Changes in Time-Related Academic Behavior Are Associated with Contextual Motivational
Shifts

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Abstract

Research in the field of time-related academic behavior (i.e., procrastination and timely engagement) has traditionally been focused on more stable factors, such as personality. Recent research suggests there may be a motivational component to these behaviors. The present study examines whether time-related academic behavior is stable across time and context, and the degree to which change is predicted by contextual and motivational factors. The sample was comprised of 453 undergraduate college students at a large public university in the Midwestern U.S. We found that time-related academic behaviors were not stable, and changes in those behaviors were most closely linked to changes in self-efficacy, self-regulation, and mastery-approach achievement goals.

Keywords: *Procrastination; Timely Engagement; Expectancy-Value Motivation; Contextual Changes; Canonical Correlation*

Changes in Time-Related Academic Behavior Are Associated with Contextual Motivational Shifts

Time-related academic behaviors (i.e. procrastination and timely engagement) present both challenges and opportunities for educators and educational systems. Time-related academic behavior can be conceptualized as encompassing either behaviors oriented toward timely completion of tasks (i.e., timely-engagement; Strunk, Cho, Steele, & Bridges, 2013), or behaviors oriented toward delaying the start or completion of tasks (i.e., procrastination; Ferrari, 1993; Lay & Silverman, 1996; Steel, 2007). For the purposes of the present study, then, procrastination was defined as a delay in starting or finishing academic tasks, while timely engagement was defined as efforts to complete tasks on time.

Many researchers have been interested in procrastination behaviors, with 46-60% of students reporting high procrastination across various studies (Onwuegbuzie, 2004; Rothblum, Solomon, & Murakami, 1986; Solomon & Rothblum, 1984). Researchers have found similar prevalence figures in various contexts, including Canadian and Singaporean students (Klassen, et al., 2009), and Turkish students (Ozer, Demir, & Ferrari, 2009), all ranging from 40-52%. Most students who report high procrastination also report a desire to procrastinate less (Onwuegbuzie, 2004).

Procrastination has, perhaps, been of particular interest to researchers in part based on the negative outcomes associated with it. High levels of procrastination have been reported to result in poorer academic outcomes, adverse psychological outcomes, and poorer health as the academic term progresses, making time-related academic behavior an issue of academic success and student well-being (Owens & Newbegin, 2000; Rothblum, Solomon, & Murakami, 1986; Tice & Baumeister, 1997). Researchers have also found a strong negative impact on academic

grades for those who report higher levels of procrastination (Owens & Newbegin, 2000; Tice & Baumeister, 1997).

Traditional Model of Procrastination

Research in time-related academic behavior (i.e., procrastination and timely engagement), however, has typically characterized actions such as procrastination as something that essentially *happens to* the individual, reflecting stable characteristics of the individual. This traditional view of procrastination has been shaped in part by prior research showing a relationship with personality traits such as high neuroticism (Hess, Sherman, & Goodman, 2000; Johnson & Bloom, 1995; van Eerde, 2003), conscientiousness (Johnson & Bloom, 1996; Moon & Illingworth, 2004; van Eerde, 2003), or high perfectionism (Flett, Blankstein, Hewitt, & Koledin, 1992; Onwuegbuzie, 2000; Saddler & Buley, 1999). Those personality characteristics have typically been considered stable, particularly among adults (Cobb-Clark & Schurer, 2012). Another potential cause of procrastination suggested by researchers is a failure to self-regulate (Brownlow & Reasinger, 2000; Senecal, Koestner, & Vallerand, 1995). This explanation for procrastination places student self-regulatory shortcomings as the stable cause of dilatory behavior, rather than directly attributing the behavior to personality (Klassen, et al., 2009; Klassen, Krawchuck, Lynch, & Rajani, 2008; Klassen, Krawchuck, & Rajani, 2008). Some researchers have conceptualized this type of self-regulatory failure as stable, even suggesting it may potentially be genetic in nature (Steel, 2007). Procrastination behaviors are cast in the literature as personality deficits thought to be inherent in the student, leading to the observable behavior of procrastination. In other words, procrastination represents *who* the student is, rather than *what* the student does in a given circumstance. If procrastination is stable and potentially

innate, it would seem to limit educators' approach to developing adaptive time-related academic behavior among students which is something students desire (Onwuegbuzie, 2004).

