Evidence for Decreasing Academic Procrastination through the Incentives and Consequences of Competition

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Abstract

Academic procrastination involves the delay of a task with the knowledge that such delay could result in future consequences, which could include lower grades and accumulated stress. In the present study, participants heard directives that induced different levels of competition in an attempt to decrease state procrastination. Participants also completed questionnaires to assess their personality characteristics, executive functioning (i.e., working memory, planning), and academic procrastination to determine the relationships between state and trait procrastination, personality traits, and executive function. Results revealed that Conscientiousness, Neuroticism, and all executive function subscales were statistically significant predictors of trait procrastination, but failed to predict state procrastination. Findings related to the manipulation provided evidence that, relative to individuals in a control condition, participants who were in experimental conditions in which perceived competition was increased, had lower state procrastination. Lastly, the implications on future research and the divergence between state and trait procrastination are discussed.

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Procrastination is characterized by the voluntary delay of a task combined with the understanding that such delay will likely result in later deleterious consequences (Park & Sperling, 2012; Steel, 2007). Procrastination involves the delay of a task that has known rewards or consequences contingent upon the quality of the finished product. By delaying the start or completion of academic work, students create disadvantageous situations for themselves. The disadvantage brought on by procrastinating leads to well-known academic consequences and, consequently, the delay is generally considered irrational (Silver & Sabini, 1981). Although some researchers argue that active procrastination is conducive to student success (Chu & Choi, 2005), others assert that all types of procrastination are generally self-handicapping behaviours that leave students with less time to complete tasks and results in lower quality work (Ferrari & Tice, 2000; Klassen, Krawchuk, & Rajani, 2008; Park & Sperling, 2012; Schraw, Wadkins, & Olafson, 2007; Steel, 2007; Steel & Klingsieck, 2016).

The literature on procrastination includes many different research paradigms and theoretical explanations and is examined in the next section. The different types of procrastination, individual differences related to procrastination, the personality of the student, the economic principles of hyperbolic discounting theory (HDT) and temporal motivation theory (TMT), and the current therapeutic orientation of the field will be explored. This analysis will serve to introduce the rationale for the present study, its underlying hypotheses and methodology, and suggestions for future research.

1.1 Prevalence and Consequences of Procrastination

Procrastination is common among student populations, 75 to 95% of students report that they engage in procrastinatory behaviours, and 90% of undergraduates report spending one hour or more procrastinating per day (Klassen et al., 2008; Steel, 2007). Furthermore, between 20 and 30% of these students reported chronic or severe procrastination that occurred across a wider variety of activities, and for longer periods of time, respectively (Ellis & Knaus, 1977; Klassen et al., 2008).

In order of prevalence, procrastination was most common for writing activities, studying for tests, and reading tasks (Senecal, Koestner, & Vallerand, 1995; Solomon & Rothblum, 1984). Moon and Illingworth (2005) demonstrated that procrastination increases as the semester progresses, but then, due to a fixed end date, decreases at the end of term. Although the frequency of procrastination in students is troublesome, a more insidious view of the behaviour is provided when the various potential consequences associated with the behaviour are considered.

Procrastination has been linked to unsatisfactory performance, stress, illness, depression, anxiety, late submissions, and a lower grade-point average compared to non-procrastinating peers (Dewitte & Schouwenburg, 2002; Ferrari, O'Callaghan, & Newbegin, 2005; Fritzeche, Young, & Hickson, 2003; Klassen et al., 2008; Tice & Baumeister, 1997). Although procrastination may temporarily shield an individual from negative emotions, there is no correlation between positive affect and procrastination at the time the behaviour occurs (Solomon & Rothblum, 1984); however, there is a significant positive correlation between guilt and procrastination (Pychyl, Lee, Thibodeau, & Blunt, 2000). Past research has overwhelmingly concluded that

procrastination is disadvantageous and thus it is unsurprising that 55-65% of students report that they would like to reduce their procrastinatory behaviour (Solomon & Rothblum, 1984; Steel, Svartdal, Thundiyil, & Brothen, 2018). Despite the established negative consequences, some researchers suggest that procrastination is not necessarily a detrimental behaviour (Chu & Choi, 2005). Instead, there are theoretical assertions that the negative consequences of procrastination are not uniformly negative, but rely on procrastination type.

1.2 Types of Procrastinator

Chu and Choi (2005) suggest there are two types of procrastinators: active and passive. The active procrastinator is capable of formulating decisions and acting upon them in a timely manner. Although these individuals still procrastinate, the behaviour only occurs because they opt to prioritize their time and energy to focus on other important tasks. The passive procrastinator is the traditionally conceptualized procrastinator. They do not intend to put off academic work, but experience difficulties with starting or completing a task because of a lower decision making and follow through proficiency (Chu & Choi, 2005). Passive procrastinators are comparatively worse than active or non-procrastinators at setting achievable goals and consequently, their actions are more likely to lack clear direction and, thus, are less effective.

The discrepancy between intent and action is often referred to as an intention-action gap and is brought about by preference reversal (Steel et al., 2018). This occurs when an individual plans or intends to follow a specific course of action, but situational variables lead to a disruption of the original goal and to the pursuit of unrelated actions (Steel et al., 2018). For example, at the beginning of the week, a student may plan to

spend Wednesday evening studying; however, when he or she is invited to a social event, preference reversal occurs. Consequently, the student will socialize instead of study because the reward of socializing is guaranteed, temporally near, and thus is likely to be perceived as more attractive.

There is evidence that the passive and the active procrastinator differ on behavioural, affective, and cognitive dimensions (Chu & Choi, 2005). Behaviourally, active procrastinators make a conscious decision to devote their time to other important tasks while passive procrastinators pursue unproductive ventures. The active procrastinator is affectively motivated by the stimulation born from pressure while the passive procrastinator tends to wither in the face of such pressure. Cognitively, the active procrastinator plans to work on many things in a short timeframe in order to achieve the most they can in the shortest possible time. Conversely, the passive procrastinator does not intend to procrastinate, but ends up doing so because of a comparative deficit in the ability to make timely decisions and to act upon them (Chu & Choi, 2005).

Solomon and Rothblum (1984) note that procrastination could be viewed as a strategy to temporarily regulate negative emotions. Procrastination can reduce stress associated with future deadlines and thus, facilitates temporary relief from deadlines and work-related stress (Baumeister, Heatherton, & Tice, 1994). Unfortunately, this strategy has affective consequences for the passive procrastinator. As a deadline approaches, passive procrastinators are prone to heightened anxiety and tend to doubt their ability to achieve acceptable results (Ferrari, Parker, & Ware, 1992). Essentially, passive procrastinators make behavioural investments (e.g., delay) that lead to a greater degree

of future stress instead of working in the present so as to eliminate or reduce the cause of their stress. Conversely, when active procrastinators face an encroaching deadline, they respond affectively by feeling challenged and motivated (Chu & Choi, 2005).

The affective response of feeling challenged and motivated guards the active procrastinator against many of the detrimental consequences associated with procrastination. Consequently, the active procrastinator embraces the pressure associated with an encroaching deadline and often outperforms the passive procrastinator (Chu & Choi, 2005). Conversely, it is the feelings of inadequacy and self-doubt elicited by the looming deadline that facilitate delay in the passive procrastinator (Chu & Choi, 2005). The pressure associated with the deadline leads to a negative affective response that is characterized by guilt and depression and generally leads the passive procrastinator to crumble (Steel, Brothen, & Wambach, 2001).

The differences in cognitive and affective pathways used by active versus passive procrastinators underlie the differences in behavioural outcomes (Chu & Choi, 2005). Because of their adaptive evaluation of the situation, the active procrastinator is persistent in the face of pressure and is therefore likely to complete the assigned task(s). On the other hand, the cognitive and affective pathways used by the passive procrastinator makes them more likely to surrender to their own negative expectations and evaluations of the work they are likely to produce. These evaluations may inhibit the passive procrastinator from starting or completing the assigned task (Chu & Choi, 2005). Thus, the ability to organize one's own activities in the service of specific goals and negative perceptions of one's own work may be the pivotal differences between active and passive procrastinators.

Unsurprisingly, students who possess a sense of academic purpose and structure their time, report higher levels of psychological well-being and more efficient study habits than those who lack such structure and purpose (Dipboye & Phillips, 1990). Chu and Choi (2005) posited that there are few differences between the non-procrastinator and an active procrastinator. They argue that both types escape the intention-action gap; the difference is that the active procrastinator is oriented towards completing the most work in the least amount of time. This orientation is what leads them to have to complete the majority of work near a deadline. This is plausible, but the implied workload does not necessarily align with that which is usually encountered in the post-secondary setting.

Although post-secondary course requirements and expectations vary, the distribution of a course outline at the beginning of a course is commonplace. The outline contains information regarding assignment guidelines and due dates and, as such, largely (if not entirely) eliminates the element of surprise. This is important, as one of the premises underlying the behaviour of the active procrastinator, is that these individuals always have incoming and ongoing obligations and thus are in a perpetual state of finishing an assignment as another deadline approaches. The behaviour associated with this premise reveals a critical difference between the active procrastinator and the non-procrastinator.

For example, if an active procrastinator and a non-procrastinator are enrolled in five courses and notice there is a three day span in the middle of the semester in which four separate assignments are due, they are likely to respond differently (Chu & Choi, 2005). Although the non-procrastinator is likely to begin and complete the assignments

early, the active procrastinator is expected to wait until the deadlines become imminent so they can work beneath the pressure they relish. The critical difference is that the active procrastinator makes the conscious decision to wait in order to capitalize on the motivation they gain from deadline pressure (Chu & Choi, 2005).

The task delay that an active procrastinator engages in should be considered maladaptive relative to the early start and completion of work by the non-procrastinator. Although active procrastinators face fewer consequences than the passive procrastinator, they still have lower life satisfaction, GPAs, and less time structure than non-procrastinators (Chu & Choi, 2005). To clarify the negative consequences related to procrastination we can relate them to physiological measures using a triathlon analogy. For example, GPA as heart rate, negative affective consequences (guilt, depression, anxiety) as blood pressure, and the timeframe in which the assignment is completed as the timeframe to finish the race.

The hypothetical athletes realize that successful completion of a triathlon involves performing three events in a single day; however, in a convenient twist the athletes are told that they have the option to complete the swimming, cycling, and running components on separate days. One athlete (the non-procrastinator) seizes this opportunity and completes each portion on a separate day. The other athlete (the active procrastinator) completes all components on the last possible day because he or she believes the pressure associated with the deadline enhances their performance. All else considered, the athlete who completes the segments on different days will face less physiological stress and have a faster time than the athlete who completes all segments in a single day, just as the non-procrastinator is likely to have a superior performance

compared to the active procrastinator. Where the former athlete is likely to have a faster time and shorter periods of elevated heart rate and blood pressure, the non-procrastinator is likely to have a superior GPA and fewer (if any) affective consequences (Chu & Choi, 2005).

According to Steel's (2007) definition of procrastination, the functional delay that active procrastinators utilize precludes their actions from being described as procrastinating (Steel & Klingsieck, 2016). This is because when they procrastinate, they do not expect themselves to be worse off for having engaged in the behavior and believe their procrastination is advantageous. Research shows that not only are active procrastinators significantly less disadvantaged by their procrastination compared with passive procrastinators, but that active and passive procrastination are entirely separate constructs (Chu & Choi, 2005; Kim & Seo, 2015).

Passive/traditional procrastinators are posited to suffer from a lack of organizational effectiveness and be less adept at structuring their time. Because they are unable to accurately assess and respond to the urgency of a given task, they are likely to drift aimlessly from one activity to another (Bond & Feather, 1988; Chu & Choi, 2005). This lack of organization is compounded by the fact that passive procrastinators are likely to underestimate the amount of time required to complete an assignment (Lay, 1990). This implies that passive procrastinators will not be able to adjust their schedule to avoid mistakes or to complete the assignment with the quality originally intended.

1.3 Personality and Individual Differences

1.3.1 Coping Strategies

When dealing with the stress associated with procrastination, three strategies are commonly used: task-oriented, emotion-oriented, and, avoidance-oriented (Endler & Parker, 1994). Those who adopt a task-oriented strategy attempt to reduce stress by attending to immediate problems. This is naturally the most effective strategy, as it addresses the catalyst of the stress rather than a sign or symptom of it. Active and non-procrastinators normally use such task-oriented strategies (Chu & Choi, 2005).

Individuals who use emotion-oriented strategies use a type of stop-gap approach to alleviate the emotional consequences elicited by a given stressor as a method to temporarily shield themselves from the stressor (Kariv & Heiman, 2005). For example, if a looming deadline elicits stress, a student may seek social support or comfort in order to deal with the emotional consequences associated with the deadline. These support seeking strategies are less efficient than completing the assignment and thus, represent a less direct coping strategy relative to a task-oriented approach. Lastly, those who employ avoidance-oriented coping strategies try to distract themselves from the stressor or ignore it entirely (Kariv & Heiman, 2005). Behaviour associated with this coping strategy is evident in students who, for example, choose to binge watch a television series or clean their rooms in order to distract themselves from the stress associated with a looming deadline. The behaviour associated with this coping style again does nothing to directly confront the catalyst of the stress felt by the student.

Although an emotion-oriented coping strategy does not directly confront the stressful catalyst, it may regulate emotional distress that, in turn, may make assignment

completion more likely. As such, both task and emotion-oriented coping strategies could be considered proactive (Kariv & Heiman, 2005). Although neither an emotion-oriented or avoidance-oriented strategy directly confront the situation that causes stress, the emotion-oriented strategy does address the emotional consequences. Conversely, an avoidance-oriented coping strategy functions to distract the student from an imminent and unavoidable problem. For these reasons, the use of an emotion-oriented strategy is preferred to an avoidance-oriented strategy.

The strategy an individual adopts is influenced by the nature of the situation-specific stressor. For example, people are most likely to adopt a task-oriented strategy when they believe they are capable of constructive action related to the stressful situation and when facing a situation in which there is little or control, emotion or avoidance-oriented strategies are more likely to be selected (Folkman & Lazarus, 1980).

It is important to note that the subjective evaluation of a stressful academic situation can markedly differ from an objective one. For example, if a student performed so poorly in a class that they could not pass regardless of final exam performance, activities aimed at distraction or the alleviation of the associated unpleasant emotions are futile. If instead the student adopted a task-oriented strategy and searched for ways to alleviate the magnitude of the consequence (e.g., course withdrawal or instructor consultation), they may avoid the worst possible consequence (e.g., a recorded failure on their academic record). By analyzing and responding to the fluctuating academic situations using a task or emotion-oriented coping strategy, students afford themselves with the greatest probability of success (Endler & Parker, 1994). Adopting an

avoidance-oriented coping strategy through distractions makes students less likely to avoid undesirable academic outcomes (Chu & Choi, 2005).

Procrastinators may possess personal characteristics that make them more likely to choose maladaptive coping strategies. In a meta-analysis, Sirois and Kitner (2015) reported that procrastination was positively correlated to the selection of maladaptive (e.g., avoidance-oriented) coping strategies, r = .31, and negatively correlated to the use of adaptive coping strategies, r = -.24. Although situational variables influence the selection of specific coping strategies, individual characteristics and cognitive appraisals are also predictive of specific behaviours. For example, higher self-efficacy makes the selection of an advantageous coping strategy (e.g., task or emotion-oriented) more likely (Devonport & Lane, 2006; Folkman & Lazarus, 1980) and research has shown that passive procrastinators have lower self-efficacy compared to active or non-procrastinators (Chu & Choi, 2005). Thus, the use of maladaptive coping strategies could further decrease the likelihood that the passive procrastinator meets deadline and quality goals, which could lead to a further reduction in perceived self-efficacy; unfortunately, these two negative outcomes can perpetuate each other (Chu & Choi, 2005; Devonport & Lane, 2006).

1.3.2 Motivation

When trying to determine why a student procrastinates, it is important to consider personal motivations. Self-determination theory (Deci & Ryan, 1991) describes intrinsic and extrinsic motivation. Intrinsically motivated students would pursue higher education because it brings them pleasure or interests them. Conversely, an extrinsically motivated student would pursue higher education because of external pressures or

rewards (Deci & Ryan, 1991). Thus, an extrinsically motivated student could become bored with the task of writing a term paper in an elective course because the subject matter does not align with their goals. On the other hand, intrinsically motivated students relish the opportunity to learn and hone their intellectual skills. Students who are extrinsically motivated or possess an amotivational style (e.g., a student not motivated by learning or rewards) toward their academic pursuits are most likely to procrastinate (Rakes & Dunn, 2010; Senecal et al., 1995). Given this, it is unsurprising that the passive procrastinator is most likely to be extrinsically motivated toward their academic pursuits and those who are intrinsically motivated are least likely to procrastinate (Chu & Choi, 2005; Senecal et al., 1995).

The motivational style of the student influences their preference for a given academic task (e.g., the preference, or lack thereof, for an academic task influence whether the student procrastinates). For example, if the student frequently watches television or plays video games instead of completing academic assignments, the behavioural pattern indicates an inability to moderate the preference for those activities in the presence of more important work. This result is particularly detrimental if the student falls into a preference loop, which occurs when the student prefers watching television, doing chores, or exercise, and engages in those activities in a loop instead of completing assignments (Andreou, 2007).

1.3.3 Self-Regulation

Self-regulation involves the ability to control one's behaviour, thoughts, emotions, and impulses (Baumeister et al., 1994). Self-regulated learners often possess cognitive strategies that enhance their learning (Pressley, Borkowski, & Schneider,

1987). Furthermore, self-regulated learners tend to be meta-cognitively skilled (i.e., they are knowledgeable about the processes of thinking and learning) and consequently have the requisite skills to effectively monitor and control these operations (Pressley et al., 1987). These learners often possess a variety of attitudes and beliefs that orient them toward their goals and enhance their self-efficacy (Schunk & Ertmer, 2000).

Balkis and Duru (2016) theorized that a lack of self-regulation could be due to either underregulation or misregulation. According to the researchers, underregulation plays a significant role in academic procrastination and occurs when the student fails to maintain motivation, set standards, or appropriately monitor performance (Balkis & Duru, 2016; Howell & Watson, 2007). The misregulated self-regulation failure occurs when procrastination becomes an emotional regulation strategy to dampen the bad moods brought on by an aversive task (Sirois & Pychyl, 2013). Both types of self-regulatory failure have implications for procrastination.

The negative affect associated with misregulation is associated with higher levels of procrastination and lower academic satisfaction (Balkis & Duru, 2016). This pattern may be a positive feedback loop, as Ciarrocchi (2001) found that doing unpleasant tasks typically worsens one's mood. Unfortunately, this means that poor mood brought on by the task may not only stem from procrastination, but also lead to it. Another self-regulatory factor that influences a student's likelihood to procrastinate is the motivational orientation a student has toward their goals. Possible orientations include a mastery goal orientation, a performance goal orientation, and a work avoidance orientation (Wolters, 2003).

The self-regulated learner is most likely to possess a mastery goal orientation (Pintrich, 2000), which involves the desire to improve one's level of ability and increase proficiency. This orientation is associated with greater perseverance and self-efficacy (Hsieh, Sullivan, & Guerra, 2007). Wolters (2003) found that students with a mastery goal orientation procrastinated the least and those who adopted a work avoidance orientation procrastinated the most. Students could also have a performance goal orientation, which indicates a desire to out-perform or prove one's self-worth to others, and to achieve good grades or other extrinsic rewards (Wolters, 2003). This goal orientation is associated with a preference for easier tasks and giving up when faced with difficult situations (Pintrich, 2000). Finally, students may also possess a work avoidance orientation, marked by a desire to minimize efforts and a focus on tasks that can be completed quickly and easily (Thorkildsen & Nicholls, 1998). Goal orientation is often strongly related to achievement orientation, both of which influence the individual's levels of self-efficacy and self-regulation.

