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Exploring Procrastination and Self-regulated Learning Through Motivational Beliefs

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Betsy Ng is a researcher from the National Institute of Education, Nanyang Technological University (NIE/NTU), Singapore. Having a strong interest in education, Betsy has an extensive working experience as an education specialist, polytechnic lecturer, science editor, and educator in a range of educational settings. Her research expertise ranges from biological to psycho-pedagogical approach. Read more about Betsy Ng

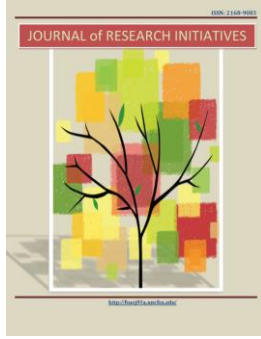
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Keywords

procrastination, self-regulated learning, motivational beliefs, self-efficacy, anxiety

Cover Page Footnote

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EXPLORING PROCRASTINATION AND SELF-REGULATED LEARNING THROUGH MOTIVATIONAL BELIEFS

Betsy Ng, National Institute of Education, Nanyang Technological University

Abstract

This study investigated the relations among procrastination, motivational beliefs, and self-regulated learning in a sample of grades eight and nine Singaporean students ($N = 442$). It examined the role of procrastination in self-regulated learning through motivational beliefs in science using structural equation modeling. The results showed positive relations of procrastination with task value, self-efficacy, and test anxiety, as well as the use of learning strategies. In addition, t-test analyses revealed significant gender and grade level differences in motivational beliefs. Procrastination accounted for enough variation in motivational beliefs to emerge as a significant predictor, suggesting that procrastination could influence motivational beliefs and improve self-regulated learning. The effect of procrastination on self-regulated learning via motivational beliefs was significant. Limitations and implications were also included.

Introduction

Procrastination is defined as the lack of self-regulation or postponement of a task (Cao, 2012). Procrastination may result in students underestimating their time to complete the given assignments and examination preparation. Procrastination has been viewed as a negative personality trait (Schraw, Wadkins, & Olafson, 2007), causing decreased long-term learning, lower self-efficacy and anxiety (e.g., Ferrari & Tice, 2000; Klassen, Krawchuk, & Rajani, 2008; Wolters, 2003). Although procrastination impedes quality in learning and academic success due to increasing anxiety and stress, procrastination remains as a prevalent practice among students. Previous studies reported that procrastination is a form of self-handicapping strategy whereas higher ability students procrastinate to become more self-regulated (e.g., Ferarri, 1991). Procrastination is common among more than 70% of college students (Schouwenburg, 1995), as it may be adaptive to successful students' academic performance. Students intentionally procrastinate as they are confident in their abilities to meet deadlines (Chu & Choi, 2005). However, there are situations whereby college students may underperform because of regular procrastination (Schraw et al., 2007). Due to these contradictory findings, more research is necessary to sort out the tendency of procrastination among students. Hence, the rationale of the present study was to establish the relations between procrastination and aspects of self-regulated learning.

Procrastination and its Dimensionality

Based on the existing literature, there are several definitions of procrastination. A general definition of procrastination is the postponement of task behavior (Schouwenburg, 1995). Specifically, Lay (1986, 1994) defined procrastination as an intentional act of postponement of a task that should be completed. Procrastination is also defined as “the act of needlessly delaying tasks to the point of experiencing subjective discomfort” (Solomon & Rothblum, 1984, p. 503)

or “quintessential self-regulatory failure” (Steel, 2007, p. 65). The term “subjective discomfort” does not really imply suffering but implies stress experienced by an individual. Procrastination is a self-handicapping strategy to avoid ego-dystonic cognition (Ferrari, 1991, 1992). Often used as an excellent excuse for poor performance, procrastination exists at work, in schools, and in daily lives. Individuals tend to engage in activities that negotiate a pleasant outcome of their behaviors. Procrastination is usually the key means to negotiate an unpleasant outcome of behaviors. For instance, if self-handicapping results in poor performance, then one will account his or her failure due to handicap and not due to personal lack of ability. In contrast, if one succeeds despite the handicap, he or she will acknowledge it as an additional credit. Nonetheless, individuals should be aware of the adverse consequences if procrastination persists. This can lead to chronic procrastination which has negative effects on self-esteem, self-confidence, and self-control of an individual (Ferrari, 1991; Ferrari & Emmons, 1995). There is also a link between chronic procrastination and high states of perfectionism, non-competitiveness, self-deception, depression and anxiety (Effert & Ferrari, 1989; Flett, Blankstein, & Martin, 1995; Flett, Hewitt, & Martin, 1995; Lay, Edwards, Parker, & Endler, 1989; Schouwenburg & Lay, 1995).