Refinement of the Traditional Model

The traditional model of procrastination (the time-related academic behavior that has been traditionally studied) has been challenged in more recent years by an alternative view that procrastination can be a strategic behavior the individual *chooses to perform* for motivated purposes. Recent researchers have suggested the concept of 'active procrastination' where procrastination is, in some cases, theorized to be motivated by a desire to increase academic performance (e.g., doing better closer to a deadline or under time pressure), while other cases would be classified as passive (e.g., the traditional model of self-regulatory failure or personality deficit). Several researchers have documented that some students report procrastinating in order to gain a strategic advantage (e.g., because of a belief that time pressure will improve their work) or of creating a better end product through delay (Choi & Moran, 2009; Chu & Choi, 2005; Ferrari, O'Callaghan, & Newbegin, 2005; Simpson & Pychyl, 2009). In addition, 'active procrastination' was associated with higher self-efficacy and lower extrinsic motivation than was 'passive procrastination' (Choi & Moran, 2009; Chu & Choi, 2005). Others have investigated academic task-related delays as self-regulatory strategies for delay of gratification (Bembenutty & Karabenick, 2004). Others have suggested that time-related academic behavior, and specifically procrastination, are linked with societal values and are thus more contextually driven (Dietz, Hofer, & Fries, 2007).

Emerging Emphasis on Motivation. This shift in more recent years among some researchers studying time-related behavior appears to be reflective of an interest in motivation and in viewing time-related behavior as motivated. For example, findings that students might

delay academic tasks to gain an advantage on that task (Choi & Moran, 2009; Chu & Choi, 2005; Ferrari, O'Callaghan, & Newbegin, 2005; Simpson & Pychyl, 2009) or to increase gratification received from completion of the task (Bembenutty & Karabenick, 2004) might broadly align with theories like expectancy-value theory and achievement goal theory. In an expectancy-value framework, motivation can be explained through two interrelated components: expectation for success, and subjective task value. Most typically, it has been thought that expectation for success, or self-efficacy, will predict achievement levels while subjective task value will predict persistence and choice of task (Wigfield & Eccles, 2000). In an achievement goal framework, the drive to improve performance through time-related academic behavior might be conceptualized as performance-approach behavior, with the urge to increase gratification from the task potentially conceptualized as mastery-approach oriented behavior. In achievement goal theory broadly, achievement goals are defined as mastery-approach goals, mastery-avoidance goals, performance-approach goals, and performance-avoidance goals (Elliot & Murayama, 2008; Elliot & Thrash, 2010). Mastery-approach goals are characterized by striving to develop competence or progressing in learning; performance-approach goals are characterized by seeking to demonstrate competence or perform up to a normative standard; mastery-avoidance goals are characterized by striving to avoid failing to gain competence or to avoid losing competence; and performance-avoidance goals are characterized by seeking to hide a lack of competence based on normative standards (Elliot & Murayama, 2008).

Integration with Achievement Goal Theory. Others researching procrastination have sought to understand the behavior through the achievement goal orientation framework described above. In the area of generalized procrastination research, Howell and Buro (2009) and Seo (2009) found that mastery-approach goals were associated with lower procrastination, while

mastery-avoidance goals were associated with increased procrastination. In addition, Seo (2009) found that performance-avoidance goals were also associated with increased procrastination. This line of inquiry is significant in showing motivational patterns associated with time-related academic behavior. That is, it appears such behaviors may be motivated rather than innate.

Integration with Timely Engagement. Another theoretical framework for understanding time-related behaviors goes a step further. In addition to understanding that *some* procrastination may be motivated, Strunk, et al. (2013) developed and tested a model wherein *all* time-related academic behaviors are undergirded by motivational valence (i.e. approach and avoidance). Their model, then, includes not only procrastination, but also timely engagement as types of time-related academic behavior. That is, while time-related academic behavior has typically been measured as degrees of procrastination (e.g. Owens & Newbegin, 2000; Rothblum, Solomon, & Murakami, 1986; Steel, 2007; Strunk & Spencer, 2012), the Strunk, et al. (2013) model measures procrastination or dilatory behavior, as well as timely engagement or prompt behaviors. Additionally, this model differentiates both procrastination and timely engagement behaviors by motivational valence, resulting in a 2×2 model with four ‘types’ of behavior: procrastination-avoidance (putting off work due to fear of failure, for example), procrastination-approach (putting off work for a perceived advantage due to time pressure, for example), timely engagement-avoidance (doing work in a timely manner due to fear of the consequences of putting it off, for example), and timely-engagement approach (doing work in a timely manner to achieve the best possible result, for example). See Figure 1 for a visual representation of this model.

[INSERT FIGURE 1 ABOUT HERE]

The 2×2 model of time-related behavior was studied in relationship with achievement goals in Strunk, et al. (2013). This study revealed that achievement goals predicted which behaviors were used in the academic setting, and concluded that procrastination was essentially a performance enhancement strategy while timely engagement was essentially a mastery attainment strategy. However, this study occurred within a single time point, and thus did not interrogate the potentially context-dependent nature of these behaviors. In another study of the same model, Strunk (2012) found that self-efficacy, self-efficacy for self-regulation, and achievement goals predicted time-related academic behavior within a single semester. Again, this study also did not account for potential changes in context that might related to changes in behavior type.