1.3.4 Achievement Orientation

Elliot and McGregor (2001) developed a 2x2 achievement orientation framework which holds that an individual can have either a mastery or performance orientation, each of which can be associated with an approach or avoidance orientation. An individual with a mastery-approach orientation desires to learn all relevant and available material. This lies in contrast to a mastery-avoidance orientation in which the individual strives to avoid failing to learn all relevant and available material (Elliot & McGregor, 2001). Conversely, students with a performance-approach orientation are motivated to outperform their peers, while those with a performance-avoidance

orientation are motivated to avoid performing worse than their peers (Elliot & McGregor, 2001). In essence, students who have a mastery orientation are motivated by the material they are expected to learn and they have a corresponding internal drive to either learn it or avoid not learning it. Those with a performance orientation are motivated by their peers and the drive to either be superior to them or not inferior to them with respect to the quantity of material learned.

These orientations help predict the extent to which an individual is likely to procrastinate because of deficient self-regulatory processes. For example, an approach orientation has been associated with constructive self-regulatory processes that assist with perceptions of self-competence and a need for achievement (Howell & Watson, 2007). In addition, regardless of whether it is linked to an approach or avoidance orientation, procrastination is negatively correlated with a mastery orientation (Scher & Osterman, 2002). Lastly, procrastination is positively associated with a performance-avoidance orientation (Wolters, 2003). Although goal orientation refers to the motivation associated with a specific context or task, some researchers argue that procrastination is the result of stable traits (e.g., personality traits) that occur across different situations rather than a behaviour elicited by the situation itself (Larsen & Buss, 2014; Watson, 2001).

1.3.5 Personality & Procrastination Types

When discussing procrastination within the context of personality, the five factor model (FFM) of personality is most commonly used (Costa & McCrae, 1995; McCrae & John, 1992) and includes: Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism (McCrae & John, 1992). The FFM was born out of

both lexical and statistical approaches (Larsen & Buss, 2014). Allport and Odbert (1936) initially amassed a collection of trait terms from the English dictionary. Following this, the trait terms were analyzed using factor analysis that revealed five common factors (Fiske, 1949; Tupes & Christal, 1961). Each of the five factors is associated with specific behaviours that are consistent and stable across time and situations (Larsen & Buss, 2014).

Individuals who have a high degree of the Openness factor are intrigued by opportunities to experience new foods, cultures, places, and people (Larsen & Buss, 2014). Someone who is low in Openness is more likely to ignore competing stimuli and experience a greater degree of tunnel-vision or focus and thus may be better equipped to focus on relevant tasks. (Larsen & Buss, 2014). However, evidence related to this assertion is mixed; Kim, Fernandex, and Terrier (2017) reported a positive associated between Openness and GPA but Komarraju, Karau, Schmeck, and Avdic (2011) reported a negative association between these variables.

Conscientiousness involves trait facets involving descriptions such as hard-working, organized, punctual, disciplined, competent, reliable, and striving for achievement (Larsen & Buss, 2014; Watson, 2001). Unsurprisingly, those with high Conscientiousness tend to have exemplary performances at both work and school (Larsen & Buss, 2014). In fact, Conscientious individuals are less likely to procrastinate and more likely to have a higher GPA relative to their less Conscientious counter-parts (Kim et al., 2017; Watson, 2001). In addition, people with high levels of Conscientiousness tend to set high standards for themselves, work hard to reach or exceed those standards, and are motivated by achievement (Larsen & Buss, 2014;

Richardson & Abraham, 2009; Stoeber, Otto, & Dalbert, 2009). One of the sub-facets of Conscientiousness, Self-Discipline, carries the strongest negative association with procrastination (Watson, 2001).

Extraversion is associated with taking pleasure in frequent social interactions, being the centre of attention, and assuming a leadership role (Larsen & Buss, 2014). With reference to their work, those high in Extraversion tend to derive enjoyment from their work, are more cooperative, and happier (Burke, Mattheiesen, & Pallesen, 2006; Hirsh & Peterson, 2009; Larsen & Buss, 2014). Interestingly, Extraversion is positively associated with active procrastination, but negatively correlated with passive procrastination (Kim et al., 2017).

The fourth trait in the FFM is Agreeableness and individuals who are highly agreeable are likely to retreat from conflict and to avoid social situations where social disagreements are expected (Larsen & Buss, 2014). With reference to performance in the academic context, Agreeableness does not carry a pronounced influence, but is negatively related to passive procrastination (Kim et al., 2017).

The final factor in the FFM, Neuroticism, has many implications within the academic realm. Highly Neurotic students tend to feel a greater impact from everyday adversities and stressors and thus display disproportionately fluctuating moods over time (Larsen & Buss, 2014; Murray, Allen, & Trinder, 2002). Although Neurotic students do not actively procrastinate, both Neuroticism and Extraversion are related to the procrastinatory activity a student engages in (Steel & Klingsieck, 2016). In fact, Gueorguieva (2011) found four classifications for distinct types of procrastination depending on how their trait levels of Extraversion, Neuroticism, and Agreeableness

interacted. According to Gueorguieva (2011), these classifications include the anxious idealist, the day-dreamer, the avoidant procrastinator, and the people pleaser.

The anxious idealist possesses a high degree of Neuroticism and fears failure or being judged. The day-dreamer is easily bored by the various academic tasks they encounter and tend to be high in Extraversion. The third type of procrastinator is one who avoids and postpones tasks. This type of procrastinator would be likely to postpone tasks that threaten their autonomy and is associated with higher Neuroticism and lower Extraversion. The people pleaser has an inability to refuse their counter-parts and thus becomes over-burdened. This procrastinator is high in Neuroticism, Extraversion, and Agreeableness (Gueorguieva, 2011).

It is important to understand that if an individual engages in procrastinatory behaviour in a habitual manner across many domains, procrastination may be considered a lower order personality trait (Larsen & Buss, 2014). This leads to the difference between trait procrastination, which tends to be consistent and state procrastination, which is situation specific.

1.3.6 Types of Procrastination

The distinctions between habitual and transient procrastination are similar to those that define differences between state and trait anxiety (Lay, 1990). That is, detrimental feelings and behaviours manifest only in response to certain stimuli or situations (transient) as opposed to in most situations (habitual). In academic situations, habitual/trait procrastination affects the completion of any type of assignment and transient procrastination may only occur for a specific type of assignment or in a specific situation. Milgram, Mey-Tal, and Levison (1998) asserted that there are two

main types of procrastination, both of which develop in response to a combination of personality traits.

The first of these types is decisional procrastination which involves the inability to make decisions regarding either major or minor matters in a timely fashion, while the second type, task-avoidant procrastination, is marked by an inclination to delay beginning or completing academic and non-academic life routines (Milgram et al., 1998; Milgram & Tenne, 2000). Of these two types, task-avoidant procrastination is the most relevant to the academic context; however, by definition, this type of procrastination also occurs outside of the academic context. Although it is important to acknowledge the theoretical underpinnings of procrastination and personality research, it must be noted that task-avoidant procrastination is not the focus of the present study. Nonetheless, it is interesting to note that Schouwenburg and Lay (1995) reported task-avoidant procrastination was associated with lower Conscientiousness, Extraversion, and Agreeableness coupled with higher levels of Neuroticism.

At the facet level, the associations were driven by inactivity items associated with Extraversion and the lower Agreeableness appeared to be driven by lower facet Straightforwardness (Schouwenburg & Lay, 1995). The elevated levels of Neuroticism are likely linked to impulsive tendencies and recent research suggests that Impulsivity is one of the strongest trait correlates to procrastination (Rebetez, Rochat, Barsics, & Van der Linden, 2018). In fact, a twin study by Gustavson, Miyake, Hewitt, and Friedman (2014) found that trait Impulsiveness accounted for the majority of the genotypic variance in procrastination.

1.4 Behavioural Economic Theories & Procrastination

1.4.1 Hyperbolic Discounting Theory

Students who self-report procrastinatory tendencies are most likely to submit assignments in the hours before a deadline expires, and that the proportional volume of submitted assignments during this timeframe follows a hyperbolic curve (Howell, Watson, Powell, & Buro, 2006). According to hyperbolic discounting theory (HDT) this may be because options that lead to faster gratification will be temporarily preferred over options that have greater value but require more time for gratification (Ainslie, 2005). For example, if the goal is academic performance, studying for a test will have greater value across a temporal frame than socializing with friends; that is, the rewards associated with consistent superior academic performance will eclipse those associated with nights out with friends. This is because, in terms of academic performance, the act of studying will have further-reaching implications and longer lasting rewards. Studying makes better grades and, consequently, graduation more likely. Both of these positive outcomes are linked to future employment opportunities and higher socioeconomic status. Compared with these benefits, socializing is less likely to possess the same magnitude of positive and far-reaching consequences.

Most students recognize the costs and benefits associated with their decisions and initially evaluate the importance of studying above socializing; however, according to HDT, as the smaller sooner (SS) reward associated with socializing becomes imminent, it may temporarily supersede the larger later (LL) reward associated with studying (Ainslie, 2005; Ziegler & Opdenakker, 2018). Essentially, when the SS reward is perceived as more attractive than the LL reward, an individual could succumb to their

immediate desire(s) and pursue the activity that carries lower overall levels of gratification and value. According to HDT, this occurs because the gratification associated with the SS reward is more immediate and guaranteed (Ainslie, 2005).

There are a number of implications according to HDT for rectifying procrastination. The most glaring of these is to alter the attractiveness of the activities that would be lead to SS rewards. Ainslie (2005) identified three possible routes that could negate the attractiveness of incompatible interests: 1) using methods external to the psyche to moderate desires (e.g., utilizing diet pills to control cravings); 2) divert attention away from possible temptations; and 3) pursue or inhibit emotions consciously, via isolation, or by reversal of affect.

Cognitive strategies, such as bundling, can be used to counter the enhancement of SS reward attractiveness that occurs due to being temporally near. According to Ainslie (2005), when bundling occurs, the bundle of LL rewards will always outweigh the bundle of SS rewards. For example, if a student wants a high grade in a course and is tempted by a night of socializing instead of studying, he or she should focus on the bundles of consequences and benefits associated with each action. Although studying can seem tedious, if students consider the extra time and money associated with socializing (e.g., transport to and from the establishment, the costs and wait associated with food and/or drink orders), they may come to understand that money and time are being spent in a way that directly undermines their ultimate goal. Through bundling, students may also come to understand that the end goal of a high grade is associated with a higher GPA and makes them a more attractive prospect for gainful employment or further education in the future. By following this strategy of bundling, the individual

is less likely to view the SS reward as more attractive than the LL reward at any point in the temporal frame.

1.4.2 Temporal Motivation Theory

Temporal motivation theory (TMT) represents a multidisciplinary approach for evaluation of behaviour (Steel & König, 2006). There are validated concepts from four separate theories included in TMT; the majority of which are based in economics. These theories include: contemporary preference, cumulative prospect theory, expectancy theory, and need theory (Steel & König, 2006).

Of the theories that precede TMT, expectancy theory is the simplest to apply. The formula associated with this theory is expectancy multiplied by value ($E \cdot V$) – i.e., the likelihood of an outcome/reward multiplied by an appraisal of the reward's value. Although this equation is valuable for determining behaviour at a specific point in time, it has been posited to fail in predicting behaviour over time (van Erde & Thierry, 1996). However, the assertion that people make decisions based on expected value was later disproven by work related to both expected utility theory and cumulative prospect theory (Kahneman & Tversky, 1992). In order to mitigate this drawback, TMT incorporates critical components, including expectancy, sensitivity to delay (e.g., impulsiveness), the delay itself, the valence and value of the reward, and different functions for losses and gains (Kahneman & Tversky, 1979; Steel & König, 2006).

Although many behavioural economic theories carry an inherent assumption of rationality, TMT does not. This is crucial, as human behaviour (e.g., procrastination) may be considered irrational when viewed in economic terms (Strotz, 1955). Contemporary preference and HDT both serve to provide the basis for the principle of

temporal discounting and draw support from social science research (Ainslie & Haslam, 1992). Both HDT and TMT can be utilized to understand why and how humans make a choice between various options.

We are in a constant state of choosing between nearly countless courses of action with some leading to aversive consequences and others leading to rewards. Naturally, most people are more inclined to select actions that lead to rewards. When deciding which reward to pursue, and thus which action we should take, we have an inherent tendency to undervalue future events (Ainslie, 2005; Steel & König, 2006) – i.e., we discount future rewards relative to temporally proximal rewards. However, once the future reward becomes temporally closer, we can more clearly identify its value and thus feel regret or guilt at the irrational delay of the actions required for its attainment (Steel & König, 2006). For example, although students may be able to put off writing a paper for weeks in favour of immediate gratification, if they delay such that they have insufficient amount of time to write a quality paper, they are likely to feel guilty and frustrated with themselves for not beginning sooner.

By incorporating the length of time before a reward occurs and individual sensitivity to delay, TMT is better able to predict behaviour over time. Nonetheless, expectancy is a key element of TMT and refers to the perceived likelihood that an action will lead to a reward. Expectancy can be expressed as a percentage (Chung & Herrnstein, 1967) and evaluations of expectancy are influenced by both internal and external factors (Steel & König, 2006). For example, an optimistic individual may overestimate the probability of a favourable outcome, which represents a false inflation of expectancy that occurs because of an internal disposition (Carver & Scheier, 2002).

Expectancy has a significant effect on the likelihood that one will engage in procrastinatory behaviour; a guaranteed reward is more attractive than an uncertain reward. According to TMT, if a reward is perceived as guaranteed rather than uncertain, we are more likely to perform the actions required for its attainment (Kahneman & Tversky, 1979; Steel & König, 2006). Furthermore, the agency we have regarding the attainment of a reward will factor into our evaluations of expectancy. For example, students who choose to watch television instead of studying guarantee through their own agency that they will be able to relax and enjoy the show (expectancy is at or near 100%). All things being equal, other students who choose to work on a paper instead of watching television are *likely* to attain a higher mark that reflects their effort; however, they don't know *definitively* how much their grade will increase (if at all) as a result of their work (expectancy is X/unknown). Because the grade is in the hands of the instructor, the students do not have *direct* agency with reference to how much their grade will increase. In this scenario, X may be equal to 100%, but it is not guaranteed and thus cannot be weighted the same as the guaranteed SS reward associated with the procrastinatory behaviour. Essentially, the probability that the SS reward associated with the procrastinatory behaviour will be obtained can be expressed as 100%; however, the same degree of expectancy cannot be expressed for the LL reward associated with the academic work.

According to expectancy theory, motivation increases proportionally relative to the confidence one has that the desired reward or outcome will be attained (Steel & König, 2006). This assertion, coupled with the fact that we are hindered by our ability to correctly value a distant reward, can explain why we are less motivated to engage in the

actions required for its attainment. Because the distant reward is not guaranteed (e.g., we can work extremely hard on a paper and still do poorly), the guaranteed rewards associated with the procrastinatory behaviour supersede the more meaningful, but distant and uncertain later rewards (Rachlin, Raineri, & Cross, 1991; Steel & König, 2006).

The next factor associated with the choice to engage in procrastinatory behaviour is individual sensitivity to delay and/or impulsiveness. As previously mentioned, FFM Conscientiousness has been inversely linked to procrastination (Watson, 2001). DeWitte and Schouwenburg (2002) expanded upon this discovery with their finding that the Impulsivity and Perseverance sub-facets of Conscientiousness mediate the relationship between Conscientiousness and procrastination. Because procrastinators tend to be Impulsive, they are unduly attracted to rewards that are nearby and accessible. The consequence is that procrastinators are more likely to spend their time pursuing diversionary rewards that have less delay associated with their attainment (Steel et al., 2018). This is a problem with sensitivity to delay related to delay discounting that has been previously tested using a choice paradigm involving less money now versus more money later (Rachlin et al., 1991).

This standard monetary hypothetical scenario is valuable for testing delay discounting. The effects of such discounting has been examined in research focused on a wide range of issues including pathological gambling, poor health-behaviour, overeating Bickel, Jarmolowicz, Mueller, Koffarnus, & Gatchalian, 2012), and procrastination (Sasaki, Xie, Ikeda, Qin, & Tsutsui, 2012). Unfortunately, the generalization of delay discounting tested with this paradigm to explain the decisions made by the

procrastinating student possesses some inherent difficulties. Participants in research scenarios involving a monetary reward are guaranteed to receive *some* money because of their decision; however, students are not guaranteed *any* marks as a result of their decision.

One of the independent variables in the monetary hypothetical is the expectancy that participants have regarding the probability they will receive the money; however, this probability can never be equal to 0%. As such, the direct comparison between delay discounting in the monetary hypothetical and the discounting a procrastinating student engages in is invalid because they represent separate types of discounting. The individual in the monetary paradigm chooses between receiving money that is guaranteed, money that has a certain probability of being received, or money that has a certain delay before being received; however, they do not face the guaranteed consequence of the withdrawal of the reward entirely as a result of an irrational choice.

Even if the probability and/or the delay before reward attainment is unknown, the individual could not view such a situation as equivalent to a guarantee that they would not receive any money; such knowledge on the part of the subject eliminates the aspect of choice. For example, if you had to choose between receiving $100 with X probability or 0 probability, X probability cannot be considered the worst choice because it could not be less probable than 0. If there was a guarantee that the participant would receive no money (e.g., X = 0 or an infinite amount of time when representing probability or delay, respectively), even a 1% chance they would receive some money would be preferable as this is the only possible path to reward attainment. In a reward-based decision, a choice that cannot lead to a reward is not a viable option, which makes

the problem of procrastination unique and different from standard delay discounting scenarios.

If the procrastinating student continually chooses SS rewards that have a greater probability and/or a lesser delay before attainment, they will invariably fail assignments. The continued pursuit of SS rewards precludes the attainment of a LL reward because these choices inevitably negate the pursuit of action(s) related to the LL reward. In reality, this rarely happens. Students may procrastinate to the point that they have an insufficient amount of time to complete an assignment satisfactorily, but they are still likely to submit their incomplete work because partial completion still has a greater probability of netting some marks compared to non-submission. Non-submission does not carry this inherent probability and will lead to no reward (i.e., a zero on the assignment).

A student must always recognize that an incomplete submission will usually lead to more marks than a non-submission. The absence of a submission can never be preferable to a submission (no matter how poor the quality) because it is the only option that carries a guarantee of reward expectancy equal to 0. This is the second critical difference between irrational choices that still result in reward attainment compared with irrational choices that result in an aversive consequence.

Irrationality in the delay discounting scenario still leads to a monetary reward. In fact, the irrational choice often leads a greater probability (or less delay) of a lesser amount being received. This is compared to a rational choice that leads to a larger amount received after a longer delay or perhaps with less probability (Rachlin et al., 1991). The irrationality in this scenario is still rewarded (albeit to a lesser extent).

Decisions such as these can be explained by the certainty effect, which is the tendency to undervalue outcomes that are probable compared with outcomes that are guaranteed (Kahneman & Tversky, 1979).

This has direct implications for academic procrastination. When attempting to complete an assignment (either poorly or to the best of their ability), students would want to avoid the consequence of the guaranteed 0% associated with non-submission. Differences in evaluation of loss versus gain and probable versus guaranteed outcomes must be considered as an explanation for the irrational behaviour of procrastination.

TMT takes this vital consideration is taken into account. The shape of the TMT function is convex for an option that carries a lower probability and concave for an option that carries a higher probability (Steel & König, 2006). In addition, TMT does not use a constant to express the evaluation of a loss versus a gain (Steel & König, 2006). This is important, as research suggests that people weigh the threat of a loss as greater than a gain of the same amount. For example, losing $5 is usually perceived as a greater loss than finding $5 is as a gain (Kahneman & Tversky, 1979). This is crucial, as rather than focusing on basic reward preference, students must incorporate a guaranteed consequence (e.g., assignment/course failure) into their decision. Because TMT accounts for both the evaluation of the probabilities of consequences and rewards, it is the best current equation to explain and counter procrastination.