Students tend to control their effort level towards tasks or school assignments. One of the self-handicapping strategies includes students’ withdrawal of effort upon given difficult tasks or procrastination in performing school tasks. According to the study by Solomon and Rothblum (1984), 50% of 342 college students reported moderate or severe procrastination. About 25% of students believed that their tendency to procrastinate had significant effects on their grade point averages (GPAs) and quality of their lives, such as increased stress due to their continued inability to meet deadlines in college. Similarly, McCown’s (1986) findings showed that procrastinators achieved lower GPAs than those who procrastinated less and had obtained slightly higher GPAs. McCown and Roberts (1994) conducted a study on procrastination, with 1543 college students assessed by behavioral and self-reports. Procrastination was found to be a significant source of personal stress and personal procrastination belief could impede students’ academic achievement, suggesting that procrastination was a common, self-perceived problem for college students. Despite the abovementioned studies, there is still limited research on procrastination of students from junior high schools. In this study, the term “procrastination” was operationalized as postponement of academic tasks and items of Lay’s (1986) instrument that measured postponement was used.

Self-Regulated Learning and Motivational Beliefs

Pintrich’s model of self-regulated learning integrates motivational and cognitive components to predict students’ academic performance (Garcia & Pintrich, 1994). Self-regulated learning is defined as an active process that entails students’ cognitive and self-regulatory strategy use. Individuals learn through monitoring, regulating and controlling their cognition, motivation, and behavior which can be guided and constrained by their goals and contextual features in the environment (Pintrich, 2000). It is an important facet of students’ learning and academic performance as students use relevant strategies to overcome learning hindrances and regulate their effort (Corno & Rohrkemper, 1985).

According to Pintrich’s (2000) model of self-regulated learning, motivation which is conceptualized as self-efficacy, task value and test anxiety play an important role in students’ cognitive processing. This framework assumes that “motivation is dynamic and contextually bound and that learning strategies can be learned and brought under the control of the student” (Duncan & McKeachie, 2005, p. 117). Learning strategies refer to metacognitive and cognitive

strategies that students use in their learning (Pintrich & De Groot, 1990). Cognitive strategies relate to rehearsal, elaboration, and organizational strategies that students use to learn, remember and understand the subject or task. Metacognitive strategies include planning, monitoring and modifying students' cognition. Self-efficacy is defined as students' judgments of their competencies to perform a task (Zusho, Pintrich, & Coppola, 2003). Task value is conceptualized as personal characteristics towards a given task (Pintrich & Garcia, 1991; Wigfield, 1994). Test anxiety is defined as general worry and negative emotions for a particular domain or subject (Wigfield & Eccles, 1989). Test anxiety can cause negative consequences on cognition and performance (Zeidner, 1995). Recent studies reported significant evidence that achievement was negatively associated with negative emotions (Ahmed, van der Werf, Kuyper, & Minnaert, 2013; Pekrun, Elliot, & Maier, 2009; Pekrun, Goetz, Daniels, Stupnisky, & Perry, 2010).

To sum, the aforementioned self-regulated learning and motivational beliefs are aligned with Pintrich's model, highlighting a direct link between students' motivation and their ability to self-regulate their learning activities. Likewise, motivation and learning strategies are not static traits of the learner, as the learner's motivation and learning strategies may vary from course to course. Based on this conceptual framework, the Motivated Strategies for Learning Questionnaire (MSLQ) was designed to assess students' motivation and self-regulated learning in a domain or specific context (Pintrich, Smith, García, & McKeachie, 1993). In this study, the MSLQ Junior High version (Pintrich & De Groot, 1990) comprising motivational beliefs (task value, self-efficacy, and test anxiety) and self-regulated learning (learning strategies) scales were tested in Singapore secondary schools.

Procrastination, Motivational Beliefs, and Self-Regulated Learning

A variety of empirical studies has examined procrastination in relation to motivational beliefs and self-regulated learning. However, the literature mostly examined these relations between self-efficacy and procrastination through motivation or self-regulation theoretical lens. There is little research examining these associations using procrastination as the predictor of self-regulated learning through motivational beliefs (task value, self-efficacy, and test anxiety). There would not be a delay in behavior unless the individual has an intent to complete the task (Schraw et al., 2007). The amount of value placed on the academic task is important when dealing with academic procrastination (Dietz, Hofer, & Fries, 2007). Students who appreciate the value of a task would try to achieve their learning goals. If students encounter any conflicting interest or lack of interest in the given academic tasks, they will experience academic procrastination (Senécal, Julien, & Guay, 2003).