Because work in the traditional model has normally proceeded from the idea that procrastination arises from relatively stable factors such as personality (specifically, neuroticism and conscientiousness; Choi & Moran, 2009; Fee & Tangney, 2000; Hess, Sherman, & Goodman, 2000; Johnson & Bloom, 1995; Moon & Illingworth, 2004; van Eerde, 2003), researchers from this perspective have also tended to hypothesize procrastination as relatively stable, arising from internal dispositions rather than from the context (e.g., Steel, 2007). In other words, procrastination is likely to be a trait rather than a state, in that model.

Contextual Factors Associated with Procrastination and Timely Engagement. Rather than reflecting a stable trait, it is argued here that procrastination and timely engagement are actually states driven by more transient motivational factors. Prior researchers have found that context strongly drives motivational valence, and that achievement goals are extremely sensitive to time and context (Fryer & Elliot, 2007). For example, classroom instructional strategies and teaching practices appear to drive student achievement goal orientation (Ames & Archer, 1988;

Hagen & Weinstein, 2006), and classroom contextual factors might moderate the relationship between achievement goals and performance (Elliot, McGregor, & Gable, 1999). Kaplan & Maher (2007) suggest that socializing agents, like educators, peers, and parents, likely shape achievement goal orientation, along with classroom context and instructional approach. Other approaches to motivation also suggest context may drive motivational orientation. Peer-group interactions may drive changes in subjective task value, for example (Ryan, 2001). Eccles (2005) suggested that both expectancy for success and subjective task value are formed on the basis of contextual variables, like classroom context, available opportunities, and instructional approaches. If this hypothesis is correct, and procrastination and timely engagement are motivated, one would expect time-related academic behavior to change over time as contexts change.

Purpose of the Study

The purpose of the present study was to assess whether individuals would change in their basic ‘type’ of time-related academic behavior, as defined by Strunk, et al. (2013), when moving between contexts (courses, semesters, etc.). A further purpose was to determine to what extent change in time-related academic behavior across time would be explained by motivation variables. The following research questions guided this study:

1. What ‘type’ of clusters can be identified based on a measure of Time-Related Academic Behavior?
2. How do individuals change ‘type’ of behavior over time?
3. To what degree are motivational variables related to changes in ‘type’ of behavior?

We hypothesized that an individual’s ‘type’ of time-related academic behavior would vary and that these differences would be associated with changes in motivation variables.

Method

Participants

Participants were initially recruited during face-to-face class sessions at a large Midwestern public university. There were 453 participants, including 301 women and 152 men. Demographic data were collected from university records, and indicated that the average age of participants was 20.56 ($SD = 3.79$). In terms of ethnicity, 342 participants were white, 37 were multiracial, 22 were Hispanic/Latino, 17 were Black/African American, 16 were American Indian, 8 were Asian, and 11 were ‘other’. In terms of academic standing, on average, participants in the sample had an ACT college entrance exam score of 25.20 ($SD = 4.22$) on a scale with a maximum score of 36, college grade point average of 3.26 ($SD = .55$) on a four-point scale, and had earned an average of 72.61 college credit hours ($SD = 38.30$) where the typical undergraduate degree requires 128 completed credit hours.

Materials

Time-Related Academic Behavior. The materials included the 2×2 Measure of Time-Related Academic Behavior (Strunk, Cho, Steele & Bridges, 2013), which is a 25-item measure intended to measure procrastination and timely-engagement differentiated by approach versus avoidance motivation, modified slightly for the present study by the use of the words “in this class” in each item. Reliability estimates in prior data using coefficient alpha ranged from .81 to .87 (Strunk, et al., 2012). In the present sample, all subscales, including timely engagement-approach ($\alpha = .78$; Sample item: “I start working right away on new assignments for this class so that I can perform better on the task”), timely engagement-avoidance ($\alpha = .84$; Sample item: “I start working on tasks in this class early because I’m afraid I will fail if I don’t start right away”), procrastination-approach ($\alpha = .87$; Sample item: “I delay completing assignments in this class to

increase the quality of my work”), and procrastination-avoidance ($\alpha = .84$; Sample item: “I delay starting assignments in this class because I am afraid of failure.”) showed acceptable score reliability (DeVellis, 2003). These subscales were derived from exploratory and confirmatory factor analyses in previous research (Strunk, et al., 2012).

Achievement Goals. To measure achievement goals, the Achievement Goal Questionnaire-Revised was used in this study (Elliot & Murayama, 2008). In prior research this measure showed good reliabilities, with coefficient alpha in the .75-.89 range. This measure includes four subscales of three items each, including mastery-approach ($\alpha = .87$; Sample item: “My aim is to completely master the material presented in this class”), mastery-avoidance ($\alpha = .86$; Sample item: “My goal is to avoid learning less than it is possible to learn in this class”), performance-approach ($\alpha = .87$; Sample item: “My aim is to perform well relative to other students in this class”), and performance-avoidance ($\alpha = .88$; Sample item: “My aim is to avoid doing worse than other students in this course”). These subscales were derived from confirmatory factor analyses in prior research (Elliot & Murayama, 2008). For the present study, this scale was modified slightly to include the words “in this class” in each item.