1.5 Rationale for the Present Study

Explanations for procrastination have largely centred on deficits in self-regulation, personality trait correlates, and motivational correlates. The methodologies used within this body of research have been sound and the findings valuable; however,

the results lead to a situation in which cognitive/internal explanations and/or strategies are developed to combat a behavioural issue. Much of the available research advocates for empirical investigation into psychological interventions that would improve deficits in self-regulation and/or the motivational issues associated with procrastination. Unfortunately, although some interventions have been developed, their effectiveness in alleviating procrastination appears to be questionable at best.

For example, Gustavson and Miyake (2017) divided students into two groups based on self-reported trait procrastination. One group developed goals along a goal paradigm that were specific, measurable, attainable, realistic, and time-based (SMART goal paradigm). In the control group, students were instructed to brainstorm goals. The groups were compared to determine if the use of a specific goal-related program decreased procrastinatory behaviour; no such decrease was found. Despite the null results, this study was one of the few to incorporate distinct goal directed strategies. Further, Glick and Orsillo (2015) reported that both a time-management based intervention and a mindfulness-based intervention were ineffective at reducing academic procrastination. Unfortunately, although much of the previous research has advocated for various psychological interventions to ameliorate the procrastination problem, none of the developed paradigms appear to be as effective as hoped.

A recent meta-analysis examining the use of psychological treatments to alleviate procrastination returned only modest results (Rozental et al., 2018). This meta-analysis included only randomized controlled trials (RCTs) that compared psychological interventions for procrastination against a control group. The authors used four criteria to determine if an existing study could be included within the meta-analysis: 1) the

intervention had to specifically target procrastination; 2) used a self-reported trait measure of procrastination; 3) the study was published with the descriptive statistics necessary to test and/or calculate standardized mean differences and Hedges' *g*, a specific indication of effect size; and, 4) participants were randomly assigned to the experimental group or the inactive comparator group. Twelve studies matched these criteria and were included in the analysis. Upon calculating the standardized mean difference at post-treatment, the authors found $g = 0.34$ which indicates a significant, but small effect of psychological interventions on procrastination (Cohen, 1988; Rozental et al., 2018).

Although the cognitive explanations for procrastination are valuable, it is my contention that investigating these explanations should not be considered the greatest priority. Focusing on the possibility that procrastination is caused by a defunct self-regulatory style or a lack of the right type of motivation does not carry immediate benefits for those affected by procrastination. By analogy, if a clinician who subscribes to the biomedical model of mental illness tells a client that his or her depression is due to a deficit of serotonin uptake in the brain, that information alone does not cause the client to feel better or alleviate their symptoms in any way. What follows is the prescription of selective-serotonin reuptake inhibitors in an attempt to address the issue. In both depression and procrastination, an understanding of the mechanisms behind the occurrence is necessary, but insufficient for resolution.

This same focus should be applied within the body of procrastination research. The objective is to help those experiencing the problem in question. Because the consequences of procrastination are associated with a readily observed behaviour (Moon

& Illingworth, 2005; Steel et al., 2001), research focused on alleviating such consequences should include investigations centred on the procrastinatory behaviours. To date, much of the research has focused on correlates of trait procrastination and the inclusion of experimental studies examining specific behaviours would further elucidate the process of procrastination.

Past research and subjective reports indicate that students have many reasons to delay beginning required academic work. In addition, because academic tasks are challenging and often not inherently enjoyable, many alternative behaviours become more attractive. The resulting procrastinatory behaviour is unfortunately both detrimental and preferable (to the student). Students often do not complete papers or exams because they want to, but because they must. By considering the value and attractiveness of the rewards associated with the work, the expectancy students can reasonably have regarding the consequences of their work (or lack thereof), their sensitivity to delay, and the length of the delay itself, principles derived from TMT may be utilized to solve, or at least ameliorate, the procrastination problem.

In short, although the cognitive/affective correlates and/or the development of cognitive strategies have enhanced the understanding of procrastination, they do not provide reliable interventions to counter its occurrence. Rather, I hypothesized that directly contending with the behavioural problem of academic procrastination with a competition-based manipulation would lead to a decrease in procrastination. The incorporation of competition into academic assignments alters the TMT equation by influencing the perceived aversive consequence(s) associated with delay, and one's

sensitivity to it, simultaneously. In addition, it dilutes the influence of an immediate lack of attractiveness associated with the LL academic reward.

Because procrastination is a problem for 70-95% of university students, it is safe to infer that students routinely encounter assignments they do not find interesting and, thus, are not particularly attractive (Steel, 2007). As such, SS rewards that are perceived as more attractive because they are guaranteed and possess a shorter delay before attainment may be immediately reinforcing. To counteract this, through a plethora of different mechanisms, an instructor could attempt to make assigned work more attractive; however, because students can possess any number of combinations in their interests, motivational styles, personality trait configurations, goal orientations, or self-regulatory abilities, making an assignment attractive to all students is a nearly impossible task. By associating procrastination with risk and thus making it aversive, the behaviour may be reduced across classrooms and assignments (Brocas & Carrillo, 2001; Kahneman & Tversky, 1992; Nicholson, Soane, Fenton-O'Creevy, & Willman, 2005; Steel & König, 2006).

In the current study, the reduction in academic procrastination was achieved by incorporating two distinct levels of competition. Students were recruited by use of a recruitment directive that notified them of the study's existence. Additionally, students were told that participation would make them eligible for a secondary study that required less than half the effort, but carried triple the research participation points. After the various measures were completed, participants were randomly assigned to one of three conditions during the debriefing.

Students in the first experimental condition (the “Be First” condition) were informed they could contact the primary researcher by email in order to sign-up for the secondary study to receive bonus points; however, they were also be told that only the first 20% of students to sign-up would be eligible. The second experimental condition (the “Don’t be Last” condition) group were given the same debriefing; however, participants were told that the last 20% of students to sign-up would be ineligible to complete the easier but more rewarding secondary study. Those in the control condition were told that they have the option to complete the study for the standard number of research points and that an opportunity to complete the more rewarding secondary study would be contingent upon a lottery (assuming a sign-up e-mail had been sent).

1.6 Hypotheses

If students know that they can choose a SS reward instead of pursuing the action(s) that will lead them to the LL academic reward (and do so without consequence), the TMT equation indicates they are likely to do so. However, if a negative consequence is associated with their decision, they will be less likely to pursue the SS reward. Based on how the differences in competition influence the TMT equation, I hypothesized that students in the “Be First” condition would sign-up the fastest for the secondary study, students in the “Don’t be Last” would take longer to sign-up, and students in the control condition would have the slowest average sign-up times.

Normally, a student could feel justified in delaying the beginning and/or completion of work because they understand there will be time to do the work later. This assessment allows students to maintain the expectancy that they could complete their

work in a satisfactory manner by the deadline. For this reason, I predicted that implementing threat via competition into the academic environment would prevent students from believing they are shielded from the consequences of their SS reward preference in the present by a deadline that lies in the future.

For example, imagine two motivated students who both need four marks in their respective courses to attain a desired grade. The students know that they must participate in a research study within two weeks to receive the final research points required in their courses. Assuming that student A is in the control condition and student B is in the "Be First" condition, both students will believe that completing the first part of the study will lead to one mark and that completing the secondary study will lead to an additional three marks; however, only Student B believes that her eligibility for the sequel study is contingent upon the extent to which she procrastinates in sending the follow-up email. On the weekend, both students are invited to a party. Given their experimental assignment, Student A believes that he can attend the party, send the follow-up email later, and maintain the same expectancy about his probability for being selected for participation within the sequel study. Student B can also attend the party and complete the primary study later but should be concerned about her eligibility to complete the secondary study after this decision due to the fact that procrastination would be associated with a reduced expectancy of reward attainment. Thus, all other things being equal, Student A is likely to attend the party and Student B is likely to defer in order to complete the necessary tasks to secure eligibility.

In this scenario, Student A does not perceive a consequence of his procrastination and can attend the party. Student B recognizes a *potential* consequence

associated with procrastination and, thus, cannot have the same expectancy that A does regarding the ability to complete the work later without penalty. In terms of the likelihood that their procrastination will lead to an aversive consequence, Students A and B have distinct X and Y expectancies (respectively), but X can never be greater than Y. By introducing competition into the scenario, the relative attractiveness of the SS reward to B has diminished because the competition attaches an aversive consequence to pursuit of the SS reward. By analogy, an individual is unlikely to relish the idea of jumping out of a second story window; however, the relative attractiveness of that action increases if the room were on fire. Although the jump is not initially attractive, it is the more attractive action *relative* to the consequence of staying in the fire.

Following this logic, students in the "Be First" condition face the greatest probability of a perceived consequence associated with procrastination and, therefore, should have the fastest average sign-up times. As previously stated, the threat of a loss is perceived as more threatening than the benefit of a gain in equal measure (Kahneman & Tversky, 1979). Consequently, the student who procrastinates when they believe they have to finish in the first 20% has a greater perceived probability of losing out on the opportunity for the more rewarding secondary (e.g., a greater perceived threat) compared to the student who believes they simply have to sign-up in the first 80%. The students in the control condition would not perceive any consequence or benefit from delaying their involvement; they would believe the secondary study opportunity is out of their control.

With reference to the personality correlates of procrastination, I hypothesized that students who were higher in Conscientiousness would be less likely to

procrastinate. In addition, I hypothesized that students who possess a higher degree of Openness to experience and Neuroticism would be more likely to procrastinate than students who do not have elevated levels of these traits. These hypotheses were aligned with results from previous literature, and reflect the correlations between certain personality traits (e.g., Conscientiousness, Neuroticism and Openness) and procrastination (Kim et al., 2017; Larsen & Buss, 2014).

The BRIEF-A is a measure that has not been used in studies of academic procrastination. Consequently, the hypotheses associated with its use were exploratory in nature. The measure has two summary index sub-scales: the Behavioral Regulation Index (BRI) and the Meta-Cognition Index (MI). The BRI is composed of four scales. These include measurements of the individual's ability to Shift, Inhibit, Control Emotions, and Self-Monitor. The MI is comprised of five scales: Working Memory, ability to Plan/Organize, Task Monitor, Organize Materials, and Initiate a task (Roth et al., 2005). I hypothesized that procrastination would be negatively correlated with Emotional Control, Self-Monitoring, Task Monitoring, Planning and Organizing, and task Initiation. These hypotheses were in line with previous research that shows passive procrastinators are unable to accurately assess and respond to the urgency of an academic task and possess a distinct lack of organization marked by aimless drifting from task to task (Bond & Feather, 1988; Chu & Choi, 2005).

To summarize, the first hypothesis predicted that participants in the experimental conditions would have faster average sign-up times compared to those in the control condition. That is, the more competition-based threat was induced into a given condition, the less procrastination would occur. This would be assessed by how much

time elapsed between when participants were told they could first send the follow-up email and when they actually sent it. Specific to this hypothesis, I predicted that participants in the "Be First" condition would have the fastest sign-up times on average, followed by those in the "Don't be Last" condition, and those in the control condition would have the slowest average sign-up times. The second hypothesis predicted that trait Conscientiousness would be negatively related to both state and trait procrastination. Third, trait Openness and Neuroticism would be positively related to both state and trait procrastination. Fourth, the executive function subscales of Emotional Control, Self-Monitor, Task-Monitor, Plan/Organize, and task Initiation would be negatively related to both state and trait procrastination.

The first hypothesis would be assessed using a behavioural/state measure of procrastination; that is, time to send the follow-up email (TTS) required to participate in the more-rewarding secondary study. Hypotheses two and three were assessed by the self-report trait procrastination scales as well as the Neuroticism Extraversion Openness Personality Inventory Revised (NEO-PI-R). Lastly, hypothesis four was assessed by the self-report procrastination scales and the BRIEF-A.

Method

2.1 Participants

The participants for this study were drawn from the University of New Brunswick Saint John campus (UNB SJ). Power analysis revealed that 150 participants would be required for a moderate effect size with 80% power for the main analysis; 50 per experimental condition. Sample size was calculated with a moderate effect size because a previous meta-analysis that examined the experimental effects of

psychological interventions on procrastination revealed a Hedges' *g* of 0.34 (Rozental et al., 2018). Although this effect size is small, it approaches moderate strength and I predicted the manipulation within the present study would be more effective than the psychological interventions.

One hundred fifty-four students completed all self-report measures. Forty-seven of these were in the "Be First" condition (30.5%), forty-eight in the "Don't be Last" condition (31.2%), and fifty-nine in the control condition (38.3%). Of these participants, one hundred and twelve (72.7%) sent follow-up emails that confirmed their exposure to the experimental manipulation. Thirty-seven of these respondents were in the "Be First" condition (33%), Thirty-nine in the "Don't be Last" condition (34.8%), and thirty-six in the control condition (32.1%). These discrepancies occurred because randomization of condition assignment occurred by session, not by individual. This was so that students could be debriefed simultaneously and so that they would not hear conflicting directions, which would undermine the manipulation. This outcome occurred because some of the larger groups were randomly assigned to the control condition.

The participants ranged in age from 17 to 54 years with a mean age of 20.8 years (*SD* = 5.67). One hundred twenty-two of the participants were female (79.2%) and 32 were male (20.8%). With reference to how participants self-identified and reported their ethnicity, the group most commonly identified was Caucasian with 104 (67.5%). The next most represented ethnic group identified as Asian with 24 (15.6%). The remaining participants were Aboriginal (3.9%), African American (6.5%), Hispanic (4%), and Middle Eastern (3%). Most of the students were enrolled full-time in either four (19.5%) or five (63.6%) courses, and most of the participants were also employed

(57.8%). Unsurprisingly, most participants were within the first two years of study. Seventy-one (46.1%) were in their first year of study and 29 (18.8%) were in their second. Thirty-five (22.7%) were in third year and 18 (11.7%) were in their fourth year.

2.2 Materials

Behavioural Rating Inventory for Executive Functioning – Adult Version (BRIEF-A; Roth, Isquith, & Gioia, 2005).

The BRIEF-A is a standardized scale used to assess individual executive functioning in daily life. The full measure contains two 75 question sub-components; a self-report form and an informant report form. In this study, the self-report form was used. The BRIEF-A has two summary index scales: the Behavioral Regulation Index (BRI) and the Meta-Cognition Index (MI). The BRI is composed of four scales. These include measurements of the student's ability to Shift (e.g., "I have trouble changing from one activity or task to another") Inhibit (e.g., "I make inappropriate sexual comments"), Control Emotions (e.g., "I have angry outbursts"), and Self-Monitor (e.g., "I have trouble staying on the same topic when talking"). The MI is comprised of five scales, which include: Working Memory (e.g., "I have trouble concentrating on tasks such as chores, reading, or work"); the ability to Plan/Organize (e.g., "I get overwhelmed by large tasks'); Task Monitor (e.g., "I make careless errors when completing tasks"); Organize Materials (e.g., "I start tasks without the right materials"); and, Initiate a task (e.g., "I need to be reminded to begin a task even when I am willing"). In addition, both the reliability and validity of this psychometric measure have been found to be acceptable when used with various populations external to this study (Ciszewski, Francis, Mendella, Bissada, & Tasca, 2014; Hauser, Lukomski, & Samar,

2013). The internal consistency for this measure in the present study was acceptable, Cronbach's alpha = .89.

Neuroticism Extraversion Openness Personality Inventory – Revised (NEO-PI-R; Costa & McCrae, 1992).

The NEO-PI-R is a 240-item personality inventory that uses a 5-point scale that ranges from strongly disagree to strongly agree. It is based on the FFM of personality and contains questions related to Openness (e.g., "I often crave excitement"), Conscientiousness (e.g., "I keep my belongings neat and clean"), Extraversion (e.g., "I really feel the need for other people if I am by myself for long"), Agreeableness (e.g., "If I don't like people, I let them know it"), and Neuroticism (e.g., "Even minor annoyances can be frustrating to me"). In addition, it includes 30 sub-facet scales (6 per factor). The measure has demonstrated good reliability and validity in a wide variety of sub-populations (Costa & McCrae, 1992; Young & Schinka, 2001). Internal consistency measures of the NEO have been acceptable. Cronbach's α scores for the five traits measured by the NEO are: Neuroticism: α = .92; Extraversion: α = .89; Openness: α = .87; Agreeableness: α = .86; Conscientiousness: α = .90 (McCrae, Kurtz, Yamagata, & Terracciano, 2011).

Procrastination Assessment Scale for Students (PASS; Solomon & Rothblum, 1984).

The PASS (see Appendix H) is the most commonly used measure of academic procrastination and contains 52 questions (Harrington, 2005). For the purposes of this study, I used a total of 44 questions that measure procrastination in two main domains: the frequency of procrastination by academic task (e.g., "To what degree do you

procrastinate on this task") and reasons for procrastination (e.g., "You had too many other things to do"). The omitted questions were targeted at discerning which type of intervention students were most interested in and which time of the day they were most likely able to participate. Within the present study, the first half of the PASS assessing procrastination in six distinct academic areas was used as an aggregate, single score. That is, because the present study was concerned with overall academic procrastination, the average of the 6 domains provided a more accurate insight into procrastinatory behaviour in the targeted context.

This measure gathers self-report information related to trait procrastination from the participant about the degree to which they endorse a given item on a Likert scale (ranging from 1-5; higher scores represent a greater propensity for procrastination). Factor analysis using the PASS has previously demonstrated that the measure is a well-represented two-factor gauge of procrastination (Yockey & Kralowec, 2015). Because the PASS is meant to measure procrastination in six distinct areas, internal consistency does not accurately represent the reliability of the measure for the first half. However, because the second half of the measure assesses various reasons for procrastination, internal consistency would be a valid indication of reliability. In the present study, internal consistency for the second half of the PASS was $\alpha = .86$. In addition, previous research has confirmed the reliability and validity of both parts of the scale (Ferrari, 1989).

General Procrastination Scale (GPS; Lay, 1986).

In addition to the PASS, I used the Lay (1986) General Procrastination Scale (see Appendix G for this scale). This self-report trait procrastination scale contains 20

items and has been shown to have the largest weighted mean correlation between procrastination and academic performance r = -.33 (Kim & Seo, 2015). The internal consistency of this measure in the present study was high, α = .86.

Demographics Questionnaire

The demographic questionnaire asked participants to provide demographic information such as age, gender, and year of study (see Appendix A). In addition, one of the questions served as a manipulation check. By asking the students how interested they were in the secondary study, I was able to determine the perceived attractiveness of the secondary study. This was assessed by a 7-point Likert scale with higher values indicating greater perceived attractiveness. The mean for the entire sample was 5.75 (SD = 1.37) and varied little by condition. The mean in the "Be First" condition was 5.62 (SD = 1.50), the "Don't be Last" condition a mean of 5.75 (SD = 1.39), and the control condition a mean of 5.85 (SD = 1.24). ANOVA results suggest a non-significant model $F(2, 144) = 0.39$, $p = .677$ for differences by condition. Moreover, none of the post-hoc tests were statistically significant. Thus, participants did not differ by condition in their ratings of attractiveness related to the secondary study. Participants who sent the follow-up email did rate the attractiveness of the secondary study slightly higher than those who did not (e.g., 5.93 versus 5.36, respectively). Moreover, a t-test revealed that this difference was statistically significant $t(143) = -2.32$, $p = .022$. This implies that participants who did not send the follow-up email did view the sequel study as less attractive initially (e.g., before exposure to the manipulation) than those who did send the follow-up email. Interestingly, the initial rating of attractiveness of the secondary study did not have a significant correlation with time to send the follow-up email (τ =

.043, p = .576). This implies that the initial rating of perceived attractiveness did not have a significant relationship with the extent to which a given participant procrastinated in sending the follow-up email, but did influence whether a participant *sent* a follow-up email.