Procrastination has been studied in relation to self-efficacy (e.g., Haycock, McCarthy, & Skay, 1998; van Eerde, 2003; Wäschle, Allgaier, Lachner, Fink, & Nückles, 2014). Self-efficacy is a predictor of procrastination, revealing individuals with strong self-efficacy reported less procrastination (Haycock et al., 1998). Although self-efficacy is a predictor of procrastination, most findings revealed a modest relationship between self-efficacy and procrastination. Self-efficacy is not considered as a personality trait but a "reflection of self-beliefs that are domain specific" (Klassen et al., 2008, p. 918). This may explain why previous findings showed weak or modest relationships between self-efficacy and procrastination in an unspecified or non-specific domain. Though self-efficacy is the key construct related to procrastination, test anxiety is also another construct of particular interest.

Delaying tasks could contribute to problematic levels of anxiety (Rothblum, Solomon, & Murakami, 1986), with an estimation of between 40% (Solomon & Rothblum, 1984) and 95%

(Ellis & Knaus, 1977) of students who procrastinate academically. High levels of procrastination could contribute to high levels of test anxiety (Cassady & Johnson, 2002). Students could experience higher test anxiety when they were not prepared, and their ways of managing it was procrastination (Lay et al., 1989). Procrastinators could be at their peak experience when faced with a greater sense of challenge immediately prior to an examination. Lay et al. (1989) found a positive correlation between procrastination and anxiety. The relationship between test anxiety and procrastination could relate to students' emotion in terms of coping with the examination situation.

Recent studies examined whether procrastination is a predictor of cognitive and metacognitive strategies (Corkin, Yu, & Lindt, 2011; Fernie, McKenzie, Nikčević, Caselli, & Spada, 2016). In contrast to motivational beliefs, procrastination is viewed as a function of low levels of self-regulation (Klassen et al., 2008; Steel, 2007). In other words, procrastinators might fail to self-regulate their academic behaviors in situations of stress or high cognitive load (Ferrari, 2001). Steel (2007) asserted that procrastination research is important because it can offer some insights into the relationships between motivation and self-regulated learning. In relation to self-regulated learning, metacognitive strategy plays a key role in self-regulation as it was found to be a significant predictor of procrastination (Wolters, 2003). Although there is strong evidence to show that lower levels of self-regulation relate to higher levels of procrastination, there is no study to date that examines the role of procrastination as a predictor of self-regulated learning through motivational beliefs.

Procrastination is often perceived as a negative construct as students are less likely to adopt effective learning strategies and thereby attaining a lower academic achievement (Jiao, DaRos-Voseles, Collins, & Onwuegbuzie, 2011; Onwuegbuzie, 2004; Wolters, 2004). Students procrastinate when they are unable to manage their learning effectively, when they fear failure or when they find the given academic tasks are boring (Schraw et al., 2007). Compared to non-procrastinators, students who procrastinate tend to be unmotivated and perceive less task value (Pintrich, 2000; Schraw et al., 2007; Steel, 2007). In short, procrastinators are passive in using self-regulatory strategies.

On the contrary, procrastination may not appear bad or result in inefficiency. It can be “a deliberate self-motivating strategy for persons who are in need of intense levels of stimulation in order to be adequately motivated” (Ferrari, Johnson, & McCown, 1995, p. 11). There are individuals who work efficiently under stress or the pressure of self-manipulated deadlines only after procrastinating, and they performed quite well (Ferrari et al., 1995).

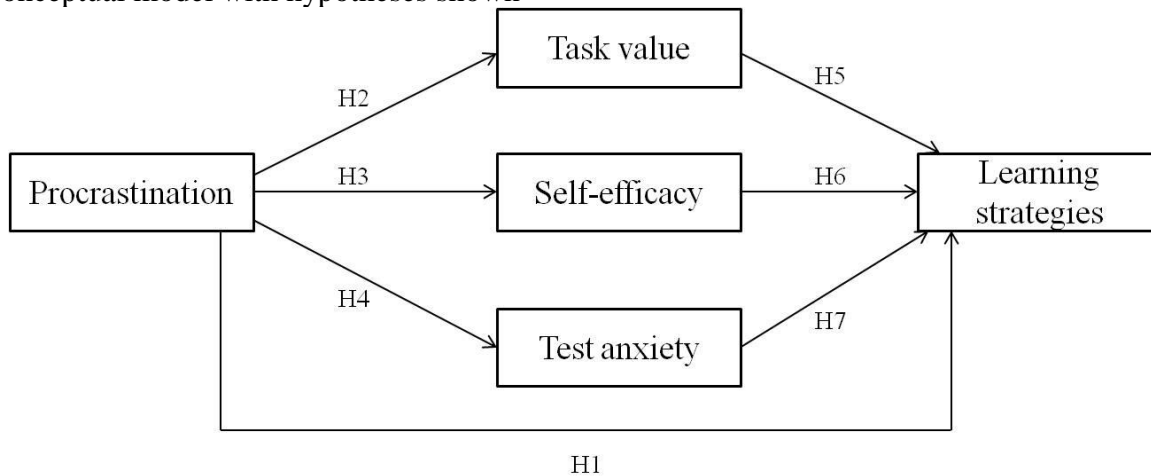
Taken together, there are limited empirical findings on the relationships among procrastination, motivational beliefs, and self-regulated learning. Due to the inconsistent findings and limited research on the combined constructs of procrastination and MSLQ, this study aimed to test for these possible relationships and examine how students' learning is affected by procrastination.

