy. The present study did not measure the change in self-efficacy that may have been due to the changing classroom environment. Another important aspect to consider is that students vary with regards to why they delay starting tasks: some use an active delay based on self-regulation, while others use delay more as a means of dealing with the aversiveness of tasks (Corkin, Yu, & Lindt, 2011; Howell, Watson, Powell, & Buro, 2006). Results of the present study cannot take this effect into account. The relation between SESRL, anxiety, and procrastination across a semester is an extremely complex phenomenon that requires further research.

Conclusion

On the basis of these findings, it can be concluded that enhancing a student's confidence and capability to strategically regulate their own learning activities may allow for alteration of a student's anxiety and procrastination behaviors. Future research may consider this same relationship on a longitudinal basis; however, controlling for task difficulty and the type of tasks—either statistically or by sampling procedures—must also be considered. Moreover, this study has some limitations. In particular, it cannot take into account many factors that have the potential to affect students throughout the semester, and therefore there should be some caution when generalizing these results. Future research should consider other personality factors that may contribute to or mediate the relationship between anxiety and procrastination. For example, impulsiveness has been found to relate to procrastination tendencies and may relate to how one may be affected by anxiety and whether one engages in constructive or impulsive behaviors. It is important to assess the effects of varying levels of anxiety and whether there is an adaptive or maladaptive level of anxiety in relation to SESRL. These results have important implications for intervention and counseling practices in that fostering a strong sense of self-efficacy for self-regulation in learning for students may lower procrastination and anxiety levels for future academic work. Such programs could teach students how to self-regulate when they feel overwhelmed by the amount of work they must complete at school and would provide strategies for dealing with difficult tasks. In this sense, students would have higher self-efficacy before the stress of school increases later in the year and, in turn, would lower anxiety and procrastination tendencies. These findings lead to the recommendation that, when considering the relationship between anxiety and procrastination, it is essential to consider the student's sense of confidence in their own ability to self-regulate.

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