Measure of State Procrastination (TTS)

The measure of behavioural/state procrastination assessed the time a given participant took to send an optional follow-up email to express a desire to participate in a less onerous and more rewarding sequel study. All participants were told they would be able to send a follow-up email expressing this desire at 9:00 PM (21:00) the same day they participated in the primary study. Thus, this measure assessed how much time had elapsed between when participants sent the follow-up email (if at all) and when it was first possible for them to do so. For example, if one participant sent the follow-up email at 10:30 PM (22:30) and one at 10:45 PM (22:45) the same day they completed the primary study, then they were assigned values of 1.5 and 1.75, respectively - this provided a quantitative measure of the extent to which each participant procrastinated on a specific academic task.

2.3 Procedure

The study was introduced at the beginning of the Fall 2019 term using a recruitment directive (see Appendix B) for students who were eligible to receive research participation points at UNB SJ. The students were aware that they could participate in studies in exchange for research participation points, and the initial recruitment directive provided specific information about the present study. The initial recruitment directive also highlighted the benefits of participation (e.g., one research

participation point per hour of time) as well as the potential to complete a secondary study that required less effort. The secondary study carried three times the participation points as a reward. The students were informed that even if they already satisfied the research participation point requirements for the current semester, they could still use the points associated with the secondary study at a later date. That is, students were told that the research points they earned in exchange for participation in the secondary study could be held over for a future course that includes research participation as part of the curriculum. Lastly, the students were told that the secondary study would not occur until the next semester; thus, they would not forgo participating in other studies in order to satisfy their research participation point requirements.

The debriefing directive varied by condition. Students in the "Be First" condition were told that only the first 20% of students to sign-up for the secondary study would be eligible to participate. Those in the "Don't be Last" condition were informed that the first 80% of students that signed-up would be eligible to participate in the secondary study. Finally, those in the control condition were told their participation in the secondary study would be contingent upon a lottery drawn from the participants that sent the secondary email and were thus included in the possible participant pool.

All students were recruited into the same initial pool; those that participated in the initial study were the only ones who believed they had the opportunity to complete the secondary study. An important note is that although the initial recruitment directive was used to highlight the benefits of participating in this particular study, students were still able to sign-up through SONA without hearing the initial recruitment directive. However, even if a student signed-up without hearing the recruitment directive and thus

did not know of the sequel study in advance, the primary researcher explained its existence and benefits before the student filled out any of the measures.

After completing the measures, participants were led into a separate room and provided with the false debriefing form (see Appendix E). At this time, the primary researcher thanked participants for their time and provided them with more information related to the process by which they would (if desired) sign-up for the secondary study. The primary researcher also induced the manipulation verbally during this debriefing session; however, it is important to note that any confirmation questions and details related to non-manipulated aspects of the study were held constant across debriefing sessions. The only component of the debriefing session that varied was information related to the competition-based manipulation (see Appendix C).

An additional note regarding the email to the secondary researcher concerns the standardization across timeslots. Students were told that the secondary e-mail would not become active until 9:00 PM (21:00) so that their e-mails could be added to a non-spam list. This prevented participants from signing up immediately after completing the study. If immediate sign-ups had been allowed to occur, then sign-up time may have been a measure of something other than procrastination (e.g., whether a student had an immediate commitment or not).

Lastly, by incorporating a question that assessed the perceived attractiveness of the secondary study (Q. 14), and thus the strength of the reward, I was able to gain insight as to whether the reward was sufficiently attractive. If it was not sufficiently attractive and the manipulation was ineffective, it could have been due to an insufficiently attractive reward rather than an ineffective manipulation. However, as

discussed before, this was not the case. Another key part of the procedure ensured that participants understood that completing the measures during an earlier timeslot provided neither an advantage nor disadvantage regarding their eligibility to participate in the secondary study.

All data was collected in small groups with a maximum of 10 students in a single group. After participants arrived for the study, the primary researcher explained the study, distributed the informed consent forms (see Appendix D), and answered any questions that arose. With the exception of the demographics form, which was always presented last, all subsets of questionnaires were counterbalanced. For example, the NEO-PI-R or BRIEF-A were always completed first or second, and the PASS and GPS were always completed third or fourth.

After completion of the questionnaire package, participants were debriefed. At this time, participants were manipulated using slight differences in a directive delivered verbally by the primary researcher. In addition, participants were also given an opportunity to ask questions or express concerns. Lastly, the primary researcher was able to ask confirmation questions ensuring the participant(s) understood the earliest time they could send the follow-up email and that they understood information related to the manipulation. For example, one of the confirmation questions asked was "what percentage of respondents will be able to participate in the sequel study?" Acceptable answers were "the first 20%/ 80%/ selected via lottery" for the "Be First," "Don't be Last," and control conditions, respectively.

After data collection was completed, all participants were emailed the genuine debriefing form (see Appendix F). This debriefing informed participants that the goal of

the study was to determine the personality and executive functioning correlates of procrastination, as well as discern if different forms of competition reduced procrastinatory behaviour. The study design was clearly laid out in the final debriefing form. Although the genuine debriefing form was not delivered before the end of the semester during which data collection took place, participants understood there was no guarantee for participation in the secondary study and that they must still complete other studies to fulfill future research participation point requirements. This study was approved by the Research Ethics Board at UNB and all participants were compensated for their time by one research point per hour of time.

Results

3.1 Data Conditioning

Each variable was examined using a frequency analysis to ensure there were no out-of-range values. Any missing or out-of-range values were adjusted using the paper copies of the questionnaires and coding mistakes were corrected.

Pairwise plots, box plots, and standardized scores were used to screen for univariate outliers. The results of each of these comparisons were cross-referenced for confirmation in order to appropriately address the assumptions of linearity and homogeneity of variance. Lastly, the data were examined for singularity, multicollinearity, and multivariate outliers using Mahalanobis distance referenced against χ^2 probability.

To summarize, all scale variables that were included in the regression analyses were assessed for linearity (e.g., visual examination of scatter plots), normality (e.g., examination of standardized *z*-scores, skew, and kurtosis values), multicollinearity (e.g.,

the tolerance and variance inflation factors returned from the regression analyses), and homogeneity of variance (e.g., Levene's test for equality of variance where possible and visual examination of scatter, residual, and pairwise plots). For further information on the variables included in the regression analyses, see Table 1.

Table 1

Descriptive Statistics for Primary Variables of Interest.

	Obs.	Mean	S.D.	Kurtosis	Skew	Min.	Max.
Age	147	19.74	2.58	7.00	2.23	17	33
Year of Study	147	1.97	1.09	-0.79	0.70	1	5
NEO-PI-R							
Openness	147	116.62	17.76	-0.04	0.37	78	165
Conscientiousness	147	122.30	22.20	-0.09	-0.04	68	173
Extraversion	147	112.05	22.08	-0.26	-0.04	50	169
Agreeableness	147	123.56	18.16	0.02	-0.07	75	172
Neuroticism	147	102.28	28.06	-0.31	-0.10	30	168
BRIEF-A							
Emotional Control	147	17.70	5.55	-0.85	0.38	10	30
Self-Monitor	147	9.04	2.28	-0.43	0.64	6	18
Initiate	147	13.65	3.45	-0.38	0.36	8	23
Plan/Organize	147	15.91	3.71	-0.40	0.44	10	28
Task Monitor	147	10.18	2.32	-0.14	0.25	6	17
Inhibit	147	13.16	2.85	-0.64	0.28	8	22
Shift	147	10.29	2.59	-0.37	0.15	6	18
Working Memory	147	13.99	3.62	-0.56	0.29	8	23
Organize	147	12.59	3.54	-0.68	0.47	8	22
Procrastination							
GPS	147	54.72	12.77	-0.46	0.12	28	84
PASS 6 Mean	147	5.12	1.30	-0.27	0.18	2	8.50
PASS Reasons	147	2.31	0.52	-0.38	0.35	1.12	4.04
TTS	105	37.09	56.22	3.06	1.87	0.00	194

Note: Lay General Procrastination Scale (GPS); State procrastination measure (TTS)
Higher scores on the BRIEF-A indicate a greater level of executive function impairment.

3.1.1 Consideration of missing data

Frequency analyses and the subsequent follow-up revealed that any data that were originally missing from the scale items were a result of error during data entry. Because data were collected in person, there were minimal issues with missing data. The exception to this was one item on the demographics questionnaire (Q. 13) that was frequently answered incorrectly. Rather than stating which procrastinatory activity the individual most frequently engaged in (e.g., checking social media, watching TV, sleeping, going for a walk), participants often stated which type of activity they procrastinated on (e.g., writing a term paper, studying for an exam). However, excluding that particular question, all 154 participants provided valid responses to the scales included in the questionnaire packages; thus, no participants were removed from the data set as a result of considerations related to missing data.

3.1.2 Consideration of univariate outliers and normality

Normality was initially assessed by examining skew and kurtosis values that were converted to *z*-scores for each scale variable inputted into the frequency analysis. In addition, histograms including the normal curve superimposed were examined. The scales were found to be normally distributed according to the *z*-scores derived from the skew and kurtosis values. Histograms indicated that outliers may be present for some of the variables, this was followed-up with an examination of standardized *z*-scores and box plots, which confirmed the presence of outliers.

Any *z*-score +/- 3.29 is generally accepted as indicating an outlier score (Field, 2018, p .347; Seo, 2006). If a case was above or below this cut-off its status as an outlier was checked against a box plot for confirmation. This examination revealed a total of 12

univariate outliers in the data set for the scale variables. One was found in the NEO-PI-R Extraversion factor, one in the reasons for procrastination measured in the second half of the PASS, and 10 from the BRIEF-A sub-scales. In psychological research one method of dealing with outliers is to adjust the outlier such that they were one point greater or less than the next highest or lowest within the range of scores for any of the given scales. For example, if the highest non-outlier score on a given scale was 86 and an outlier score of 145 was present, the score of 145 was adjusted down to 87 (Kwak & Kim, 2017).

Although this practice was followed for the various scale variables, data gleaned from the state measure of procrastination, TTS, did not possess any clumping of scores. Many scores were clustered in the left tail in the distribution and the remaining scores were discontinuous. Both the adjustment of outlier scores and a square root transformation failed to normalize these scores.

Because the normality assumption was violated for the measure of state procrastination, Kendall's τ was used for any correlations involving this measure. In addition, quantile regression was used, which is robust against both univariate outliers and departures from normality (Koenker, 2005).

3.1.3 Consideration of multivariate outliers

Multivariate outliers are deviant or unexpected combinations of scores from individual data points (Sunderland et al., 2019). Mahalanobis distances were used to detect the presence of multivariate outliers. These values were obtained by regressing both predictor and outcome variables onto participant number and a sequence of randomly generated numbers. After the Mahalanobis distances were obtained, they were

compared against a χ^2 distribution that had the same degrees of freedom. Using $\alpha = .001$ (Pallant, 2007), seven multivariate outliers were identified and subsequently excluded from the various regression analyses. Because each of the cases removed was a participant that sent a follow-up email, the final data set included 36 participants in the control and "Don't be Last" conditions, and 33 in the "Be First" condition for all analyses that involved only participants that sent the follow-up email. Otherwise, the data set included 59 participants in the control condition, 45 in the "Don't be Last" condition, and 43 in the "Be First" condition.

3.1.4 Homoscedasticity and linearity

Non-categorical variables were examined for evidence of homoscedasticity and linearity using scatter, pairwise, and residual plots. Each probability plot was created with 95% confidence intervals in order to better assess this assumption. No standardized residuals were present outside of the cut-offs recommended by Tabachnick and Fidell (2007) of +/- 3 standard deviations; moreover, the largest Cook's Distance assessed for any of the regression analyses was $D = 0.29$, well inside the recommended cut-off value of 1 (Cook & Weisberg, 1982; Field, 2018, p. 522). During standard data screening procedure, these results were corroborated by the scatter and probability plots which indicate the assumptions of both homoscedasticity and linearity were met for the variables included in the regression analyses. However, once again the measurement variable for state procrastination, TTS, was not homoscedastic. Put another way, all continuous variables had linear relationships with all outcome variables with the exception of the outcome variable related to state procrastination, TTS.

3.1.5 Consideration of between group differences

Because the present study was primarily aimed at discerning the effects of the competition-based manipulation on behavioural procrastination, differences between those who sent a follow-up email and those who did not were evaluated on specific variables of interest (see Table 2). Although the participants were divided into groups randomly after completion of the various scale variables, differences between the conditions were evaluated to determine if there were statistically significant differences between the conditions. The results of this screening can be seen in Table 3.

Table 2

Pearson r correlations, mean scale variable scores, and t-test independent group comparisons by those who sent the follow-up e-mail and those who did not.

	Mean – Follow up Email Sent	Mean – No Follow up Email Sent	Pearson *r* – Follow up Email Sent	*t*(152) = , *p*
Openness	113.31	117.94	.12	-1.43, .154
Conscientiousness	121.00	122.82	.04	-0.45, .655
Extraversion	114.64	111.02	-.07	0.90, .370
Agreeableness	125.19	122.91	-.06	0.69, .494
Neuroticism	98.50	103.79	.09	-1.03, .303
Age	19.74	19.74	.00	-0.01, .992
Year of Study	2.05	1.94	-.04	0.52, .601
BRI	48.52	50.95	.10	-1.24, .216
MI	64.69	67.07	.08	-0.93, .353
Inhibit	13.24	12.98	.04	-0.50, .616
Shift	10.46	9.88	.10	-1.22, .224
Emotional Control	16.83	18.05	.10	-1.20, .232
Self-Monitor	8.79	9.14	.07	-0.86, .392
Initiate	13.87	13.11	.10	-1.19, .237
Working Memory	14.20	13.48	.09	-1.10, .275
Plan/Organize	15.40	16.11	.09	-1.05, .297
Task Monitor	9.81	10.32	.10	-1.22, .225
Organize Materials	12.48	12.88	-.05	0.63, .533
GPS	55.31	54.49	-.03	0.35, .725
PASS 6 Domains	5.27	5.06	-.07	0.90, .373
PASS Reasons	2.22	2.35	.11	-1.35, .180
	Count:	Count:		χ^2 (1) = , *p* =
Gender	25 Male, 80 Female	6 Male, 36 Female		1.635, .201

Note: *Higher scores on the BRIEF-A indicate a greater level of executive function impairment.*

Table 3

Mean, standard deviation, correlation, and ANOVA F values with significance to each of the scale variables by condition.

	Mean, SD			
	Be First	Don't be Last	Control	$F(2,144) = , p$
Openness	118.51, 16.62	113.93, 16.73	117.29, 19.31	0.80, .452
Conscientiousness	125.00, 21.83	126.24, 23.67	117.32, 20.69	2.57, .080
Extraversion	112.21, 22.55	113.27, 20.64	111.02, 23.09	0.13, .876
Agreeableness	121.47, 19.51	125.71, 18.20	123.46, 17.22	0.60, .551
Neuroticism	107.16, 27.72	96.87, 28.25	102.85, 27.91	1.51, .224
Age	20.30, 2.31	19.36, 1.90	19.63, 3.12	1.60, .206
Year of Study	2.35, 1.13	1.87, 1.09	1.78, 1.00	**4.41, .015**×
BRI	51.05, 9.36	48.11, 11.80	51.32, 10.75	1.31, .272
MI	64.37, 11.69	64.27, 16.47	69.47, 13.04	**2.64, .077**×
Inhibit	13.09, 2.57	12.44, 3.19	13.76, 2.67	2.83, .062
Shift	10.67, 2.09	9.87, 2.71	10.34, 2.81	**1.23, .298**×
Emotional Control	18.40, 5.27	16.73, 5.81	17.93, 5.55	1.07, .345
Self-Monitor	8.84, 1.86	9.09, 2.50	9.15, 2.41	0.25, .779
Initiate	13.56, 3.49	13.04, 3.75	14.19, 3.15	1.43, .243
Working Memory	13.56, 3.18	13.80, 4.27	14.46, 3.39	**0.10, .374**×
Plan/Organize	15.40, 3.30	15.47, 3.93	16.63, 3.77	1.86, .160
Task Monitor	10.09, 2.09	9.76, 2.65	10.56, 2.18	1.59, .208
Organize Materials	11.77, 2.73	12.07, 3.79	13.59, 3.67	4.21, .017
GPS	53.14, 12.66	52.84, 12.91	57.31, 12.52	2.05, .132
PASS 6 Domains	5.09, 1.22	5.04, 1.36	5.20, 1.33	0.21, .811
PASS Reasons	2.28, 0.50	2.28, 0.57	2.35, 0.50	0.38, .684
	Count:	Count:	Count:	χ^2 (1) = , p =
Gender	9 Male, 34 Female	12 Male, 33 Female	10 Male, 49 Female	1.45, .484

Note: Higher scores on the BRIEF-A indicate a greater level of executive function impairment.

× = **Significant Levene's test; Welch's F**

Table 3 shows that despite randomization, there were statistically significant differences between the conditions for year of study and the Organize Materials subscale. Because of this, year of study was first screened using Dunnett's post-hoc test with the control condition as the reference category. However, because year of study returned a significant Levene's test, both variables were examined using the Games-Howell nonparametric post-hoc test. Both of these tests used $\alpha = .05$. The results of these follow-up comparisons can be seen in Table 4.

Table 4

Multiple comparisons by condition for Year of Study, and Organize Materials.

	M_{diff}, Std. Error	
	Year of Study	Organize Materials
BF - C	0.57, 0.22*	-1.83, 0.63*
DBL - C	0.09, 0.21	-1.53, 0.74
BF - DBL	0.48, 0.24	-0.30, 0.70

Note: Conditions "Be First" (BF); "Don't be Last" (DBL); Control (C)
Organize Materials is a subscale of the BRIEF-A

Despite the randomization protocols and sufficient sample size for each group for the central limit theorem to apply (Field, 2018), there were group differences between the "Be First" and control conditions in their average year of study, and between their average scores on the Organize Materials facet of the BRIEF-A. Unfortunately, this could not be addressed in the regression analyses directly; however, it is worth noting that this statistically significant difference was present and thus, results related to differences between the "Be First" and control conditions on the Organize Materials subscale should be interpreted with caution.

3.2 Statistical Analyses

After pursuing bivariate correlations to analyze the replication and exploratory hypotheses, a quantile regression analysis was used to analyze the effects of the competition-based manipulation on behavioural procrastination. In addition, three separate hierarchical regressions were used to test the predictive ability of hypothesized covariates in the context of self-report procrastination.

3.3 Divergence of State and Trait Measures of Procrastination

Interestingly, some of the analyses suggested there may be a divergence in the expected relationship between the measures of state and trait procrastination. In order to more closely examine this pattern of results, the various measures of procrastination were correlated with each other. However, in addition to the originally discussed outcome variables related to state and trait procrastination, there was data inadvertently being collected on another indicator of state procrastination. Specifically, this was the date a given participant completed the study (DSC). The in-person timeslots during which participants came in and filled out the various measures were made available on

SONA at 2-week intervals as the semester progressed. Consequently, students who registered and participated later in the semester delayed to a greater extent than those who completed the study earlier in the semester.

Because the objective of the manipulation was to change the extent to which a given participant procrastinated (e.g., time to send the follow-up email; TTS), I would not expect to see a statistically significant correlation between either of the two experimental conditions (e.g., "Be First" and "Don't be Last") and DSC. However, because the same TMT principles were not influencing participants in the control condition, there should be a positive relationship between TTS and DSC for the control condition specifically. As can be seen by Table 5, the correlations between the DSC and TTS variables and the PASS and the GPS are similar. Given that the DSC is similar to other assessments of state procrastination (Orellana-Damacela, Tindale, & Suárez-Balcázar, 1999) and that it only relates to TTS in the unmanipulated group, the assertion that TTS is assessing state procrastination was established.