Purpose of the Study

Based on existing knowledge, there is no structural equation modeling study that examined the role of procrastination (Lay's concept on postponement) on self-regulated learning through motivational beliefs. The purpose of the present study was to examine procrastination within a self-regulated learning framework. Specifically, the aim was to determine whether procrastination would predict self-regulated learning via motivational beliefs. To investigate these relations, conceptual path analytic models were proposed to test: (1) procrastination would predict learning strategies (i.e., self-regulated learning) and (2) procrastination would be

associated with motivational beliefs which lead to self-regulated learning. Drawing on the above-mentioned literature and conceptual framework, the proposed research model is as shown (see Figure 1).

Figure 1
Conceptual model with hypotheses shown



In relation to the key research questions, the following hypotheses were tested:

- H1:** Learning strategies will be influenced by procrastination.
- H2:** Task value will be influenced by procrastination.
- H3:** Self-efficacy will be influenced by procrastination.
- H4:** Test anxiety will be influenced by procrastination.
- H5:** Learning strategies will be influenced by task value.
- H6:** Learning strategies will be influenced by self-efficacy.
- H7:** Learning strategies will be influenced by test anxiety.

Methods

Participants and Procedures

Data were collected from 442 secondary school students ($M = 14.65$, $SD = .68$) of mixed academic abilities studying in eight Singapore secondary schools. The sample comprised 211 males, 227 females (4 did not state gender) from grade levels namely Secondary 2 (i.e., Grade 8) and Secondary 3 (i.e., Grade 9).

Prior to the sample collection, ethics clearance from the university review board and permission from the Ministry of Education (MOE) were attained. For a representative sampling of local secondary school students, schools from four different school clusters (north, east, south and west zones) were invited to participate in this study and approvals from the eight participating schools' principals were obtained. Participants were briefed on the purpose of the study and the confidentiality of their responses was assured. They were informed that their participation was voluntary and they could choose to withdraw during or after the administration of the questionnaire. The questionnaires were administered in English and the participants took about 20 minutes to complete them.

Measures

For each measure, students rated themselves on a 7-point Likert scale, from 1 (*not at all true of me*) to 7 (*very true of me*) whereby the scores for the individual scales were computed by taking the mean of the items that make up the scale.

Motivated Strategies for Learning Questionnaire

Twenty-two items were adapted from the MSLQ Junior High version (Ng, Wang, & Liu, 2015) designed to measure secondary school student motivational beliefs and learning strategies in a specific academic context (i.e., science). For instance, the four scales concerning science included self-efficacy (e.g., “Compared with other students in this class, I think I know a great deal about Science”; 5 items); intrinsic value (e.g., “I prefer Science work that is challenging so I can learn new things”; 5 items); test anxiety (e.g., “I am so nervous during a test that I cannot remember facts I have learned”; 4 items); and learning strategies (e.g., “When I study for a Science test, I practise saying the important facts over and over to myself”; 8 items).

Lay’s Procrastination Scale

Four items were adapted from Lay’s (1986) procrastination scale and an example of the item was “I usually do my homework at the last minute.”

Data Analysis

To explore the construct validity of the measures used in this study, confirmatory factor analyses (CFA) were conducted using AMOS 23.0. Structural modeling analyses were carried out using AMOS 23.0. As a preliminary check for group differences, independent t-tests and Pearson's correlations were performed using the Statistical Package for Social Sciences (SPSS) 23.0. To handle any potential missing data on one variable, pairwise deletion method in SPSS was used in the analysis (Schlomer, Bauman, & Card, 2010).