Student Motivation. Student motivation was measured in two ways. First, the Motivated Strategies for Learning Questionnaire was used in this study (Pintrich & DeGroot, 1990). Its subscales include self-efficacy, test anxiety, cognitive strategy use, and self-regulation, all of which were derived from factor analyses. However, there is a history of using only one or two subscales of interest for a particular study (e.g. Howell & Watson, 2007, Klassen, Krawchuck, & Rajani, 2008; Klassen & Kuzucu, 2009). In the present study, only the self-efficacy ($\alpha = .79$; Sample item: “I expect to do very well in this class”) and self-regulation ($\alpha = .84$; Sample item: “I ask myself questions to make sure I know the material I have been studying”) scales were

used to examine time-related academic behavior. Among the present sample, both showed good score reliability.

Also used to measure student motivation were scales for expectancy for success and subjective task value. Items were adapted from prior research measuring subjective task value and expectancy for success (Eccles & Wigfield, 1995; Wigfield & Eccles, 2000). For subjective task value, items were included to measure utility value and intrinsic value. Utility value may be defined as value derived from the perception that a task is useful or has value for career or daily life. This scale included five items, and showed good score reliability in the present sample ($\alpha = .94$; Sample item: “This course is useful for what I want to do after I graduate and go to work”). On the other hand, intrinsic value may be defined as value derived from the perception that a task is enjoyable or interesting in and of itself. This scale included six items, and also showed good score reliability in the present sample ($\alpha = .88$; Sample item: “I am very interested in the content area taught in this class”). Finally, expectancy for success may be defined as the expectation of success on classroom tasks. This scale included five items, and also showed good score reliability in the present sample ($\alpha = .91$; Sample item: “I can do even the hardest work in this class if I try”). We included both the MSLQ self-efficacy scale and the Eccles expectancy for success scale as they measure somewhat different concepts, illustrated by the sample items from each scale. The MSLQ scale measures more outcome-related self-efficacy (e.g., expecting to perform well in the class), whereas the Eccles expectancy for success scale measure more task-related expectations (e.g., expecting to be successful in even challenging tasks).

Procedure

At the beginning of class sessions, a researcher explained the purpose of the research, distributed paper research packets containing the materials, and allowed time for all participants

to complete the materials before collecting them. Participants were asked to provide their email addresses on a separate sheet from the data for follow up survey analysis. This face-to-face data collection began in September, 2013, in the fifth through seventh weeks of the Fall term. For the longitudinal data collection, emails were sent with information about the study and a link to the online survey to students who participated in the face-to-face collection approximately one semester later, during the sixth week of the Spring semester. Of those who participated in the initial face-to-face data collection ($n = 1754$), 25.82% completed the longitudinal, online survey one semester later ($n = 453$). Attrition rates in longitudinal research vary widely, with some as low as 10% and others as high as 86% (Menard, 2002). Attrition rates in the present study are partially attributable to students leaving college (either transferring or graduating), where the university-wide attrition rate is approximately 28% from year to year. Attrition rates also tend to be higher in college student populations (Menard, 2002). However, even among samples with relatively high attrition, Cordray and Polk (1983) found that the data were still valid. In other words, attrition rates in the present study were within the normal limits of educational research, and were unlikely to meaningfully bias the results. The online system presented participants with the consent and participants signaled their consent through a checkbox. The survey instruments were then administered, and participants were offered the chance to enter for one of three \$50.00 cash prizes as an incentive for their participation. Participants were matched across time using the student identification numbers, which were removed from the data after the match was completed. The University Institutional Review Board approved these procedures, and all participants were treated in compliance with APA ethical standards.

Results

Cluster Analyses

To determine if participants would change in their basic ‘type’ of time-related academic behavior, we began by first classifying participants on time-related academic behavior using hierarchical cluster analysis, with the subscales of the 2×2 Measure of Time-Related Academic Behavior as the clustering variables. For the purpose of this analysis, data from the initial collection and the one-semester follow up were clustered simultaneously, to produce cluster solutions that fit the entire data set, so that clusters would be comparable across both time points. We examined solutions ranging from ten clusters to two clusters using the reverse scree method (Lathrop & Williams, 1987; Lathrop & Williams, 1989; Lathrop & Williams, 1990) to determine the number of clusters to retain, interpret, and use in subsequent analyses. This involved determining the amount of unexplained and error variance remaining in each cluster solution in a MANOVA using the clusters as independent variables and all four clustering variables (the four subscales of the 2×2 Measure of Time-Related Academic Behavior) as dependent variables. The results of the reverse scree analysis can be seen in Figure 2, and led us to select a four cluster solution.