Table 5

Correlations between the state versus trait measures of procrastination by condition.

	GPS	PASS 6	PASS Reasons	TTS	DSC
Control					
GPS	X	.67 ***	.38 **	.07	.05
PASS 6	.67 ***	X	.55 ***	.14	.07
PASS Reasons	.38 **	.55 ***	X	.14	.01
TTS	.07	.14	.14	X	.31 *
DSC	.05	.07	.01	.31 *	X
Don't be Last			.54 ***		
GPS	X	.66 ***	.58 ***	.11	.18
PASS 6	.66 ***	X	.X	.16	.26 *
PASS Reasons	.54 ***	.58 ***		-.04	.20
TTS	.11	.16	-.04	X	-.08
DSC	.18	.26 *	.20	-.08	X
Be First					
GPS	X	.67 ***	.48 **	-.15	-.15
PASS 6	.67 ***	X	.58 ***	.02	-.09
PASS Reasons	.48 ***	.58 ***	X	-.08	-.05
TTS	-.15	.02	-.08	X	-.08
DSC	-.15	-.09	-.05	-.08	X

Note: Kendall's τ used for all correlations involving TTS and DSC
*****p < .001. **p < .01. *p < .05.**

In order to determine if there were any systematic differences by condition on any of the self-report measures of procrastination, three separate one-way ANOVAs were used along with Dunnett's post-hoc tests using the control condition as the reference category. There were no systematic differences revealed between the conditions. That is, although condition predicted a change in state procrastination as measured by TTS, it was not significantly related to trait procrastination.

3.4 Replication Hypotheses

Each of the replication hypotheses related to personality involving Conscientiousness, Openness, Neuroticism, and their facets were first examined using one-tailed correlations. This is because there is existing evidence to support the direction associated with these respective hypotheses. Recall that Pearson r correlations were used for all self-report measures of procrastination, but Kendall's τ was used for all comparisons using the behavioural measure of procrastination due to its non-normal distribution. The results of these correlations can be seen in Table 6.

Table 6

Correlations between NEO-PI-R factors, facets, and measures of procrastination.

	PASS 6 Domains	PASS Reasons	GPS	TTS
Conscientiousness	-.58***	-.51***	-.66***	-.14*
Competence	-.48***	-.47***	-.47***	-.11
Order	-.29***	-.20**	-.43***	-.18**
Dutifulness	-.39***	-.37***	-.44***	-.13*
Achievement	-.43***	-.47***	-.53***	-.08
Self-Discipline	-.65***	-.51***	-.71***	-.09
Deliberation	-.38***	-.31***	-.40***	-.12*
Openness	.00	.00	.13	-.01
Fantasy	.19*	.08	.31***	.08
Aesthetics	-.05	.08	-.01	-.07
Feelings	.03	.05	.11	-.06
Actions	.02	-.04	.11	-.04
Ideas	-.15	-.09	-.09	.01
Values	-.04	-.15	.06	.06
Neuroticism	.47***	.53***	.41***	-.01
Anxiety	.26***	.41***	.21***	-.00
Hostility/Anger	.42***	.34***	.32***	.01
Depression	.40***	.50***	.36***	-.07
Self-Consciousness	.28***	.43***	.29***	.00
Impulsiveness	.48***	.35***	.43***	.07
Vulnerability to	.42***	.48***	.36***	.01
Extraversion	-.20*	-.18*	-.05	.02
Warmth/Kindness	-.29***	-.12	-.11	.00
Gregariousness	-.13	-.10	.00	-.07
Assertiveness	-.24**	-.28**	-.18*	-.02
Activity	-.18*	-.18*	-.07	.05
Excitement Seeking	.17*	.10	.19*	.02
Positive Emotion	-.18*	-.16*	-.06	.06
Agreeableness	-.27**	-.07	-.22**	-.06
Trust	-.30***	-.10	-.24**	.03
Straightforwardness	-.18*	-.09	-.21*	.00
Altruism	-.37***	-.16*	-.26**	-.12
Compliance	-.17*	-.06	-.17*	-.08
Modesty	-.02	.10	.00	-.07
Tender-Mindedness	-.10	-.10	-.02	-.03

Note: Kendall's τ used for correlations involving measure of state procrastination.
***p < .001. **p < .01. *p < .05.**

The first replication hypothesis involved determining whether trait Conscientiousness and its facets possessed significant negative correlations to the various measures of procrastination. Conscientiousness was strongly and significantly negatively related to all self-reported trait procrastination measures. Strong relationships were revealed between factor Conscientiousness and each of the facets, the GPS, the aggregate score of the six procrastination domains measured within the PASS, and to the aggregate score of the twenty-six reasons for procrastination measured by the PASS. Overall, the hypothesis that Conscientiousness was associated with both trait and state procrastination was supported (see Table 6).

The second replication hypothesis postulated that factor and facet Openness and Neuroticism would be positively related to procrastination. These relationships were first examined within the context of self-report trait procrastination using the GPS and both segments of the PASS. Next, the presence of such relationships to the behavioural measure of procrastination were examined using Kendall's τ.

Contrary to the initial prediction, there were no statistically significant relationships between factor Openness and any of the self-report measures of procrastination; however, there were significant correlations between the average of the 6 domains of procrastination measured by the PASS and Fantasy ($r = .19$, $p = .020$) and Ideas ($r = .15$, $p = .040$). Fantasy was also moderately correlated with the GPS ($r = .31$, $p < .001$).

Although some of the facets of factor Openness were related to the trait measures of procrastination (e.g., Fantasy to both the GPS, $r = .31$, $p < .001$, and the 6 domains of the PASS, $r = .19$, $p = .02$), no relationships were found between the factor

or any of its facets and TTS, the measure of state procrastination. Overall, these findings suggest that the hypothesis that Openness and its facets would be positively related to procrastination is not supported (see Table 6).

With reference to the second component of this hypothesis, the relationship between Neuroticism and the self-report trait measures of procrastination, strong and significant correlations were revealed between Neuroticism, its facets, and each of the self-report trait procrastination scales. However, there were no significant relationships between Neuroticism, its facets, and the behavioural/state measure of procrastination. Overall, this pattern of results indicates that the hypothesis that Neuroticism and its facets would be positively related to procrastination was partially supported (see Table 6).

The factors of Extraversion and Agreeableness were screened using two-tailed correlations against the various measures of procrastination to check for the presence of any relationships. Extraversion was negatively related to both factors of the PASS, but only weakly. The relationship to the aggregate scores of the 6 domains of procrastination assessed by the PASS was statistically significant, $r = -.20$, $p = .02$, as was the relationship to the second component of the PASS assessing the Reasons for procrastination, $r = -.18$, $p = .03$.

The facets of Warmth/Kindness, Assertiveness, Activity, Excitement Seeking, and Positive Emotion possessed statistically significant relationships to at least one of the three measures of procrastination, but tended to be weak in strength. In addition, there was some variance in the direction of the relationships. That is, most facets had a negative relationship with the measures of procrastination, but Excitement Seeking had

a positive relationship to the GPS and the 6 domains of procrastination measured by the PASS (see Table 6). Agreeableness showed weak-moderate relationships to the 6 domains of procrastination measured by the PASS and the GPS. The facets of Trust, Altruism, Straightforwardness, and Compliance each had statistically significant negative relationships to at least one of the self-report trait measures of procrastination that ranged in strength from weak-to-moderate. However, neither trait Agreeableness nor any of its facets had a statistically significant relationship to the behavioural measure of procrastination.

3.5 Exploratory Hypotheses

As with the replication hypotheses, the five subscales of executive functioning included in the exploratory hypotheses were analyzed using bivariate correlations using two-tailed tests of significance. The remaining subscales of the BRIEF-A were assessed with two-tailed tests of significance and all correlations between the subscales and the behavioural measure used Kendall's τ (see Table 7).

Table 7

Correlations between the BRIEF-A and the measures of procrastination.

	PASS 6 Domains	PASS Reasons	GPS	TTS
BRI	.50***	.48***	.45***	.09
MI	.67***	.61***	.70***	.17*
Emotional	.37***	.39***	.31***	-.01
Self-Monitoring	.45***	.37***	.45***	.14*
Task Monitor	.59***	.52***	.63***	.13
Plan/Organize	.62***	.59***	.60***	.16*
Initiate	.65***	.61***	.66***	.13
Shift	.43***	.43***	.28**	.03
Inhibit	.42**	.35***	.45***	.16*
Working Memory	.49***	.49***	.48***	.08
Organize Materials	.44***	.31***	.56***	.23**

Note: Kendall's τ used for correlations involving the TTS state measure of procrastination

Higher scores on the BRIEF-A indicate a greater level of executive function impairment.

*****p < .001. **p < .01. *p < .05.**

Prior to data collection, I predicted that the Emotional Control, Self-Monitoring, Task Monitoring, the ability to Plan and Organize, and Initiation subscales of the BRIEF-A would be positively related to procrastination. These hypotheses were supported and correlations with the trait measures of procrastination ranged in strength from moderate (Emotional Control), to strong (Self-Monitoring, Task Monitoring, Initiate, and Plan/Organize). Only the Self-Monitoring, Plan/Organize, Inhibit, and Organize Material subscales were related to the behavioural/state measure of procrastination (see Table 7).

The Organize Materials subscale was the most strongly related to the behavioural/state measure of procrastination; however, the magnitude of this relationship was still quite low, $\tau = .23$, $p = .001$. The overarching MI scale, $\tau = .17$, $p = .010$, and the Self-Monitor, $\tau = .14$, $p = .045$, Inhibit, $\tau = .16$, $p = .022$, and Plan/Organize, $\tau = .16$, $p = .020$, subscales also possessed statistically significant correlations to TTS, the measure of behavioural/state procrastination.

Lastly, because the hypotheses entailed determining the extent to which personality and executive function facets predict procrastination, three hierarchical regressions were used to determine if these variables predicted the trait measures of procrastination. For these regressions age, gender, and year of study were entered in Block 1, NEO-PI-R factors were entered in Block 2, the BRIEF-A subscales were entered in Block 3, and sets of variables were entered into Block 4. This was done in order to assess the effects of personality and executive function on the various measures of self-report trait procrastination.

From the results of the regression with GPS as the criterion reported in Table 8 and only the demographic factors of age, gender, and year of study included, the model is not statistically significant. When the NEO-PI-R factors were included in Block 2, trait Conscientiousness was a statistically significant predictor of GPS trait procrastination $\beta = -0.63$, $t(137) = -7.94$, $p < .001$. When sets of variables were included in the model, factor Conscientiousness was still a statistically significant predictor of GPS procrastination, albeit to a lesser extent $\beta = -0.36$, $t(128) = -3.63$, $p < .001$. Block 2 possessed a significant R^2 change; $\Delta R^2 = .45$, $F(8, 138) = 14.81$, $p < .001$.

In Block 3 the ability to Initiate a task, Task Monitor, and Organize Materials subscales were each significant predictors of GPS procrastination. Recall that higher scores in any given executive function subscale indicate greater levels of self-report executive function impairment. According to the standardized coefficients, three BRIEF-A subscales possessed statistically significant explanatory ability with reference to trait procrastination assessed by the GPS. First was the Initiate subscale, $\beta = 0.36$, $t(133) = 3.72$, $p < .001$. Next was the Organize Materials subscale $\beta = 0.29$, $t(133) = 4.29$, $p < .001$. Last was the Shift subscale $\beta = -0.16$, $t(133) = -2.11$, $p = .04$. When only the executive function subscales were included in Block 3, R^2 change was statistically significant; $\Delta R^2 = .56$, $F(12, 134) = 14.79$, $p < .001$.

In Block 4 when sets of variables were included in the model, the subscales of Material Organization and task Initiation remained statistically significant predictors of GPS procrastination; however, the Shift subscale was replaced by Task Monitoring as a statistically significant predictor. The first statistically significant predictor of GPS procrastination was the Initiate subscale, $\beta = 0.36$, $t(128) = 3.53$, $p = .001$. This was

followed by Task Monitoring $\beta = 0.23$, $t(128) = 2.29$, $p = .02$, and then by Material Organization $\beta = 0.19$, $t(128) = 2.57$, $p = .01$. Again, R^2 change was statistically significant; $\Delta R^2 = .61$, $F(17, 129) = 12.39$, $p < .001$.

Table 8

Hierarchical regression predicting GPS scores.

	Unstandardized B/ Standard Error			
	Block 1	Block 2	Block 3	Block 4
Constant	46.63/10.55***	88.56/ 14.32***	4.33/8.44	42.57/15.81**
Age	0.45/ 0.52	-0.08/ 0.41	0.26/ 0.37	0.11/ 0.36
Gender	-0.35/ 2.61	-0.06/ 2.06	0.45/ 1.91	0.27/ 1.87
Year of Study	-0.11/ 1.24	1.71/ 0.95	1.04/0.88	1.42/ 0.85
Openness		0.05/ 0.05		0.02/ 0.05
Conscientiousness		-0.36/ 0.05***		-0.21/ 0.06***
Extraversion		0.01/ 0.04		0.03/ 0.04
Agreeableness		-0.01/ 0.05		0.00/ 0.05
Neuroticism		0.04/ 0.04		-0.00/ 0.05
Emotional Control			0.10/ 0.18	0.03/ 0.20
Self-Monitor			0.16/ 0.50	0.20/ 0.52
Initiate			1.41/ 0.38***	1.33/ 0.38**
Plan/Organize			0.25/ 0.39	-0.46/ 0.43
Task-Monitor			1.09/ 0.56	1.26/ 0.55**
Inhibit			-0.01/ 0.43	-0.48/ 0.45
Shift			-0.81/ 0.39*	-0.32/ 0.46
Working Memory			0.01/ 0.35	0.14/ 0.34
Organize Materials			1.04/ 0.24***	0 .67/ 0.26*
$F/ \Delta F$	0.37/ 0.37	14.81/ 23.30***	14.80/ 19.46***	12.39/ 14.87***
R^2/Adj. R^2	.01/ -.01	.46/ .43	.57/ .53	.62/ .57

***p < .001. **p < .01. *p < .05.

The second regression model included the six domains of procrastination measured by the PASS as the criterion variable (see Table 9). As before, the demographic covariates of age, gender, and year of study were entered in Block 1 and once again, these covariates were not statistically significant predictors of procrastination in the six domains of procrastination measured by the PASS. Moreover, as with the regression model with GPS procrastination as the criterion variable, the adjusted R^2 was negative in Block 1; indicative of a complete absence of explanatory ability.

In Block 2 the NEO-PI-R personality factors were entered and the factors of Conscientiousness, $\beta = -0.47$, $t(137) = -5.48$, $p < .001$, and Neuroticism, $\beta = 0.19$, $t(137) = 2.08$, $p = .040$, were statistically significant in their ability to predict PASS procrastination. In addition, the R^2 change was statistically significant; $\Delta R^2 = .38$, $F(8, 138) = 11.14$, $p < .001$.

Block 3 once again included only the executive function subscales. Only the subscales related to the ability to Initiate a task, $\beta = 0.34$, $t(133) = 3.00$, $p = .003$, and Organize Materials, $\beta = 0.15$, $t(133) = 2.10$, $p = .038$, were revealed as statistically significant. This model had a significant R^2 change; $\Delta R^2 = .48$, $F(12,134) = 10.67$, $p < .001$.

In Block 4 when sets of variables were included, only Conscientiousness, $\beta = -0.25$, $t(128) = -2.20$, $p = .030$, and the task Initiation subscale, $\beta = 0.30$, $t(128) = 2.59$, $p = .011$, were statistically significant predictors of the aggregate score of the 6 domains of procrastination assessed by the PASS. This model also possessed a significant R^2 change; $\Delta R^2 = .51$, $F(17, 129) = 8.31$, $p < .001$.

Table 9

Hierarchical regression predicting scores on the 6 domains of procrastination measured by the PASS.

	Unstandardized B/ Standard Error			
	Block 1	Block 2	Block 3	Block 4
Constant	5.23/ 1.07 ***	9.23/ 1.55 ***	1.24/ 0.94	5.38/ 1.81 **
Age	0.02/ 0.05	-0.01/ 0.04	0.00/ 0.04	-0.01/ 0.04
Gender	-0.13/ 0.27	-0.18/ 0.22	-0.23/ 0.21	-0.21/ 0.21
Year of Study	-0.12/ 0.13	0.03/ 0.10	-0.02/ 0.10	0.01/ 0.10
Openness		-0.00/ 0.01		-0.00/ 0.01
Conscientiousness		-0.03/ 0.01 ***		-0.01/ 0.01 *
Extraversion		-0.01/ 0.00		-0.00/ 0.00
Agreeableness		-0.00/ 0.01		-0.00/ 0.01
Neuroticism		0.01/ 0.00 *		0.00/ 0.01
Emotional Control			0.01/ 0.02	0.01/ 0.02
Self-Monitor			0.03/ 0.06	0.01/ 0.06
Initiate			0.13/ 0.04 **	0.11/ 0.04 *
Plan/Organize			0.07/ 0.04	0.04/ 0.05
Task-Monitor			0.05/ 0.06	0.04/ 0.06
Inhibit			-0.04/ 0.05	-0.06/ 0.05
Shift			0.05/ 0.04	0.06/ 0.05
Working Memory			-0.02/ 0.04	-0.01/ 0.04
Organize Materials			0.06/ 0.03	0.04/ 0.03
$F/\Delta F$	0.44/ 0.44	11.14/ 17.42 ***	10.67/ 13.97 ***	8.31/ 9.92 ***
R^2/Adj. R^2	.01/ -.01	.39/ .36	.49/ .44	.52/ .46

***p < .001. **p < .01. *p < .05.

The last self-report measure of procrastination analyzed with a hierarchical regression was the Reasons for Procrastination as measured by the PASS (see Table 10). As with the previous regressions, the demographic variables of age, gender, and year of study were entered in Block 1; the model was not statistically significant.

When personality factors were included in Block 2, both Conscientious $\beta = -0.37$, $t(137) = -4.40$, $p < .001$, and Neuroticism $\beta = 0.35$, $t(137) = 3.78$, $p < .001$, significantly predicted endorsement of the Reasons for procrastination measured by the second component of the PASS. Block 2 also returned a significant R^2 change; $\Delta R^2 = .35$, $F(8, 138) = 10.67$, $p < .001$.

In Block 3 when the executive function subscales were entered with the demographic variables, only the task Initiation $\beta = 0.33$, $t(133) = 2.77$, $p = .006$, and Planning/Organizing $\beta = 0.26$, $t(133) = 2.02$, $p = .046$, subscales were statistically significant. Block 3 was also associated with a significant R^2 change; $\Delta R^2 = .40$, $F(12, 134) = 8.63$, $p < .001$.

Lastly, when sets of variables were entered in Block 4, the task Initiation subscale $\beta = 0.27$, $t(128) = 2.28$, $p = .024$, and factor Agreeableness $\beta = 0.16$, $t(128) = 2.04$, $p = .044$, emerged as statistically significant predictors of the Reasons for Procrastination assessed by the second component of the PASS. Block 4 also returned a statistically significant R^2 change; $\Delta R^2 = .46$, $F(17, 129) = 7.24$, $p < .001$.

Table 10

Hierarchical regression predicting scores on the Reasons for procrastination measured by the PASS.