Results

Psychometric Properties of MSLQ and Procrastination Scale

The measurement model analysis included 27 items yielding 5 constructs of the MSLQ and procrastination. The fit indices for the five-factor model using CFA were satisfactory ($\chi^2 = 572.00$, $df = 305$, $p < .001$, $\chi^2/df = 1.88$, $TLI = .94$, $CFI = .95$, $RMSEA = .045$, 90% CI of $RMSEA = .039$, $.050$), confirming the validity in this sample of secondary school students. The internal consistency for the five scales, namely task value ($\alpha = .79$), self-efficacy ($\alpha = .87$), test anxiety ($\alpha = .74$), learning strategies ($\alpha = .85$) and procrastination ($\alpha = .79$) were also satisfactory.

Preliminary Analyses

Independent sample *t*-tests were performed to determine if any of the main variables differed statistically as a function of demographic characteristics (gender and grade level). Table 1 presents the descriptive statistics of the independent sample *t*-tests on mean differences.

#Insert Table 1 about here#

Significant gender differences were revealed across three variables: task value ($t(426) = 2.56$, $p < .05$), self-efficacy ($t(426) = 3.44$, $p < .01$), and test anxiety ($t(426) = -2.54$, $p < .05$). An examination of the group means revealed that male students scored better in task value ($M = 5.10$, $SD = 1.03$) and self-efficacy ($M = 4.42$, $SD = 1.03$) than female students (task value: $M = 4.86$, $SD = .92$; self-efficacy: $M = 4.10$, $SD = .93$). In contrast, female students scored higher in test anxiety ($M = 4.21$, $SD = 1.18$) than males ($M = 3.91$, $SD = 1.29$). Male students appeared to procrastinate more and were less self-regulated than females, but the mean differences were not significant.

There were significant grade level differences in task value ($t(437) = -4.71, p < .001$), self-efficacy ($t(437) = -4.76, p < .001$), and test anxiety ($t(437) = -.65, p < .001$). Students in secondary 3 had higher scores for task value ($M = 5.18, SD = .92$), self-efficacy ($M = 4.45, SD = .96$) and test anxiety ($M = 4.10, SD = 1.30$) than those in secondary 2 (task value: $M = 4.74, SD = 1.01$; self-efficacy: $M = 4.01, SD = 1.00$; test anxiety: $M = 4.02, SD = 1.18$). Students in secondary 2 appeared to procrastinate more and were less self-regulated than those in secondary 3, albeit not significant at .05 level. Despite having higher perceived task value and self-efficacy, students in secondary 3 appeared to experience higher test anxiety than those in secondary 2. The explanation for this is discussed in the next section.

Descriptive Statistics and Correlations

Table 2 presents the scale means, standard deviations, and inter-correlations among the measured variables. All the variables were significantly correlated, with the exception of learning strategies and test anxiety. These correlational analyses revealed significant relationships between procrastination and the MSLQ variables. Specifically, procrastination was negatively associated with task value ($r = -.39, p < .01$), self-efficacy ($r = -.34, p < .01$) and learning strategies ($r = -.28, p < .01$), but positively correlated with anxiety ($r = .49, p < .01$). Task value was strongly correlated with self-efficacy ($r = .67, p < .01$) and learning strategies ($r = .56, p < .01$). Self-efficacy was negatively correlated with test anxiety and positively associated with learning strategies.

Table 2.

Means, standard deviation and Pearson correlations of the key variables ($N = 442$)

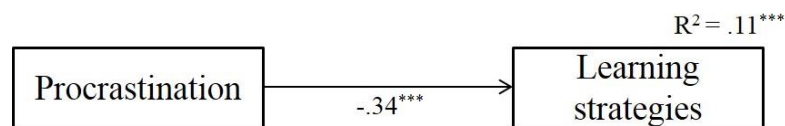
Variable	<i>M</i>	<i>SD</i>	1	2	3	4
Procrastination	3.69	1.25				
Task value	4.98	.99	-.39**			
Self-efficacy	4.25	1.00	-.34**	.67**		
Anxiety	4.06	1.25	.49**	-.23**	-.29**	
Learning strategies	4.78	1.07	-.28**	.56**	.50**	-.05

Note: ** $p < .01$

Structural Equation Modeling

The purpose of this study was to test for the role of procrastination in self-regulated learning. Controlling the gender and grade level, the first model was to show the direct relationship between procrastination and self-regulated learning. The statistical results revealed a good model fit: $\chi^2 = 515.42, df = 301, p < .001, \chi^2/df = 1.71, TLI = .95, CFI = .96, RMSEA = .040, 90\% CI of RMSEA = .034, .046$. A significant negative path between procrastination and self-regulated learning ($\beta = -.34$) emerged. This significant relationship explained 11% of variance in self-regulated learning. Figure 2 presents the first model with a standardized path coefficient and variance reported.