[INSERT FIGURE 2 ABOUT HERE]

In order to interpret the four clusters, we compared the means of each cluster on the four clustering variables (the subscales of the 2×2 Measure of Time-Related Academic Behavior). These are plotted in Figure 3 for ease of comparison, with descriptive statistics presented in Table 1. We interpreted the first cluster as generalized timely engagement due to very low means on both procrastination subscales, and high means on both timely engagement subscales. We interpreted the second cluster as timely engagement/approach due to the relatively higher means on timely engagement subscales, but also the higher means in both procrastination and timely engagement subscales with approach valence. We interpreted cluster three as generalized

procrastination as it has an almost opposite pattern to cluster one. Finally, we interpreted cluster four as timely engagement/avoidance as it shows higher means in timely engagement, but also somewhat higher means in avoidance on both procrastination and timely engagement subscales.

[INSERT FIGURE 3 ABOUT HERE]

[INSERT TABLE 1 ABOUT HERE]

Next, we moved to the central question of the present study: would participants change clusters or their basic ‘type’ of behavior over time? We tested whether individuals varied in their cluster membership (on clusters from the analysis reported above) from the initial to the follow-up survey. There was a significant difference in cluster membership across the semester-long delay ($\chi^2_3 = 16.31, p < .001$). Specifically, 229 participants (50.55%) changed clusters. Of those in the generalized timely engagement cluster at time one ($n = 139$), 25 (17.99%) moved to the timely engagement/approach cluster, 15 (10.79%) moved to the generalized procrastination cluster, and 11 (7.91%) moved to the timely engagement/avoidance cluster, while 88 (63.31%) remained in the same cluster. Of those in the timely engagement/avoidance cluster at time one ($n = 96$), 25 (26.04%) moved to the generalized timely engagement cluster, 15 (15.63%) moved to the generalized procrastination cluster, and 12 (12.50%) moved to the timely engagement/avoidance cluster, while 44 (45.83%) remained in the same cluster. Of those in the generalized procrastination cluster at time one ($n = 113$), 31 (27.43%) moved to the generalized timely engagement cluster, 25 (22.12%) moved to the timely engagement/approach cluster, and 21 (18.58%) moved to the timely engagement/avoidance cluster, while 36 (31.86%) remained in the same cluster. Finally, of those in the timely engagement/avoidance cluster at time one ($n = 105$), 8 (7.62%) moved to the generalized timely engagement cluster, 24 (22.86%) moved to the

timely engagement/approach cluster, and 17 (16.19%) moved to the generalized procrastination cluster, while 56 (53.33%) remained in the same cluster.

Canonical Correlation Analysis

To explore how motivational factors might have explained changes in time-related academic behavior between semesters, a canonical correlation analysis (CCA) was performed on the data from participants who changed clusters ($N = 228$). CCA allows the researcher to test multiple independent (predictor) and dependent (criterion) variables simultaneously in one multivariate analysis. We used CCA as it is the appropriate methodology for exploring structural relationships, which was the purpose of the present study. As such, seven predictor variables were included in the CCA representing the difference scores between the first and second survey administration for items on the Achievement Goal Questionnaire-Revised (AGQ-R), the Motivated Strategies for Learning Questionnaire (MSLQ), a more general measure of academic expectancy for success (SSE), and a measure of subjective task value (utility value and intrinsic value). The four criterion variables represented the change in each of the four group cluster scores for participants (i.e., procrastination approach, procrastination avoidance, engagement approach, engagement avoidance).

To better inform the results of the cluster analysis, only those students who changed clusters over time were included in the CCA ($N = 228$). Specifically, we excluded from the CCA participants who did not change clusters in the analysis. The purpose of the CCA was to understand, among those who changed, which variables would predict that change. Therefore, narrowing to those participants who changed clusters on time-related academic behavior allowed for a more direct approach to the research question. The full CCA model and individual functions were evaluated using methods described in Sherry and Henson (2005). Both p values

and effect sizes were considered in the interpretation of results (Wilkinson & APA Task Force on Statistical Inference, 1999). Specifically, 1-Wilks's λ was used as an effect size because it "can be interpreted just like the multiple R^2 in regression as the proportion of variance shared between the variable sets across all functions" (Sherry & Henson, 2005, p. 42). Finally, the relative importance of variables within each function were assessed using both standardized canonical coefficients (weights) and structure coefficients (product-moment correlation between an observed variable and the canonical function scores) given their purported value in the literature (Courville, & Thompson, 2001; Henson, 2002).