	Unstandardized B/ Standard Error			
	Block 1	Block 2	Block 3	Block 4
Constant	1.96/ 0.42 ***	2.28/ 0.62 ***	0.71/ 0.39	0.92/ 0.75
Age	0.01/ 0.02	-0.00/ 0.02	-0.00/ 0.02	-0.00/ 0.02
Gender	0.18/ 0.11	0.10/ 0.09	0.13/ 0.09	0.10/ 0.09
Year of Study	-0.06/ 0.05	-0.02/ 0.04	-0.02/ 0.04	-0.01/ 0.04
Openness		-0.00/ 0.00		-0.00/ 0.00
Conscientiousness		-0.01/ 0.00 ***		-0.01/ 0.00
Extraversion		-0.00/ 0.00		0.00/ 0.00
Agreeableness		0.00/ 0.00		0.01/ 0.00 *
Neuroticism		0.01/ 0.00 ***		0.00/ 0.00
Emotional Control			0.01/ 0.01	-0.00/ 0.01
Self-Monitor			-0.01/ 0.02	0.01/ 0.02
Initiate			0.05/ 0.02 **	0.04/ 0.02 *
Plan/Organize			0.04/ 0.02	0.02/ 0.02
Task-Monitor			0.00/ 0.03	0.01/ 0.03
Inhibit			-0.02/ 0.02	-0.02/ 0.02
Shift			0.01/ 0.02	0.01/ 0.02
Working Memory			0.01/ 0.02	0.01/ 0.02
Organize Materials			0.01/ 0.01	-0.00/ 0.01
$F/\Delta F$	1.62/ 1.62	10.67/ 15.61 ***	8.63/ 10.64 ***	7.24/ 8.20 ***
R^2/Adj. R^2	.03/ .01	.38/ .35	.44/ .39	.49/ .42

***p < .001. **p < .01. *p < .05.

3.6 Experimental Hypotheses

In order to ascertain the effectiveness of the manipulation, a quantile regression analysis was used. The state measure of procrastination, time to send the follow-up email (TTS), was analyzed at the 1st quartile, the median, and at the 3rd quartile. Unlike ordinary least squares which conditions on the mean, quantile regression allows one to examine any point along the outcome distribution. Because the distribution of the state measure of procrastination, TTS, did not have a discernible distribution, quantile regression provided a robust analysis (Koenker, 2005; Rodriguez & Yonggang, 2017). In the current data set, outlier analyses indicated many univariate outliers and estimates of central tendency using the median rather than the mean are less sensitive to the presence of such outliers.

Since the present study contained only one manipulated variable, Block 1 of the analysis included only the manipulated conditions with the "Don't be Last" and control conditions dummy-coded and compared against the "Be First" condition reference category. Block 2 contained the previously included demographic factors of age, gender, and year of study along with the NEO-PI-R personality factors, and all nine BRIEF-A subscales of executive function. Thus, the quantile regression included all of the variables present in the three previous hierarchical regressions with the addition of a comparison by condition.

Regardless of which quantile was being analyzed, only the control condition was significantly different from the "Be First" condition, and that regardless of the quantile being analyzed, only Block 1 which had condition as the sole predictor variable returned a significant *F* value (see Table 11).

In the first quartile, the only significant predictor of TTS was condition; specifically, the control condition. Within the median regression analysis, again only the control condition was indicated as significantly different from the "Be First" condition; no other covariate was indicated as a significant predictor of the measure of TTS. In the third quartile, only condition and the Organize Materials subscale of executive functioning were statistically significant predictors.

Table 11

Summary of the Quantile Regression Analysis for Covariate effects on Behavioural Procrastination.

	1st Quartile		2nd Quartile		3rd Quartile	
	B Coefficient/ Standard Error					
	Block 1	Block 2	Block 1	Block 2	Block 1	Block 2
Be First	0.02/2.26	9.95/52.32	0.27/7.28	-86.13/128.03	2.90/20.86	21.11/208.64
Don't be Last	0.21/3.13	0.56/ 5.99	11.46/ 10.09	15.08/ 14.65	21.88/28.89	27.65/ 23.88
Control	17/3.13 ***	15.89/ 6.27 *	47.96/ 10.09 ***	55.92/ 15.34 ***	90.37/28.89 **	52.65/ 25.00 *
Age		-0.56/ 1.31		0.08/ 3.20		0.12/ 5.22
Gender		-1.13/ 6.18		2.81/ 15.13		-0.25/ 14.66
Year of Study		1.23/ 3.05		8.96/ 7.47		6.79/ 12.18
Openness		-0.03/ 0.14		-0.25/ 0.34		-0.02/ 0.56
Conscientiousness		-0.01/ 0.20		-0.07/ 0.50		-0.13/ 0.81
Extraversion		-0.01/ 0.13		0.37/ 0.32		-0.34/ 0.53
Agreeableness		0.05/ 0.16		0.21/ 0.40		-0.18/ 0.65
Neuroticism		-0.06/ 0.16		0.01/ 0.40		-0.16/ 0.65
Emotion-Control		0.32/ 0.67		-0.55/ 1.65		-3.15/ 2.69
Self-Monitor		-0.62/ 1.81		2.07/ 4.42		0.03/ 7.21
Initiate		0.81/ 1.34		1.86/ 3.27		-1.00/ 5.33
Plan/Organize		-0.02/ 1.54		-0.08/ 3.76		4.10/ 6.12
Task-Monitor		-0.19/ 1.80		2.00/ 4.39		1.85/ 7.16
Inhibit		0.97/ 1.61		0.34/ 3.93		3.93/ 6.41
Shift		-0.80/ 1.56		-0.82/ 3.81		4.72/ 6.22
Working Memory		-0.31/ 1.20		-1.09/ 2.94		-3.54/ 4.80
Organize Material		0.32/ 0.96		4.16/ 2.34		11.68/ 3.82 **
GPS		-0.07/ 0.32		-1.33/ 0.79		-2.47/ 1.29
PASS 6 Domains		0.74/ 2.89		8.39/ 7.08		4.43/ 11.54
PASS Reasons		-2.21/ 6.88		-7.99/ 16.83		-1.45/ 27.43
F	19.98 ***	0.10	12.55 ***	0.71	5.42 **	1.23
Pseudo R^2	.06	.08	.13	.24	.22	.41

Note: Block 1 (*df*1, *df*2) = (2, 102) Block 2 (*df*1, *df*2) = (20, 82)

*****p < .001. **p < .01. *p < .05.**

Discussion

4.1 General Findings

The major findings from the present study suggest that, in line with previous literature, factor Conscientiousness is a strong negative predictor of procrastination (Larsen & Buss, 2014; Lee, Kelly, & Edwards, 2006; Milgram & Tenne, 2000; Schouwenburg & Lay, 1995; Watson, 2001). Further, results indicate that Conscientiousness is associated with both state and trait procrastination. A second notable finding with links to past literature is that factor Neuroticism is significantly positively related to trait procrastination (Lee et al., 2006; Schouwenburg & Lay, 1995; Watson, 2001). Interestingly, Openness was not shown to have a statistically significant relationship to trait procrastination despite there being suggestions to the contrary (Larsen & Buss, 2014).

These findings are directly related to the first and second hypotheses within the present study. The first hypothesis, which was supported, held that factor Conscientiousness would have a negative relationship with procrastination. The second hypothesis held that both Openness and Neuroticism would have a positive relationship with procrastination. However, only Neuroticism had a statistically significant relationship with procrastination, and only when related to trait procrastination. Neither Openness nor Neuroticism had statistically significant relationships to state procrastination. Overall, this hypothesis was partially supported.

The third hypothesis related exclusively to the effect of the competition-based manipulation on state procrastination, suggesting that as competition increased, procrastination would decrease. More specifically, the “Be First” condition would have

the fastest average time to send the follow-up email, "Don't be Last" would be slower than the "Be First" condition (but faster than the control condition), and the control condition would be the slowest on average. However, this hypothesis was only partially supported. Only the "Be First" condition was statistically different from the control group, which had the largest TTS scores. Thus, there is insufficient evidence to suggest that this hypothesis was supported in its entirety.

Lastly, the fourth set of hypotheses related to the subscales of executive functioning as measured by the BRIEF-A. These exploratory hypotheses held that the subscales of Emotional Control, Self-Monitoring, Task-Monitoring, Planning and Organizing, and task Initiation would be negatively related to procrastination. These subscales each possessed significant relationships to the various measures of trait procrastination; however, Organizing Materials was the only subscale shown to possess a statistically significant relationship to state procrastination within the quantile regression. Given these results, there is sufficient evidence to suggest that this pattern of findings was partially congruent with the original set of hypotheses.

4.2 Experimental Findings and Rationale

The purpose of the present study was to determine whether a competition-based manipulation informed by TMT principles could lead to a reduction in state procrastination. In the current study, the competition-based manipulation was developed from two main economic theories; hyperbolic discounting theory (HDT) and temporal motivation theory (TMT). The principles of HDT can be used to understand the problem; however, the principles of TMT constitute the solution. According to HDT, the

problem of procrastination often occurs as a result of preference reversal (Ainslie, 2005).

Preference reversal occurs when a preferred larger later (LL) reward is abandoned in place of a smaller sooner (SS) reward that is perceived as more valuable due to temporal proximity (Ainslie, 2005; Grether & Plott, 1979). Such reversal often occurs because of the temporal immediacy of the SS reward compared to the LL reward (Ainslie, 2005; Ziegler & Opdenakker, 2018). More specifically, HDT holds that this occurs because options that lead to faster gratification will be preferred over options that have greater value, but require more time before attainment (Ainslie, 2005). In the context of procrastination, these SS rewards could be as simple as watching television versus working on a paper (or sending a follow-up email). Individual impulsivity with reference to putting off an activity associated with a LL reward in favour of an option that is immediately gratifying (e.g., a SS reward) is an explanation for why procrastination occurs (Ainslie, 2005). Within the context of trait procrastination, the results of the present study support this assertion, as both facet Impulsivity and the BRIEF-A subscale of Inhibition possessed statistically significant relationships to each of the measures of trait procrastination.

The use of principles derived from HDT in the present study stemmed from two underlying assumptions. The first assumption held that the rewards associated with the secondary study were sufficient. As stated previously, there was a question included in the demographics questionnaire that gauged the perceived attractiveness of the secondary study. Expressed as a percentage, the average perceived attractiveness of the secondary study for the entire sample was 82.14% (e.g., an average rating of 5.75 on a

7-point Likert scale). In addition, 72.7% of the sample sent the follow-up email in an attempt to secure their eligibility. The second assumption held that, by extension, if a participant did not send a follow-up email then it must have been because he/she had succumbed to the allure of a SS reward. Although descriptive information related to the first assumption was gathered, neither of these assumptions were directly testable.

In order to determine if the secondary study was sufficiently attractive, a basis of comparison is required; the reward/value appraisal of LL and SS rewards is relative. For this comparison to be testable in the present study, data would have to have been collected on the perceived attractiveness of the various procrastinatory activities listed on the demographics questionnaire. In addition, it would be useful to know which procrastinatory activity a given participant engaged in instead of sending the follow-up email (if any) and the perceived attractiveness of that activity.

Unfortunately, data was not collected on the perceived attractiveness of the various procrastinatory activities a participant could have engaged in. Given the data and the economic principles observed in the development of the manipulation, participants who did not send the follow-up email either found the secondary study insufficiently attractive and/or perceived the attractiveness of an unknown SS reward as greater than the LL reward linked to the secondary study. As previously stated, data that makes these assumptions testable was not collected; thus, it is an assumption linked to HDT principles that if participants chose a course of action other than sending a follow-up email, it is because they perceived that course of action as more attractive or the secondary study as insufficiently attractive. Although an incentive mechanism to reduce

academic procrastination has been established, the data does not allow a definitive conclusion with reference to why a participant did not send a follow-up email.

This is because the data in the present study related to this question was categorical in nature; did the participant send a follow-up email or did they not. Regardless, it is important to note that the principles of HDT assist in understanding the procrastination problem; however, the principles of TMT provide the solution (Steel et al., 2018).

$$Motivation = \frac{Expectancy\ x\ Value}{1 + (Impulsiveness\ x\ Delay)}$$

The primary components of this equation manipulated in the present study were expectancy and delay. Participants in either of the experimental conditions (e.g., "Be First" and 'Don't be Last") had some control over the expectancy they had over reward attainment. If a participant sent the follow-up email at 9:00 PM exactly, they could not have delayed any less; therefore, their expectancy would still be unknown, but would be as high as it could possibly be. The more a participant in these conditions procrastinated, their expectancy of reward attainment would proportionally decrease according to the TMT equation (Steel & König, 2006; Steel et al., 2018). Put another way, a greater delay would be associated with a lowered expectation of reward attainment; that is, a probable future consequence.

This was divergent from the control condition in that even if a control condition participant sent an email at 9:00 PM, their expectancy would be unknown; they didn't know the odds of winning the lottery. In fact, those in the control condition not only lacked control over the expectancy they could have of reward attainment, but also did not know how many were involved in the lottery, or how many would be selected. In

this instance, expectancy could not reasonably change regardless of whether a follow-up email was sent at the earliest possible time versus the latest possible time allowed by the hanging deadline. To re-iterate, this is because they believed their selection for enrollment in the more rewarding secondary study was contingent upon a lottery. Put another way, the manipulation led participants in the experimental conditions to believe they *earned* participation in the secondary study, while participants in the control condition were *selected* for participation; an outcome perceived to be beyond their control.

The manipulation in the experimental conditions was similar to expectancy commonly encountered in the academic context. As stated in the introduction, students do not have direct agency with reference to how much their grade will increase as a function of how much time/effort they devote to studying for an exam or researching and writing a paper. This is not to say that these factors have no effect; rather, they that they don't offer a guarantee. Participants in the experimental conditions who sent the email at 9:00 PM could not have done anything more to earn their placement in the sequel study, just as students who devote excessive time to study or writing can do little else to earn a high grade. However, students do not grade themselves and thus lack direct agency with reference to how much their grade will increase.

Time and effort in the academic context lead to a greater expectancy of an exemplary grade, but do not guarantee it. Sending the follow-up email sooner as opposed to later increased expectancy in the same way; it did not guarantee participation, but it increased the expectancy a participant could reasonably have. Essentially, attaching a consequences to procrastination and thus further incentivizing

productive action, an incentive mechanism born from competition was revealed to lead to decreases in procrastination.

The motivation to engage in a course of action required to attain a particular reward is predictable under the tenets of TMT (Steel & König, 2006; Steel et al., 2018). Because participants in the experimental conditions had some agency in their expectancy of reward attainment, they could act earlier to increase their expectancy. All other components of the equation being equal, this would lead to greater motivation to engage in a given course of action. In this study, there were only two ways participants in the experimental conditions could decrease expectancy.

Most obviously, the participants could have opted to not send the follow-up email, this would lead to expectancy being 0. The participants also could have procrastinated in sending the follow-up email, and this would result in a lowered expectancy of reward attainment. However, the less procrastination participants engaged in, the greater their expectancy would reasonably be. Because participants in the "Be First" condition were the most influenced by competition (e.g., only the fastest 20% to send the follow-up email were perceived as being eligible for the reward), the corresponding reduction in expectancy of reward attainment was the most pronounced. This is in clear contrast to the "Don't be Last" condition perceived the fastest 80% to send the follow-up email would be eligible, and both of these are discrepant from the control condition which did not perceive any control over the expectancy they could have with reference to reward attainment.

This does not mean that participants in the control condition never should have sent a follow-up email; however, it does imply that they would be less likely to do so.

The descriptive statistics by condition for those who sent a follow-up email versus those who did not were in line with this expectation that reasonably follows from the TMT equation. Out of the 47 participants in the Be First" condition, 21.28% did not send the follow-up email. Of the 48 participants in the "Don't be Last" condition, 18.75% did not send the follow-up email. Lastly, out of the 59 participants in the control condition, 38.98% did not send the follow-up email. Analysis of this outcome was statistically significant, χ^2 (2) = 6.69, p = .035, and consistent with the expectation that those in the control condition would be less likely to send a follow-up email.

A second expectation related to expectancy and the experimental conditions would be that those in the "Don't be last" condition would have the highest rate of sending the follow-up email. Participants in either experimental condition had expectancy of reward attainment that decreased as time passed beyond the 9:00 PM start time; however, the rate of decrease of expectancy related to reward attainment in the "Be First" condition would be faster compared to the "Don't be Last" condition since those in the former condition believed only 20% of participants were eligible for the secondary study compared to 80% in the latter. However, an analysis on this outcome was not statistically significant, χ^2 (1) = 0.10, p = .758.

It is important to note that expectancy was not the only TMT principle incorporated into the competition-based manipulation and other principles contained within the TMT equation could underlie this outcome; however, the data present do not allow for this to be tested. Given the results of the above analyses, it would be reasonable to say that control over expectancy leads to a greater probability of reward

motivated action; however, the analyses do not allow for definitive statements made about the exact expectancy required for reward motivated action to occur.

Unfortunately, this study lacked a measure capable of quantifying how expectancy, reward appraisal, and delay factored into a given participant's decision. The manipulation within the present study was aimed at producing clear and quantifiable outcomes (e.g., reductions in state procrastination as a function of competition); however, future studies could benefit by including measures that are capable of tapping into these various constructs. Regardless, the outcomes related to probability of sending a follow-up email and the discrepancy in average TTS values by condition serve to corroborate the assertion that cognitive mechanisms related to expectancy, delay, and how they influence reward appraisal can motivate behaviour (Steel & König, 2006).

4.3 Procrastination and Personality

The hypotheses within the present study related to factor Conscientiousness, Openness, and Neuroticism were each supported, either partially, or in full. An interesting finding within the results is that the areas in which the hypotheses were only partially supported seemed to stem from a discrepancy between the measures of state and trait procrastination; something that will be discussed shortly.

Although the FFM of personality is well-validated, there is substantial debate in the literature surrounding whether state procrastination is captured in trait measures of procrastination (Krause & Freund, 2014). In fact, Steel et al. (2001) suggest that there is a divergence in the trait correlates of procrastination dependent upon whether trait or state measures of procrastination are used. Although self-reported trait procrastination is suspected to measure procrastinatory behaviour, endorsement or rejection of items

intended to measure procrastination are susceptible to influence from previously formulated self-concepts (Dunning, Heath, & Suls, 2004). Results related to the PASS support this assertion. The 6 aggregate domains of the PASS that assessed trait procrastination related to behaviour in various academic tasks (e.g., writing a term paper, studying for an exam, etc.) possessed a statistically significant relationship to the measure of state procrastination (TTS), $\tau = .14$, $p = .035$; however, the second component of the PASS assessing the reasons for procrastination lacked any such statistically significant relationship.

Despite this, trait Conscientiousness showed negative correlations with all measures of procrastination; however, the relationship between Conscientiousness and state procrastination was weaker. To test whether the differences between the strength of the correlation coefficients were statistically significant, a Fisher's r to z transformation was used. Results of this test revealed a statistically significant difference $z = 2.88$, $p = .002$. Although Conscientiousness was more strongly related to trait measures of procrastination, the overall pattern of results from the present study suggests that regardless of how procrastination is measured, trait Conscientiousness will be related to it (Lay, 1986; Schouwenburg & Lay, 1995). This suggests Conscientiousness is likely more resilient than other previously established trait correlates of procrastination to situational variables.

Neuroticism was strongly positively correlated with each of the trait measures of procrastination but showed no statistically significant relationship with the measure of state procrastination (TTS). Interestingly, previous studies have found relationships that vary in strength between Neuroticism and either state or trait procrastination (Johnson &

Bloom, 1995; Steel et al., 2001). However, the strength of the relationship between Neuroticism and procrastination as assessed by trait measures is invariably larger than the link between Neuroticism and measures of state procrastination (Steel et al., 2001). This implies that Neuroticism and its facets may be less important when attempting to predict and reduce behavioural/state procrastination.