Figure 2



Controlling the gender and grade level, the second model examined the relationships among procrastination, motivational beliefs, and self-regulated learning. The results of model fit supported acceptable fit indices ($\chi^2 = 569.73.97$, $df = 306$, $p < .001$, $\chi^2/df = 1.86$, $TLI = .94$, $CFI = .95$, $RMSEA = .044$, $90\% \text{ CI of RMSEA} = .039, .050$). There were significant, negative path coefficients between procrastination and task value ($\beta = -.44$, $p < .001$), as well as between procrastination and self-efficacy ($\beta = -.41$, $p < .001$). In contrast, procrastination was a positive predictor of anxiety ($\beta = .66$, $p < .001$). Task value ($\beta = .51$, $p < .001$), self-efficacy ($\beta = .21$, $p < .05$) and test anxiety ($\beta = .20$, $p < .05$) had positive effects on learning strategies, whereas procrastination ($\beta = -.16$, $p < .05$) had negative direct effect on learning strategies. Together, these variables contributed to 51% of the total variance in self-regulated learning. The percentages of explained variances for the scales of motivational beliefs (i.e., task value, self-efficacy, and test anxiety) were 19%, 17% and 44%, respectively. The explained variance for the learning strategies scale indicated that procrastination played a significant role in predicting the learners' self-regulated learning. Figure 3 presents the second model with standardized path coefficients and variances reported. Table 3 shows the results of hypotheses in this study.

Figure 3
Structural model

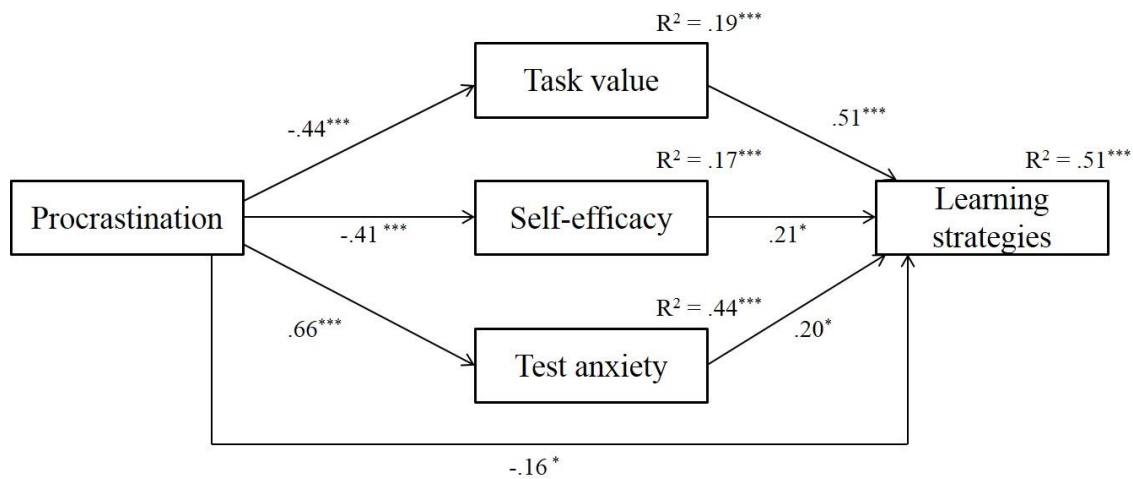


Table 3
Results of the hypotheses for the research model

Hypothesis	Conclusion
H1: Learning strategies will be influenced by procrastination.	Supported
H2: Task value will be influenced by procrastination.	Supported
H3: Self-efficacy will be influenced by procrastination.	Supported
H4: Test anxiety will be influenced by procrastination.	Supported
H5: Learning strategies will be influenced by task value.	Supported
H6: Learning strategies will be influenced by self-efficacy.	Supported
H7: Learning strategies will be influenced by test anxiety.	Supported

Discussion

The main goal of the present study was to test whether procrastination would be associated with motivational beliefs which lead to self-regulated learning. Based on the research literature on procrastination, motivational beliefs and self-regulation, a conceptual model was postulated to test the role of procrastination in self-regulated learning through motivational beliefs. Specifically, this study aimed to determine whether procrastination would predict self-regulated learning via motivational beliefs.