The canonical correlation analysis yielded four functions (Table 2). The full model was tested first (functions 1 to 4) and determined to be statistically significant ($F_{36,799.95} = 5.309, p < .001$). This collective model also explained 55% of the variance across all predictor and criterion variable sets (Wilks' $\lambda = .448$). The model's subsequent functions were then tested hierarchically through a dimension reduction analysis. Only function 2 ($F_{24,621.27} = 3.456, p < .001$) and function 3 ($F_{14,430.00} = 2.245, p = .006$) resulted in statistically significant relationships. Because each function is specified to be orthogonal in CCA and its respective canonical correlation reflects only the residual variance not explained by the previous function, only the first two functions resulted in effect sizes (R_c^2) that merited further interpretation (36% and 20% of shared variance, respectively). The last two functions explained only 13% and 5% of the residual variance after extraction of the previous two functions.

[INSERT TABLE 2 ABOUT HERE]

Table 3 presents the standardized canonical function coefficients for the first two functions from dimension reduction analysis (function 1 and 2). Functions were interpreted first in terms of the criterion variable(s) most relevant to that function followed by the predictor

variables. The standardized canonical coefficients for function one seemed to indicate that the full model primarily predicted changes to timely-engagement approach. This conclusion was supported by timely-engagement approach also having the largest squared structure coefficient ($r_s^2 = .691$). Procrastination approach and procrastination avoidance yielded standardized canonical weights greater than .5 but shared less variance in common with the composite predictor set ($r_s^2 = .051$ and $r_s^2 = .362$). This was in contrast to timely-engagement avoidance which had a near zero canonical weight but the second largest squared structure coefficient ($r_s^2 = .414$). There is some evidence in the literature to support a strong relationship between timely-engagement approach and avoidance. The bivariate between these two variables in this study was high ($r = .855$), suggesting some level of multicollinearity, and this may have impacted the results. Of the predictor variables included in the analysis, mastery approach, both MSLQ subscales, expectancy for success and task value contributed most toward explaining differences in the criterion variable set for this function. Increases in each of these predictors was associated with increases in timely-engagement approach.

[INSERT TABLE 3 ABOUT HERE]

In the second function, procrastination-approach resulted in the largest standardized canonical coefficient. However, timely-engagement avoidance also yielded a large standardized canonical coefficient relative to the other two criterion variables. Given that this variable had a large communality across both functions (1 and 2), function 2 was interpreted as predicting changes in both timely-engagement avoidance and procrastination approach. Because the signs of the canonical coefficients for these two variables were different, procrastination approach was negatively related to changes in timely-engagement avoidance. The primary predictors of changes to these behaviors were self-regulation and self-efficacy as measured by the MSLQ.

Changes in self-efficacy were positively related to procrastination-approach and negatively related to timely-engagement avoidance. Self-regulation was positively related to timely-engagement avoidance and negatively related to procrastination-approach.

[INSERT TABLE 4 ABOUT HERE]

Discussion

The purpose of this study was twofold: First, to assess whether individuals would change in their basic ‘type’ of time-related academic behavior when moving between contexts. Our hypothesis was that ‘type’ of time-related academic behavior would be unstable, and that individuals would move between ‘types’ as they moved between contexts (through different classes and academic terms). The second purpose was to determine to what extent changes in time-related academic behavior varied due to changes in motivation.

Instability in Time-Related Academic Behavior is Explained by Motivation Variables

Our first hypothesis was supported: ‘type’ of time-related academic behavior was not stable across time and context, and in fact the majority of participants changed ‘type’ of behavior over the course of a semester. These results are supportive of the notion that time-related academic may not be stable, or tied to personality and genetic disposition as previously supposed.

Our second hypothesis was also supported: changes in time-related academic behavior were associated with changes in motivation variables. Although prior researchers had suggested achievement goals and motivational valence are driven by context (Fryer & Elliot, 2007), the same has not been previously established in time-related academic behavior. In short, based on these results, one might expect changes in motivation variables can lead to changes in time-

related academic behavior. This points to the role of context in shaping time-related academic behavior, as the motivation variables in question can be contextually driven.

If it is the case that time-related academic behavior is not stable across time and context, and that students change their basic orientation to time-related academic behavior (or ‘type’) based on various situations, then the personality (Choi & Moran, 2009; Fee & Tangney, 2000; Hess, Sherman, & Goodman, 2000; Johnson & Bloom, 1995; Moon & Illingworth, 2004; van Eerde, 2003) and genetic (Steel, 2007) explanations for time-related academic behavior would, at the least, require a more nuanced approach. Personality and genetic explanations may indeed carry weight in shaping students’ time-related academic behavior. However, in the present study, we demonstrated that time-related academic behavior was not, in fact, stable as students move from class to class, semester to semester. For traditional theories that emphasize genetics and personality to remain tenable, such theories would have to evolve to incorporate an understanding of less stable drivers of student behavior, as well. The finding that time-related academic behavior is not stable, on its own, is novel and worth noting. However, a natural question arises as to whether this is simply measurement instability or construct instability, or if changes in time-related academic behavior were predictable.