Openness was not significantly related to any of the measures of procrastination included in the present study. With the exceptions of the facets of Fantasy which was related to the GPS ($r = .31$, $p < .001$), there was no relationship between trait Openness, its facets, and the various measures of procrastination. The hypothesis that Openness would be positively related to procrastination was based on descriptions of behaviours that people high in this trait commonly engage in (Larsen & Buss, 2014), and the fact that this trait has been conceptualized as relating to the ability to attend to and process cognitive concepts and rules (Weisberg, DeYoung, & Hirsh, 2011). Admittedly, this is a weak justification; however, it has been examined as a possible trait correlate to procrastination in past literature (Schouwenburg & Lay, 1995; Watson, 2001).

Since factor Openness and its facets often either lack statistically significant relationships with measures of procrastination (Schouwenburg & Lay, 1995; Steel et al., 2001; Watson, 2001; Zhou, 2018) or is ignored entirely (Johnson & Bloom, 1995), it is unlikely worth a great deal of consideration. In fact, because of the repeated failure of trait Openness to significantly predict or be associated with procrastination (e.g., in the present study and those cited above), its inclusion in future studies aimed at elucidating the factors that underlie procrastination or decreasing instances of the behaviour should be carefully justified.

One final consideration with reference to personality, procrastination, and the measures of procrastination within the present study relates to trait versus state procrastination. The self-report measures in the present study are primarily used to tap into trait procrastination; however, the measure of behavioural procrastination only allows us to gauge procrastination in a specific context or state. From this perspective, the weak/lack of relationships between the measures of trait and behavioural/state procrastination in the present study makes sense. However, it must be recognized that behaviours are likely to be overridden by contextual (e.g., state) factors anyway (Fleeson, 2004).

It logically follows from this that measures of, and interventions aimed at, reducing behavioural procrastination in place of self-report/trait procrastination as the type of procrastination most worthy of focus in the academic environment is reasonable. This line of argumentation is not new (Moon & Illingworth, 2005; Steel et al., 2001) and lends itself to the idea that focusing on an elucidation and the corresponding reduction of state procrastination is more likely to ameliorate the consequences associated with procrastination.

4.4 Executive Function Findings

Although some of the replication and experimental hypotheses were confirmed, there were novel inclusions that aimed to explore additional correlates and predictors of procrastination. The correlates from the BRIEF-A including the two summary index scales and every subscale to trait procrastination warrants further investigation. In addition, because some of these subscales had relationships to behavioural/state procrastination, their inclusion in the investigation of procrastination in either context

would be justifiable. Because the inclusion of this measure to ascertain the strength and direction of relationships between executive functioning and procrastination was novel, the findings reported in this study require replication.

Unfortunately, because the present study had limitations related to power, and thus the possibility that the lack of findings as the BRIEF-A related to state procrastination occurred as a result of Type 2 error, caution should be exercised when interpreting these results. However, the relationships between the BRIEF-A facets and the measures of trait procrastination should not be ignored. Although these results are interesting, the findings related to the BRIEF-A as applied to procrastination should be replicated before any speculative, let alone definitive statements are made.

The results stemming from the inclusion of the BRIEF-A more than any others from the present study should be interpreted cautiously due to a lack of statistical power. For example, only the subscales of Self-Monitoring, Planning/Organizing, Inhibition, and Organizing Materials had statistically significant correlations to the measure of state procrastination, TTS. It could be the case that more of the BRIEF-A subscales possess statistically significant relationships to state procrastination; however, the present study could have failed to reveal these due to a lack of statistical power. Regardless, the observed patterns of correlations were consistent, statistically significant, and on average, quite strong. As such, future studies could use these results as a feasible justification for applying the BRIEF-A to future research into procrastination, regardless of whether state or trait procrastination is being measured.

4.5 Divergence of State vs. Trait Procrastination

One of the most noteworthy implications from the results of the present study is that measures of state and trait procrastination had a smaller degree of overlap than expected. For example, according to the trait procrastination approach, we would expect to see procrastinatory tendencies remain stable across situations, time, and tasks (Moon & Illingworth, 2005; Schouwenburg & Lay, 1995). However, research shows that mean levels of procrastination change over time, and that regardless of divergent initial self-reports of trait procrastination (e.g., some students rating themselves as "high" and some as "low" in procrastination via Likert scales) students tend to follow a similar trajectory over time (Moon & Illingworth, 2005; Steel et al., 2001). These findings are consistent with the idea that some situations or environments are capable of over-riding personality (Darley & Batson, 1973; Fleeson, 2004; Pychyl et al., 2000; Reynolds & Karraker, 2003). It is also important to note that of the various measures of trait versus state procrastination, measures of state procrastination generally have stronger relationships to the consequences of academic procrastination (Steel et al., 2001).

Recent research has into the debate surrounding the use of self-report/trait versus behavioural/state measures suggests that the weak relationship between these measures may be due to three fundamental differences (Dang, King, & Inzlicht, 2020). First is the idea that behavioural measures generally provide insight into a reaction to stimuli that are not commonly encountered in an unusually structured situation. Conversely, self-report measures rely on participants to reflect on what they can recall about their behaviour within a plethora of real-world situations, although, other evidence suggests these self-reports are not reliable (Dunning et al., 2004).

Second is the idea that behavioural measures tend to be based on objective performance, while self-report measures are based on *perceived* performance through a subjective lens (Dang et al., 2020). With reference to this second point, it is important to note that behavioural measures of procrastination have an established relationship with the negative consequences associated with the occurrence of the behaviour; a statement of the same magnitude cannot be made with reference to self-report/trait measures of procrastination (Moon & Illingworth, 2005; Steel et al., 2001).

Lastly is the idea that behavioural measures are purported to tap into an individual's maximal performance, while self-report measures are a subjective gauge of that same individual's average performance/behaviour (Dang et al., 2020). Unfortunately, this same argument does not apply to behavioural/state measures as they appear in procrastination literature, as the behavioural measures are usually not manipulated; that is, participants are not positioned to do either better or worse than they would normally (Lay, 1986; Moon & Illingworth, 2005; Solomon & Rothblum, 1984). Although explanations do exist in recent literature to explain why behavioural and self-report measures are different, these explanations should be interpreted through a context-specific lens.

In the context of academic procrastination research, it is important to understand that the objective of reducing academic procrastination is prevalent because it is so often associated with deleterious consequences (Dewitte & Schouwenburg, 2002; Ferrari et al., 2005; Fritzeche et al., 2003; Klassen et al., 2008; Steel et al., 2001; Tice & Baumeister, 1997). However, self-report measures of trait procrastination often are not associated with academic performance, while measures of behavioural/state

procrastination are (Moon & Illingworth, 2005; Steel et al., 2001). This is not to suggest that self-report trait measures of procrastination should be abandoned; however, their limitations must be recognized. The field thus far has largely relied on these measures and have found strong statistically significant results from their use; however, these results have not yet led to a successful intervention aimed at procrastination reduction (Rozental et al., 2018).

A final point on this matter is the fact that the observed weak correlations between the state measure of procrastination and the trait measures have surfaced in past literature where both types of measures have been used. Solomon and Rothblum (1984) compared PASS scores against an unmanipulated measure of state procrastination and found only a weak relationship between them, or none at all. Recall that there are six domains of procrastination assessed by the PASS. Only three domains possessed statistically significant correlations to their measure of state procrastination. In this study, the domains related to writing a term paper ($r = .24$, $p < .001$), studying for an exam ($r = .19$, $p < .01$), and weekly reading ($r = .28$, $p < .001$).

A second study that used similar methodology (e.g., both state and trait measures of procrastination) returned similarly weak correlations. Statistically significant correlations between the measures in this study ranged from, $r = .19$, $p < .01$, to, $r = .27$, $p < .01$ (Moon & Illingworth, 2005). In both of these cases, correlations between the measures of state and trait procrastination would be described as weak-to-moderate (Akoglu, 2018; Field, 2018).

There are two primary reasons the relationship between state and trait measures of procrastination in the present study were weak. The first would be that the measure of

state procrastination in the present study, time to send a follow-up email (TTS), was not actually measuring procrastination. Despite the fact the operationalization of TTS followed the same fundamental principles of previously established state measures of procrastination (Moon & Illingworth, 2005; Solomon & Rothblum, 1984) and fit the very definition of procrastination outlined in the introduction (Park & Sperling, 2012; Steel, 2007), it could be argued that since definitions are descriptive rather than prescriptive, the congruence between measure and the definition of the construct is necessary, but insufficient to guarantee external validity. However, because the present study also included a post-hoc non-manipulated measure of procrastination (e.g., date the participant completed the study, DSC) as a manipulation check, the assertion that state procrastination was being measured in the present study is reinforced.

Put another way, DSC possessed a statistically significant relationship to the control condition, $r = .31$, $p < .05$, but neither of the experimental conditions. Thus, there is evidence to suggest that in both instances where procrastinatory behaviour was not manipulated there was significant overlap. Because DSC is methodologically synonymous with previously used measures of non-manipulated state procrastination (Moon & Illingworth, 1984; Solomon & Rothblum, 1984), this provides support for the assertion that TTS was a measure of both manipulated and non-manipulated procrastination.

The second reason would be that state and trait measures of procrastination fail to tap into the same construct. In fact, this has been a previously expressed criticism of the trait procrastination approach (Moon & Illingworth, 2005; Steel et al., 2001). In addition, studies involving procrastination rarely involve the use of both self-report trait

and state measures of procrastination; instead, they often rely exclusively on self-report measure (Krause & Freund, 2014). However, the two aforementioned studies that also involved both types of measures (Moon & Illingworth, 2005; Solomon & Rothblum, 1984) returned correlations with similar strength to those observed in the present study between the different types of measures. It must be noted that only the relationships between the measures of trait procrastination and the control condition would represent a proper comparison, as that would be the only instance where measures of trait procrastination were correlated to non-manipulated state procrastination.

Although the present study did not gauge/measure indicators of academic performance, it must be noted that trait measures of procrastination, not state measures, are generally unrelated to academic performance and the consequences of procrastination (Moon & Illingworth, 2005; Steel et al., 2001). A reasonable conclusion to draw from this information is that when attempting to ameliorate or elucidate the procrastination problem, state measures over trait measures should be utilized and relied upon to a greater extent.

4.6 Strengths and Limitations of the Current Study

Generally, post-secondary convenience samples are viewed as weaknesses for studies that seek to generalize their results to the general population. This is due to student samples being generally homogenous, and because of that homogeneity, not representative of the general population (Henrich, Heine, & Norenzayan, 2010; Peterson, 2001). This position has been supported when researchers examine variables related to personality and attitudinal variables (Hanel & Vione, 2016). However, in the

context of this study, the use of a convenient student sample can be viewed as not overly problematic, at least in the context of Canadian post-secondary students.

Another limitation was the fact that there could have been a sample selection bias. That is, because students who procrastinate heavily tend to possess lower GPA's (Chu & Choi, 2005), the heaviest of procrastinators could have been inadvertently have been omitted from the sample. Such procrastinators may have either already failed out of university, or procrastinated to the extent that they were unable to participate in any of the studies that led to research participation points. Although it isn't possible to confirm this limitation, as the sub-sample of interest wouldn't have been included in the overall sample, this possibility would lead to a downward biasing of the results. That is, because the sub-sample for whom the intervention may have been most effective for weren't included in the present study, the results may be conservative.

The sample was primarily female with 84.9% between the ages of 18 and 24. Furthermore, the sample was overwhelmingly female (79.2%). Although such a pronounced skew in the gender and age distributions is seemingly problematic, the majority of the sample being between 18-24 years of age and female is congruent with the finding that the gender and age distribution at Canadian universities tends to follow this pattern (Duffin, 2019). Given that the purpose of this study was to determine if a competition-based manipulation could decrease procrastination, it would be noteworthy if there was a consistency in the literature with reference to one gender being more prone to procrastination than others; however, there is no such basis. Findings on this matter have been returned; however, they're largely incongruent and seem to vary on a

study-to-study basis (Balkis & Duru, 2017; Ferrari, Keane, Wolfe, & Beck, 1998; Zhou 2018).

Another limitation within the present study was that there was a ceiling effect within the sample, but only related to the manipulation. That is, because 27.3% of the sample did not send the follow-up email, no information could be gleaned from these participants as it related to the effects of the manipulation. This is not to suggest that these participants escaped measurement, they still completed all other measures as the other participants. However, it is unknown whether these participants were not influenced by the manipulation in the same way as the other participants or if they did not find the secondary study attractive enough to warrant the actions required to become eligible. Regardless, this is an important limitation to note with reference to the manipulation; however, it did not limit conclusions drawn from the measures related to trait procrastination.

A second limitation, and that which is most pronounced within the present study relates to power. The power analysis performed at the outset of the study indicated 150 participants were required with an even distribution of 50 between the three conditions. Furthermore, it was not just that 50 participants were required in each condition, but that all of these 50 participants sent the follow-up email. Unfortunately, this requirement was not met. Our distribution by condition was 47 in the "Be First" condition, 48 in the "Don't be last" condition, and 59 in the control condition. These raw numbers indicate that only the control condition had a sample size sufficient to meet the recommendations from G*Power assuming all but nine of them sent the follow-up e-mail. In the current study, participants were informed that they would have two weeks to sign up for the

secondary study. To meet this requirement, data collection ended two weeks before the last day of classes; however, the minimum sample size requirement indicated by the power analysis was met.

Although I did end up with significant findings and can thus assume sufficient power in some areas of the analyses (or a Type II error), it is a limitation of the present study. If the results had been non-significant, then this limitation could have been a potential explanation for the failure to reject the null hypothesis associated with the manipulation. The power in the present study may have been insufficient to detect statistically significant effects from many of the covariates included in the regression analyses, as well as statistically significant differences between the "Be First" and "Don't be Last" conditions.

4.7 Implications

The results of the present study imply that there are three primary directions research related to procrastination could take. The first would be to continue along the current trajectory and use self-report measures of procrastination to not only gauge procrastinations occurrence, but to develop interventions aimed at its reduction. The second would be to shift towards the use of behavioural measures and interventions/manipulations that specifically target the behaviour. The third would be working to develop self-report measures of procrastination that are more sensitive to contextual and situational variables and possess a stronger relationship to behavioural/state procrastination. Put simply, this third direction would be the development of self-report measures that can still be conveniently distributed and analyzed, but provide improved insights into the probability of the occurrence of

behavioural procrastination in various contexts/situations. Of these choices, options two and three are the most preferable.

An additional direction for future research could involve the examination of whether the economic principles incorporated into the manipulation within the present study reduce procrastination for more commonly encountered academic tasks. The present study represents a novel research paradigm that has not previously been manipulated and tested; thus, it serves as a proof of concept. Because the present study returned statistically significant findings related to the manipulation, it would be justifiable for future research to examine ways in which procrastination could be decreased within academic tasks that are more commonly encountered (e.g., studying for an exam or writing a term paper). Such direction would represent a more focused attempt to solve the procrastination problem within the academic context.

Procrastination research to date has largely used self-report/trait measures and important discoveries have been made; however, the interventions being developed using these measures as guides are not as effective as researchers had hoped (Rozental et al., 2018). Although true, this is an important contribution to the field as well. Narrowing the scientific lens assists all subsequent researchers. The results of past literature and the present study suggest that the focus of the field should undergo a pivotal shift. That is, rather than continue to focus on interventions derived from and focused on trait measures of procrastination, to focus on reductions in the behaviour itself and/or to develop trait measures of procrastination that are better able to predict the occurrence of the behaviour and thus would be more closely associated to the consequences of academic procrastination.

.4.8 Conclusions

The results of this study show that executive function, personality, and competition can each affect procrastination. However, the results also indicate that the degree of overlap between self-report/trait and behavioural/state procrastination may not be strong enough for the field to

continue to primarily rely on self-report/trait measures. It must be recognized that the intent of research into procrastination is aimed fundamentally at a reduction in the harmful consequences students face as a result of its occurrence.

If self-report measures do not provide a reliable insight into the occurrence of the behaviour, and consequences faced by students stem from the behaviour, then self-report measures are not the most effective tool. Although not definitive, the results of the present study do cast doubt on this area. That is, because the relationships between behavioural and self-report measures of procrastination are weak, it is doubtful that continuing to use self-report measures as the basis for developing interventions that target consequences associated with the behaviour is the most logical course of action. If the consequences associated with procrastination were linked to how much students *thought* they procrastinated versus how much they procrastinate, then such a course of action would be logical; however, this is not the case.

Ideally, future research will begin to more frequently incorporate measures of, and interventions for behavioural/state procrastination. As previously stated, the intent of researchers in this area is to help students avoid deleterious consequences associated with a behaviour that they frequently engage in. Hopefully, the results from the present study can provide information that allows researchers to achieve this objective more

effectively and thus assists in reducing the extent to which students face these harmful consequences.

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Appendix A

Demographics Form

Please circle or write your answer:

1) What is your age?

---

2) What is your ethnicity?

African American Aboriginal Asian Caucasian

Other: _____

3) Are you an athlete?

Yes No

4) If yes, which sport do you play? Please indicate competitive [C] or recreational [R]

_____

5) What is your sex?

Male Female Other

6) Does your preferred gender differ from your sex? If so, please state your gender identity:

_____

7) Are you currently employed? Full or part-time?

Yes No FT PT Contract Seasonal

8) How many courses are you enrolled in this semester?

_____

9) What year of study are you currently enrolled in?

First Second Third Fourth Other: _____

10) Which academic activity do you enjoy LEAST?

Exams Writing Papers Completing Assignments Reading Course Material

Other: _____

11) How often do you procrastinate? 1 = Never 4 = Sometimes 7 = Always

1 2 3 4 5 6 7

12) To the best of your knowledge, which activity do you procrastinate on the most?

Studying for an Exam Writing a Paper Assignments Reading Course Material

13) Please state which procrastinatory activity you most frequently engage in:

_____

14) How attractive do you find the opportunity to participate in the more rewarding secondary study? 1 = Not at all interested 4 = Moderately interested 7 = Very interested

1 2 3 4 5 6 7

If interested, please indicate your e-mail address below:

_____

Appendix B

Initial Recruitment Directive:

Good morning/afternoon, my name is Ryley Russell and I am a graduate student here at UNB. I am visiting classes to try and recruit participants for a study currently taking place here at UNB entitled: "The influence of personality on efficiency and behaviour." This study requires you to sign-up for a time slot of your choosing during which you will complete four pencil and paper measures. This study is for the usual one research participation point per hour of your time. However, if you sign-up for this study specifically, you will be eligible to participate in a secondary study that is currently clearing the institutions ethics board. This secondary study will take about a third of the time as the present study, but will carry three times the research participation points. In addition, special authorization has been granted such that you can use the research participation points in future courses you may take while enrolled at UNB (like introductory psychology 1004). Once again, the study is titled: "The influence of personality on efficiency and behaviour." Thank you for your time and I hope to see some of you in the time slots.

Appendix C

Debriefing Directive:

Good morning/afternoon, first off, I would like to sincerely thank you for taking the time to come in and participate in this study. I will take this time to quickly debrief you and answer any final questions, after that, you'll be free to go. Do you have any questions at this point?

Much of what I will tell you is related to the secondary study that you could be eligible for since you completed this study. Have you been told about the secondary study yet?

Regardless of the participant's response, the sequel study was reiterated as follows:

Since you have just completed the first study, you are potentially eligible for a sequel study that takes significantly less time (between 7-10 minutes), and leads to three research points being gained rather than the usual one. In addition, these points are "flexible" and can be banked. By this I mean that you can opt to save these points for use during a later course you encounter at UNB assuming it contains research points as part of its syllabus.

However, these benefits are unfortunately not without drawbacks. Because the sequel study grants more than the institutional standard of one research point per hour, and allows students to bank points, the University has limited the number of students who can participate. This is largely due to logistical problems; I'm sure you can see how it would be difficult to keep track of students who have "banked" points and are using them in classes they weren't enrolled in when they were earned!