The higher task value score of male students suggests that boys likely held a greater interest in science than girls. Since task value and self-efficacy are strongly related, it also explains why the male students reported a higher level of self-efficacy than female students. Schiefele et al. (1992) stated that the gender difference could be accounted for interest in certain tasks or subjects. Moreover, there is evidence that boys exhibit stronger task value and self-efficacy in science than girls (Lee, Lee, & Bong, 2014; Linn & Hyde, 1989; Meece & Painter, 2008; Wolters & Pintrich, 1998). The higher test anxiety level in female students may imply that girls' likely showed greater test anxiety than boys. Consistent with previous findings, female students reported higher levels of test anxiety than males (e.g., Bandalos et al., 1995; Volkmer & Feather, 1991). This could be due to girls having lower competence beliefs than those of boys (Goetz, Bieg, Lüdtke, Pekrun, & Hall, 2013).

For significant grade level differences, students in secondary 3 had higher scores for task value, self-efficacy and test anxiety than those in secondary 2. Consistent with previous findings, mean levels of self-efficacy increase with grade level (Midgley et al., 1995; Zimmerman & Martinez- Pons, 1990). This implies that older students are more oriented to task goals and they perceive greater task value, thus leading to higher levels of self-efficacy. The prevalence of test anxiety decreases as student's self-efficacy increases (Hembree, 1988). However, the present contradictory finding suggests that lower secondary school students experienced less test anxiety than those in secondary 3 level. This could be due to the subject difficulty increases when the grade level increases. As such, secondary 3 students experienced more stress, resulting in greater test anxiety than the secondary 2 students.

The correlation results revealed that procrastination was significantly related to task value, self-efficacy, test anxiety, and learning strategies. The negative correlation between procrastination and self-efficacy was consistent with previous findings (Wäschle et al., 2014), indicating that lower procrastination was related to higher self-efficacy. Likewise, lower procrastination was also related to higher task value and frequent use of learning strategies. The negative correlations of procrastination with task value, self-efficacy, and learning strategies indicate that when students perceive procrastination, their levels of task value, self-efficacy and learning strategy use decrease. Likewise, task difficulty can promote procrastination (Senécal et al., 2003). The way students perceive the information about a task would influence their motivational beliefs (Winne & Hadwin, 1998). Therefore, students are likely to procrastinate when they do not perceive the value of a task. There is a need to develop task value by providing challenging yet achievable tasks; promote self-efficacy and foster the use of learning strategies, thereby reducing the level of procrastination.

The strong positive correlation between procrastination and test anxiety may be explained by how students perceived procrastination and test anxiety. Anxiety level could impede an individual's self-regulated learning and result in stress and poorer health (Schraw et al., 2007). Consistent with previous research, procrastination could link to anxiety (Ferrari & Tice, 2000). Test anxiety was negatively correlated with learning strategies, albeit not at the .05 significant

level. The results were consistent with previous findings indicating that for this sample of students, the effects of test anxiety were related to answering of questions at the time of testing rather than to lack of learning strategy use (Pintrich & De Groot, 1990).

Results from the path model showed that a lower level of procrastination was associated with higher level of self-regulated learning through task value and self-efficacy. Students who perceived tasks as boring are likely to procrastinate (Senécal et al., 2003). The information of a task can influence students' motivational beliefs about the task (Winne & Hadwin, 1998). Students tend to assess the interest or usefulness of the task prior to engaging in it. With this, it is plausible that students with interest in the task are likely to procrastinate less and apply learning strategies. Similarly, students' self-efficacy beliefs can relate to their ability to perform tasks, which subsequently influence their procrastination (Corkin, Yu, Wolters, & Wiesner, 2014). The inverse relationship between procrastination and self-efficacy is consistent with the previous research. Students with high self-efficacy were reported to have a low level of procrastination (Haycock et al., 1998).

On the contrary, the path model indicated that a higher level of procrastination was associated with higher level of self-regulated learning through test anxiety. Procrastination was associated with test anxiety and self-regulated learning, accounting for the greatest variance in test anxiety. Anxiety is a construct that was associated with procrastination (Haycock et al., 1998). This noteworthy finding contributes to the understanding of negative constructs, that is, procrastination was a significant predictor of test anxiety, which in turn was associated with learning strategies. Although procrastination may result in test anxiety, positive relationships may result in students' ability to self-regulate effectively when they are required to do so at the last minute (Wäschle et al., 2014). Procrastination might not play an adaptive, direct role in predicting anxiety. But through anxiety, there was a positive relationship between procrastination and self-regulated learning, implying that procrastination may play an adaptive role in this case. Alternatively, it is likely that students who work under tight deadlines can cope with procrastination despite experiencing anxiety. This noteworthy finding contributes to the existing literature on self-regulated learning. As alluded to earlier, procrastination may not result in inefficiency as there are procrastinators who work efficiently under tight deadlines (Ferrari et al., 1995).