Our results demonstrate that changes in time-related academic behavior are at least partially predictable based on changes in motivation variables. In particular, the canonical correlation analysis had two meaningful functions. On the first, we were primarily able to predict timely engagement-approach. That is a particularly meaningful prediction, as timely engagement-approach is theoretically the most adaptive ‘type’ of behavior. As a result, understanding predictors of increases in timely engagement-approach behaviors may be particularly useful in devising intervention strategies to encourage students to develop more

adaptive academic behavior. In this case, increases in mastery approach goal orientation, self-efficacy, and self-regulation all predicted increases in timely engagement-approach behavior. Researchers have previously documented strategies for increasing mastery-goals (Ames, 1995; Meece, Anderman, & Anderman, 2006; Morron, Harkness, D'Ambrosio, & Caulfield, 2004), for improving self-efficacy (Gist & Mitchell, 1992; Pajares, 1996; Schunk & Ertmer, 2002), and increasing self-regulation (Boekaerts & Corno, 2005; Dignath & Buttner, 2008). As a result, it is possible that existing intervention strategies might prove useful in increasing timely engagement-approach.

The second canonical function was primarily predictive of procrastination-avoidance. This, too, is perhaps particularly meaningful because procrastination-avoidance is theoretically the most maladaptive 'type' of time-related academic behavior. The primary predictors were self-efficacy and self-regulation, which, as noted above, have shown malleability to intervention in prior research. It may, then, be possible that existing intervention strategies might also prove useful in decreasing procrastination-avoidance.

It seems that the most adaptive time-related academic behavior (timely engagement-approach) and the most maladaptive (procrastination-avoidance) are both associated with a similar set of motivation variables. In particular, both are associated with changes in self-efficacy and self-regulation. Future researchers may find a focus on interventions targeted toward self-efficacy and self-regulation promising, as in the present study increases in these two motivation variables was associated with increases in adaptive behavior, and decreases in maladaptive behavior.

Limitations

The present study has limitations. First, generalizability is limited by the use of only one university in the sample (perhaps other universities, with different motivational environments, different kinds of students, and different instructional norms would exhibit different results). Future studies can address this limitation through the use of multi-site data collection. Although the university was relatively well-represented in the sample for the present study, it may not generalize to other locales. In addition, although the study was longitudinal, we have little information regarding how changes across time in context, instructional style, campus events, etc., might have influenced the changes in motivation variables and time-related academic behavior. In other words, while we know that changes in motivation were associated with changes in time-related academic behavior, these data do not support a causal link. Future research can address this limitation through the use of experimental methods aimed at systematically varying the context through changes in instructional style, student activities, or attempts to manipulate motivational orientation. The study is subject to methodological limitations, as well. It is possible that some of the unexplained and error variance in this study could be explained by systematic variation in the face-to-face versus online data collection methods. Method variance could contribute to unreliability across time in scores and cluster memberships. While a meaningful portion of longitudinal variation was explained by changes in motivation, this explanation might be improved by accounting for method variance differently in future studies. Despite the limitations on generalizability and inference in the present study, the results are novel and suggest a promising area for continued research.

Conclusion and Implications

The present study has many implications for theory and research on time-related academic behavior. The finding that time-related academic behavior ‘type’ is not stable, as

previous researchers have suggested, is novel and calls for more research to understand that instability and what it means for the idea that time-related academic behavior is personality-driven. The finding that changes in time-related academic behavior are associated with changes in motivation variables, perhaps most notably self-efficacy and self-regulation, opens an opportunity for future intervention research. The field of research on time-related academic behavior has typically been descriptive, with very few intervention studies (c.f., Strunk & Spencer, 2012). The present study points to possible variables on which future researchers can intervene in an attempt to develop effective interventions for encouraging adaptive time-related academic behavior.

In summary, the present study challenges the traditional assumption that procrastination and other time-related academic behaviors are stable, and offers evidence of potential sources of change in such behaviors. These results offer the opportunity for a shift in theory about time-related academic behavior, and some beginnings for pursuing effective interventions.

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Table 1

Means and Standard Deviations for Clustering Variables by Cluster

Cluster	Procrastination-Avoidance		Procrastination-Approach		Timely Engagement-Avoidance		Timely Engagement-Approach	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
1. Generalized Timely Engagement	1.61	.59	1.80	.70	5.70	.79	5.93	.67
2. Timely Engagement/Approach	2.07	.71	2.97	.79	3.64	.66	4.13	.64
3. Generalized Procrastination	3.26	1.18	4.34	1.28	2.49	.69	2.82	.81
4. Timely Engagement/Avoidance	3.47	1.07	3.38	1.10	4.80	.65	4.61	.67

Table 2

Canonical Correlations and Eigenvalues for Each Function Separately.