The following statements were dependent on which condition the participant(s) were in:

Control:

In order to decide which participants get to move on to the secondary study, we have decided to utilize a lottery system. To be entered into this lottery, you must send an e-mail to the address listed at the bottom of the debriefing form; could you read it out loud to me? Thank you. Now, because it is a University e-mail, I must add your email address to a non-spam list. I will have this done by 9pm tonight. In addition, there is a deadline; that is, if we do not hear from you within 2 weeks' time, we will assume you're not interested and your name will be removed from the non-spam list. This would exclude you from the sequel study. Does that make sense? Excellent, that's all I have for you. Now I will ask you 3 confirmation questions and then you'll be free to go.

1) Where do you send your email if you're interested in participating in the sequel study?
2) What is the earliest time you could send us an email confirming your interest in the sequel study?
3) When is the latest you could send us an email confirming your interest in the sequel study?

Alright, that's all I have for you. I would like to once again thank you for your time and I hope we hear from you soon!

"Be First" Condition:

In order to decide which participants get to move on to the secondary study, we have decided to let those most motivated to do so, do so. By this I mean that the students who are in the fastest 20% of those who express their desire to participate will be selected for participation in the secondary study. Just to clarify, this means that those who are in the

slowest 80% will be ineligible to participate. Now, in order to express your desire to participate, you must send an e-mail to the address listed at the bottom of the debriefing form; could you read it out loud to me? Thank you. Now, because it is a University e-mail, I must add your email address to a non-spam list. I will have this done by 9pm tonight. In addition, there is a deadline; that is, if we do not hear from you within 2 weeks' time, we will assume you're not interested and your name will be removed from the non-spam list. This would exclude you from the sequel study. Does that make sense? Excellent, that's all I have for you. Now I will ask you 4 confirmation questions and then you'll be free to go.

1) Where do you send your email if you're interested in participating in the sequel study?
2) What is the earliest time you could send us an email confirming your interest in the sequel study?
3) When is the latest you could send us an email confirming your interest in the sequel study?
4) What percentage of students who send a follow-up email will be able to participate in the sequel study?

Alright, that's all I have for you. I would like to once again thank you for your time and I hope we hear from you soon!

"Don't be Last" Condition:

In order to decide which participants get to move on to the secondary study, we have decided to let those most motivated to do so, do so. By this I mean that the students who are in the fastest 80% of those who express their desire to participate will be selected for

participation in the secondary study. Just to clarify, this means that those who are in the slowest 20% will be ineligible to participate. Now, in order to express your desire to participate, you must send an e-mail to the address listed at the bottom of the debriefing form; could you read it out loud to me? Thank you. Now, because it is a University e-mail, I must add your email address to a non-spam list. I will have this done by 9pm tonight. In addition, there is a deadline; that is, if we do nothear from you within 2 weeks' time, we will assume you're not interested and your name will be removed from the non-spam list. This would exclude you from the sequel study. Does that make sense? Excellent, that's all I have for you. Now I will ask you 4 confirmation questions and then you'll be free to go.

1) Where do you send your email if you're interested in participating in the sequel study?
2) What is the earliest time you could send us an email confirming your interest in the sequel study?
3) When is the latest you could send us an email confirming your interest in the sequel study?
4) What percentage of students who send a follow-up email will be able to participate in the sequel study?

Alright, that's all I have for you. I would like to once again thank you for your time and I hope we hear from you soon!

Appendix D

This Informed Consent Form is for individuals who seek to participate in research regarding the personality correlates of work related behaviours and executive functioning. We invite you to participate in the present study entitled "The influence of personality on efficiency and behaviour."

Ryley Russell, M.A. Candidate
University of New Brunswick
Dr. Lisa Best – Psychology Department, Chair

This Informed Consent Form has two parts:

- **Information Sheet (to share information about the research with you)**
- **Certificate of Consent (for signatures if you agree to take part)**

You will be given a copy of the full Informed Consent Form

PART I: Information Sheet

Introduction

Welcome! I am a graduate student currently enrolled at the University of New Brunswick. I invite you to participate in the present study concerning the personality correlates of work related behaviours and executive functioning. At any point in the study you may speak to anyone you feel comfortable with about the research in question. Moreover, you are not obligated to complete this study. Please take some time to reflect on whether you would like to participate in this study. The precise methodology of the study will be explained in greater detail, and all concepts and language clarified. If you have any questions about the procedure, language used, your tasks, or any general inquiry, please feel free to ask any questions you may have at any time.

Purpose of the research

This research is being undertaken with the aim of determining how different combinations of personality traits influence efficiency and executive functioning. The personality traits being measured are: openness, conscientiousness, extraversion, agreeableness, and neuroticism. These will be measured along with behaviours related to: organization, emotional regulation, activity levels, procrastination, and attention. The reason we are doing this research is to determine if individuals possessing certain personality traits are

more or less likely to be efficient in their work-related behaviour(s) and how effective they are at regulating this behaviour.

Participant selection
You are part of the population that has been given the option to participate because we seek to understand how personality traits relate to the previously mentioned behaviours in students.

Voluntary Participation
Your participation in this study is voluntary. You maintain the right to withdraw your voluntary participation at any time. If you choose to consent now and continue on with the study, you may still cease activity at any point and withdraw. There will be no consequences to your withdrawal; however, we do appreciate your participation.

Procedures and Protocol
We will ask you to complete three different self-report questionnaires. These are the NEO-PI-R, BRIEF, and a basic demographics questionnaire. The first measure is designed to ascertain your personality traits in the five domains of: openness, conscientiousness, extraversion, agreeableness, and neuroticism. The second measure is a behavioural inventory that determines your level of executive functioning and behavioural patterns. Finally, the demographics questionnaire makes an inquiry into some of your basic personal information as well as behaviours specific to procrastination.

B. Description of the Process

Your participation will involve the following steps:
1) Sign-up for the study
2) Arrive at your scheduled timeslot and complete the informed consent questionnaire
3) If consent is given, you will complete the three (3) previously mentioned measures
4) Following your completion of the measures, you will be debriefed and given contact information for the researcher and an individual you can contact with any ethical concerns. It should be noted that if at any time you decide to withdraw from the study, you will still be debriefed and given the aforementioned contact information.

Duration
This research takes place over one session that lasts as long as you need, but usually takes around one (1) hour. This involves the time to: complete the BRIEF(10 minutes), the NEO-PI-R (45 minutes), and the demographics questionnaire (5 minutes). You may complete these measures earlier or take longer if you wish/need to. Once these tasks are completed, your active participation is completed and additional time will be allotted for debriefing and the answer to any subsequent questions you may have.

Risks
The risks involved in this study are minimal. There is a possibility that you may feel uncomfortable with some of the questions in the measures; however, you are free to not

record a response if this occurs. Additionally, you may withdraw at any time if you become too uncomfortable with the questions or the study.

The possibility of this occurring is very low; however, if such an event does occur, you will be provided with information relevant to any counseling services you may require.

Benefits

The benefits of this study are concerned with student populations across various disciplines and at various points of their degree(s). By understanding which balances of specific personality traits could lead to better behavioural regulation and executive functioning, we may be able to identify individuals who show promise/an inclination to specific fields of work or education.

Reimbursements

In exchange for your participation, you will be rewarded research participation points.

Confidentiality

Any personal information that we obtain through the pursuit of this research will be kept strictly confidential. Only the researchers will have information about you as it relates to your sign-up. The personal information you provide while completing the NEO-PI-R, BRIEF, or the demographics questionnaire will all be anonymously collected. In addition, the information concerning when you signed up for the study will be deleted following completion of the study. This ensures all data is anonymous and immune from any personal disclosure. All hard copies of completed measures will be kept within a locked file cabinet in a secure location. It is important to repeat that even this filing cabinet was to be compromised, there would be no identifying information contained within the measures you had completed.

Sharing the Results

Upon completion of this study, it is our intent as researchers to disseminate the findings of this study. It is our hope that our findings are published. Should this aim come to fruition, other people in the research community may view the results and learn from our research. If you would like to receive a copy of the study prior to any attempts at publication, please contact the researcher following your involvement. This information will be provided within the debrief form.

Right to Refuse or Withdraw

As previously stated your participation in this study is entirely voluntary and includes the right to withdraw at any time. It should also be noted that by consenting to participation in this research, you are not waiving your legal right to recourse should you suffer any harm related to the research. Once again, this risk is minimal, but your consent does not equate to the loss of the possibility of legal recourse. We will ensure all decisions you make are respected and do our best to answer any questions before, during, or after you complete the study.

Who to Contact
You may contact either of the head researchers with any questions or concerns:
Dr. Lisa Best: lbest@unb.ca
Ryley Russell: ryley.russell@unb.ca

This proposal has been reviewed and approved by [name of the local IRB], which is a committee whose task it is to make sure that research participants are protected from harm. If you wish to find about more about the IRB, contact [name, address, telephone number.]). It has also been reviewed by the Ethics Review Committee of the World Health Organization (WHO), which is funding/sponsoring/supporting the study.

PART II: Certificate of Consent

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research.

Print Name of Participant_____
Signature of Participant _____
UNB E-mail address of Participant _____
Date _____
Day/month/year

Statement by the researcher/person taking consent
I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands.
I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this ICF has been provided to the participant.

Print Name of Researcher/person taking the consent_____

Signature of Researcher /person taking the consent_____

Date _____

Day/month/year

Appendix E

THE INFLUENCE OF PERSONALITY ON EFFICIENCY AND BEHAVIOUR

Thank you for taking the time to participate in our study! The study you completed was designed to determine how personality interacts with executive functioning to influence procrastination. Past literature has shown that procrastination is a significant problem for between 75-95% of the undergraduate student population. Moreover, procrastinatory behaviour has been linked to unsatisfactory performance, stress, illness, depression, anxiety, late submissions, and a lower grade-point average. Our objective was to use the NEO-PI-R and the BRIEF-A to determine the executive functioning and personality correlates of procrastination.

Unfortunately, you did not sign-up fast enough for the study and will not be eligible to participate in the secondary study described at the time you received directions in class. However, we would like to again thank you and inform you that you will still receive the research participation points consistent with your involvement in the study.

If you feel you require counselling for the stress this study has caused you, the principle investigator(s) can refer you to student counselling services. Contact information is listed at the bottom of this page.

Further Reading:

Fritzsche, B. A., Young, B. R., & Hickson, K. C. (2003). Individual differences in academic procrastination tendency and writing success. Personality and Individual Differences, 35, 1549-1557.

Howell, A. J., Watson, D. C., Powell, R. A., & Buro, K. (2006). Academic procrastination: The Pattern and Correlates of Behavioural Postponement. Personality and Individual Differences, 40, 1519-1530.

E-mail Address Contact for Secondary Study:

Ryley Russell, M.A. Candidate **University of New Brunswick** **ryley.russell@unb.ca**	**Dr. Lisa Best** **Professor, Psychology Department,** **lbest@unb.ca; 648-5562**

Appendix F

Incentives or consequences in competition as a method to decrease procrastination

Thank you for taking the time to participate in our study! The study you completed was designed to determine if competition decreased the extent to which a student would procrastinate in the completion of an academic task. Past literature has shown that procrastination is a significant problem for between 75-95% of the undergraduate student population. Moreover, procrastinatory behaviour has been linked to unsatisfactory performance, stress, illness, depression, anxiety, late submissions, and a lower grade-point average. Our objective was to use principles inherent to hyperbolic discounting theory (HDT) to reduce procrastination.

HDT holds that that options that lead to faster gratification will be temporarily preferred over options that have greater value, but require more time for gratification. We hypothesized that by stabilizing the value of the rewards through competition, students would be more efficient at signing up for and completing academic work. If our hypotheses are supported, the findings may serve to inform future course design so as to reduce the likelihood of student procrastination and its associated consequences.

You were initially informed that you may receive the opportunity to complete a secondary study that required less effort but led to a greater number of research participation points. No such study ever existed. However, you will still receive the research participation points consistent with your involvement in the study.

The reason for this deception was to make the competition "feel" real and to give our manipulation greater amounts of potency. If you are uncomfortable with the deception used in the study, you may contact the principle investigator to ensure your data is removed from the sample. However, it is important to note that the experimenters are blind to your specific data, and all data will be published as anonymous group data. If you feel you require counselling for the stress this study or its deception has caused you, the principle investigator(s) can refer you to student counselling services. Contact information is listed at the bottom of this page.

Further Reading:

Broccas, I., & Carrillo, J. D. (2001). Rush and procrastination under hyperbolic discounting and interdependent activities. The Journal of Risk and Uncertainty, 22, 141-164.

DeWitte, S., & Schouwenburg, H. C. (2002). Procrastination, temptations, and incentives: The Struggle Between the Present and the Future in Procrastinators and the Punctual. European Journal of Personality, 16, 469-489.

Ryley Russell, M.A. Candidate **University of New Brunswick** **Ryley.Russell@unb.ca**	**Dr. Lisa Best** **Professor, Psychology Department,** **lbest@unb.ca; 648-5562**

Appendix G

Procrastination Scale (Lay, 1986) - For student populations

Instructions: People may use the following statements to describe themselves. For each statement, decide whether the statement is uncharacteristic or characteristic of you using the following 5 point scale. Note that the 3 on the scale is Neutral – the statement is neither characteristic nor uncharacteristic of you.

In the box to the left of each statement, fill in the number on the 5 point scale that best describes you.

Extremely Characterisic	Moderately Characteristic	Neutral	Moderately Uncharacteristic	Extremely Uncharacteristic
5	**4**	**3**	**2**	**1**

____ I often find myself performing tasks that I had intended to do days before.

____ I do not do assignments until just before they are to be handed in.

____ When I am finished with a library book, I return it right away regardless of the date it is due.

____ When it is time to get up in the morning, I most often get right out of bed.

____ A letter may sit for days after I write it before mailing it.

____ I generally return phone calls promptly.

____ Even with jobs that require little else except sitting down and doing them, I find they seldom get done for days.

____ I usually make decisions as soon as possible.

____ I generally delay before starting on work I have to do.

____ I usually have to rush to complete a task on time.

____ When preparing to go out, I am seldom caught having to do something at the last minute.

____ In preparing for some deadline, I often waste time by doing other things.

____ I prefer to leave early for an appointment.

____ I usually start an assignment shortly after it is assigned.

____ I often have a task finished sooner than necessary.

____ I always seem to end up shopping for birthday or Christmas gifts at the last minute.

____ I usually buy even an essential item at the last minute.

____ I usually accomplish all the things I plan to do in a day.

____ I am continually saying "I'll do it tomorrow."

____ I usually take care of all the tasks I have to do before I settle down and relax for the evening.

Appendix H

Procrastination Assessment Scale for Students (PASS; Solomon & Rothblum, 1984).

Areas of Procrastination

For each of the following activities, please rate the degree to which you delay or procrastinate. Rate each item using the 1-5 scale below according to how often you wait until the last minute to do the activity. Then indicate on the 1-5 scale the degree to which you feel procrastination on that task is a problem. Finally, indicate on the 1-5 scale the degree to which you would like to decrease your tendency to procrastinate on each task.

Always Procrastinate	Nearly Always Procrastinate	Sometimes	Almost Never Procrastinate	Never Procrastinate
5	**4**	**3**	**2**	**1**

I. WRITING A TERM PAPER

____ To what degree do you procrastinate on this task?

____ To what degree is procrastination on this task a problem for you?

____ To what extent do you want to decrease your tendency to procrastinate on this task?

II. STUDYING FOR EXAMS

____ To what degree do you procrastinate on this task?

____ To what degree is procrastination on this task a problem for you?

____ To what extent do you want to decrease your tendency to procrastinate on this task?

III. KEEPING UP WITH WEEKLY READING ASSIGNMENTS

____ To what degree do you procrastinate on this task?

____ To what degree is procrastination on this task a problem for you?

____ To what extent do you want to decrease your tendency to procrastinate on this task?

IV. ACADEMIC ADMINISTRATIVE TASKS: FILLING OUT FORMS, REGISTERING FOR CLASSES, GETTING ID CARD

____ To what degree do you procrastinate on this task?

____ To what degree is procrastination on this task a problem for you?

____ To what extent do you want to decrease your tendency to procrastinate on this task?

V. ATTENDANCE TASKS: MEETING WITH YOUR ADVISOR, MAKING AN APPOINTMENT WITH A PROFESSOR

____ To what degree do you procrastinate on this task?

____ To what degree is procrastination on this task a problem for you?

____ To what extent do you want to decrease your tendency to procrastinate on this task?

VI. SCHOOL ACTIVITIES IN GENERAL

____ To what degree do you procrastinate on this task?

____ To what degree is procrastination on this task a problem for you?

____ To what extent do you want to decrease your tendency to procrastinate on this task?

Reasons for Procrastination

Think of the last time the following situation occurred. It's near the end of the semester. The term paper you were assigned at the beginning of the semester is due very soon. You have not begun work on this paper. There are reasons why you have been procrastinating on this task.

Rate each of the following reasons on a 5-point scale according to how much it reflects why you procrastinated at the time. Mark your answers on your answer sheet.

Use the scale:

Definitely Reflects Why I Procrastinated	A Major Part of Why I Procrastinated	Somewhat Reflects Why I Procrastinated	A Minor Part of Why I Procrastinated	Not At All Reflects Why I Procrastinated
5	**4**	**3**	**2**	**1**

____ You were concerned the professor wouldn't like your work.

____ You waited until a classmate did his or hers, so that he/she could give you some advice.

____ You had a hard time knowing what to include and what not to include in your paper.

____ You had too many other things to do.

____ There's some information you needed to ask the professor, but you felt uncomfortable approaching him/her.

____ You were worried you would get a bad grade.

____ You resented having to do things assigned by others.

____ You didn't think you knew enough to write the paper.

____ You really disliked writing term papers.

____ You felt overwhelmed by the task.

____ You had difficulty requesting information from other people.

____ You looked forward to the excitement of doing this task at the last minute.

____ You couldn't choose among all the topics.

____ You were concerned that if you did well, your classmates would resent you.

____ You didn't trust yourself to do a good job.

____ You didn't have enough energy to begin the task.

____ You felt it just takes too long to write a term paper.

____ You liked the challenge of waiting until the deadline.

____ You knew that your classmates hadn't started the paper either.

____ You resented people setting deadlines for you.

____ You were concerned you wouldn't meet your own expectations.

____ You were concerned that if you got a good grade, people would have higher expectations of you in the future.

____ You waited to see if the professor would give you some more information about the paper.

____ You set very high standards for yourself and you worried that you wouldn't be able to meet those standards.

____ You just felt too lazy to write a term paper.

____ Your friends were pressuring you to do other things.

Appendix I

NEO PI R

Copyright material

Appendix J

BRIEF A

Copyright material

Curriculum Vitae or *CV*

Candidate's full name: Ryley Steve Russell

Institutions attended: Northern Alberta Institute of Technology, Diploma in Personal Fitness Training, 2014; MacEwan University, B.A. (hons), 2018

Publications:

Russell, R., & Honey, L. P. (2018). Effects of Feedback Templates on Student Performance, *MacEwan University Student Research Journal, 3.*

Russell, R., & Peace, K. (2017, April). *Are You As Good As You Think You Are? Malingering, Narcissism, & Feedback,* 2.

Conference Presentations:

Gaudet, D, J., Russell, R., Proctor, C. J., McPhee, R., & Best, L. *Prescribing Mindfulness: An Examination of How Mindfulness Relates to Subjective and Physical Well-Being.* Presented at the INpact conference in Zagreb, Croatia, May 2019.

Russell, R., & Honey, L. P. (2018). *Effects of Feedback Templates on Student Performance,* 3. Presented thesis findings at the Association for Psychological Science conference located in San Francisco, May 2018.

Russell, R., & Peace, K. (2017, April). *Are You As Good As You Think You Are? Malingering, Narcissism, & Feedback,* 2. Poster presented at MacEwan University Student Research Day.