In the path analysis, procrastination accounted for enough variation in motivational beliefs to emerge as a significant predictor. When accounting for these motivational beliefs simultaneously, the amount of shared variance between procrastination with test anxiety was the greatest, implying the increased total variance in learning strategies. This noteworthy finding showed that students' procrastination can be mitigated through motivational beliefs, and in turn improve self-regulated learning. Alternatively, students who procrastinate actively may have higher levels of purposive use of time and time control (Corkin et al., 2011), suggesting that successful procrastinators are able to self-regulate effectively under tight deadlines. In addition, they are likely to endorse a sense of choice and practice productive postponement (Ng, 2016). Overall, the effect of procrastination on self-regulated learning via motivational beliefs was significant. Although procrastination generally relates to maladaptive learning behaviors such as stress and anxiety, it may also be viewed as a "motivator" to learning for these successful (or active) procrastinators.

Practical Implications

Procrastination is likely to remain as a prevalent practice among students and this study provides several practical implications. First, understanding the role of procrastination on

motivation and self-regulated learning is important. Teachers may influence students' motivational beliefs and use of learning strategies to reduce procrastination. For instance, teachers might consider providing feedback instead of awarding grades to motivate students who procrastinate (Fritzsche, Young, & Hickson, 2003). Praising students for their effort instead of abilities can support students' self-efficacy (Dweck, Chiu, & Hong, 1995). Second, the findings are promising because procrastination is associated with motivational beliefs. Teachers may apply appropriate strategies to enhance students' interest in a task, develop their self-efficacy and reduce their test anxiety, which in turn lead to self-regulated learning. Encouraging peer workshops or teacher-student consultations can provide students with academic support (Fritzsche et al., 2003). Finally, the results of this research inform researchers that personal motivational beliefs may influence the interpretation of procrastination in relation to self-regulated learning. Future research may consider testing whether procrastination is a potential mediator, as the positive relation between procrastination and self-regulated learning through test anxiety was significant.

Limitations

Despite the promising findings, there are three limitations to consider for future research. First, the present study did not examine the mediation effects of task value, self-efficacy and test anxiety. It did not infer any indirect effect of procrastination on self-regulated learning. As the purpose of this study was to examine if procrastination would predict self-regulated learning via motivational beliefs, bootstrap analysis was not included to test for mediation effects. Second, only self-reports were used to assess students' perceptions of procrastination, motivational beliefs, and self-regulated learning. Future study should include qualitative measures to evaluate the role of procrastination. Third, the selection of variables should be expanded to cover a comprehensive self-monitoring protocol to investigate procrastination and self-regulated learning. However, it will be time-consuming and students' motivation to participate in the long survey would have decreased, which may affect the data. Based on the current research intention, these five key variables were included in this study: procrastination, task value, self-efficacy, test anxiety and learning strategies.

Conclusion

The present study extended Pintrich's research and investigated Lay's concept of procrastination. To date, this is the first structural equation modeling study that explored the role of procrastination in self-regulated learning through motivational beliefs. The structural equation model revealed the significant relationships between procrastination and motivational beliefs, as well as between motivational beliefs and self-regulated learning. These findings add to the existing literature, suggesting that procrastination may influence motivational beliefs and learning strategy use. In particular, the current findings provide practical implications that inform practitioners about the potential adaptive role of procrastination and how procrastination and motivational factors act together to predict self-regulated learning. Future qualitative research should examine how students' motivational beliefs influence their interpretations of procrastination and identify the successful procrastinators. It is prudent to examine differences in the beliefs between these successful procrastinators and unsuccessful ones. The replicable evidence is necessary to support procrastination as conducive to learning.

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Table 1.
Independent sample *t*-tests on mean differences ($N = 442$)

Variable	Gender			Grade level		
	Male ($n = 211$)	Female ($n = 227$)	<i>t</i>	Sec 2 ($n = 203$)	Sec 3 ($n = 236$)	<i>t</i>
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)		<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	
Procrastination	3.75 (1.26)	3.62 (1.22)	1.10	3.79 (1.20)	3.61 (1.29)	1.46
Task value	5.10 (1.03)	4.86 (.92)	2.56*	4.74 (1.01)	5.18 (.92)	-4.71***
Self-efficacy	4.42 (1.03)	4.10 (.93)	3.44**	4.01 (1.00)	4.45 (.96)	-4.76***
Test anxiety	3.91 (1.29)	4.21 (1.18)	-2.54*	4.02 (1.18)	4.10 (1.30)	- .65***
Learning strategies	4.70 (1.105)	4.85 (1.03)	-1.53	4.50 (1.10)	5.01 (.99)	-5.08

Note: * $p < .05$; ** $p < .01$; *** $p < .001$