<i>Root No.</i>	<i>Eigenvalue</i>	<i>%</i>	<i>Cumulative %</i>	R_c	R_c^2
1	.552	58.256	58.256	0.596	0.356
2	.249	26.285	84.540	0.447	0.199
3	.091	9.585	94.125	0.289	0.083
4	.056	5.875	100.000	0.230	0.053

Table 3

Standardized Canonical Coefficients, Structure Coefficients, and Communalities for Criterion and Predictor Variables for Interpreted Canonical Functions (1 to 4 and 2 to 4)

Variables	Coef	r_s	r_s^2	Coef	r_s	r_s^2	h^2
Predictor							
AGQ-R							
Mastery Approach	0.210	.678	.460	0.161	-.032	.001	<u>.461</u>
Mastery Avoidance	0.089	.474	.224	-0.404	-.163	.027	.251
Performance Approach	0.034	.521	.271	-0.403	-.245	.060	.332
Performance Avoidance	0.079	.459	.211	0.358	.076	.006	.216
MSLQ							
Self-Efficacy	0.267	.741	.549	-0.734	-.385	.148	<u>.697</u>
Self-Regulation	0.291	.738	.545	0.962	.545	.297	<u>.843</u>
Expectancy for success	0.299	.646	.417	-0.018	-.023	.001	<u>.418</u>
Subjective Task Value							
Utility Value	-0.247	.460	.211	0.141	-.051	.003	.214
Task Value	0.417	.647	.419	-0.142	-.092	.008	<u>.427</u>
R_C^2			.355				.199
Criterion							
Procrastination Approach	0.542	-.226	.051	-.969	-.835	.698	<u>.749</u>
Procrastination Avoidance	-0.617	-.601	.362	.427	-.074	.005	.367
Engagement Approach	0.882	.831	.691	-.469	.441	.194	<u>.885</u>
Engagement Avoidance	0.029	.644	.414	.664	.646	.417	<u>.832</u>

Note: **Bolded** values reflect those predictor and criterion variables identified to be most relevant to each function. Underlined values represent communalities $h^2 > .45$ across both functions. Communalities were computed by adding the squared correlations between variables and either predictor or criterion variables and canonical variables. AGQ-R is the Achievement Goal Questionnaire-Revised, MSLQ is the Motivated Strategies for Learning Questionnaire.

Table 4

Correlation Coefficients, Means, and Standard Deviations for Criterion and Predictor Variables.

Variable	PrAp	PrAv	TEAp	TEAv	AGQ	ACQ	AGQ	AGQ	MSLQ	MSLQ	SERR	IVRCI	UVRC
PrAp	--												
PrAv	.532	--											
TEAp	-.483	-.303	--										
TEAv	-.483	-.194	.855	--									
MasAp	-.086	-.264	.314	.252	--								
MasAv	.073	-.056	.230	.195	.457	--							
PerAp	.013	-.164	.226	.116	.538	.297	--						
PerAv	-.038	-.096	.255	.223	.368	.444	.565	--					
MSLQ_SE	-.018	-.331	.277	.122	.446	.194	.421	.265	--				
MSLQ_SR	-.335	-.310	.470	.413	.423	.284	.314	.276	.451	--			
SERR	-.033	-.119	.363	.273	.189	.303	.165	.163	.389	.403	--		
IVRCI	-.040	-.264	.268	.235	.509	.141	.255	.171	.464	.318	.188	--	
UVRCI	-.040	-.170	.213	.159	.522	.162	.233	.139	.464	.287	.146	.742	--
M	.047	.399	.224	.265	-.043	.135	-.046	-.034	-.156	.081	.075	.006	-.063
SD	1.238	1.308	1.316	1.297	1.203	.986	.989	.999	1.212	1.025	1.104	1.847	1.081

Note: Variables names have been abbreviated for space. Variables (above) include the four identified clusters from the cluster analysis (procrastination-approach [PrAp], procrastination-avoidance [PrAv], timely engagement-approach [TEAp], and timely engagement-avoidance [TEAv]), four dimensions of the Achievement Goal Questionnaire-Revised (mastery approach [MasAp], mastery avoidance [MasAv], performance approach [PerAp], and performance avoidance [PerAv]), two dimensions of the Motivated Strategies for Learning Questionnaire (self-efficacy [MSLQ_SE] and self-regulation [MSLQ_SR]), expectancy for success (SERR), intrinsic value (IVRCI) and utility value (IVRCI). A full description of variables is available in the section on the study method.

Figure 1.

2 x 2 Model of Time-Related Academic Behavior

Note: Adapted from Strunk, K. K., Cho, Y., Steele, M. R., & Bridges, S. L. (2013). Development and validation of a 2x2 model of time-related academic behavior: Procrastination and timely engagement. *Learning and Individual Differences*, 25(1), 35-44.

Figure 2.

Plot of Unexplained and Error Variance (vertical axis) by Number of Clusters (horizontal axis) on Clustering Variables

Figure 3.

Means (horizontal axis) on Clustering Variables by Cluster Across Combined Longitudinal Data