TEMPORAL AND CONTEXTUAL MULTILEVEL PERSPECTIVES ON PROCRASTINATION

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General Abstract

Procrastination is a problem for many individuals – especially university students – who may struggle to keep up not only with the requirements of a demanding life domain (i.e., education), but also with the demands of their other life domains (e.g., health, family, finances, and community). Past research on procrastination has mainly focused on understanding why some individuals procrastinate more than others and the consequences of procrastination for those individuals (i.e., between-person level). However, given that almost all individuals procrastinate to a certain extent, there has been an increased interest over the last few years in studying procrastination as a phenomenon that fluctuates within each person, especially over time (i.e., within-person level). Inspired by these burgeoning multilevel perspectives, the purpose of my doctoral thesis was to propose three new multilevel studies to increase our understanding of the antecedents and outcomes of procrastination when comparing university students to one another (i.e., between-person level) and when comparing time points and contexts within each student (i.e., within-person level). In *Article 1*, I examined the influence of between-person procrastination on the within-person achievement trajectory of students from their last year of high school to their first year at university. A sample of 269 first-year undergraduate students completed a self-reported measure of trait procrastination and their objective grades were obtained at three time points, namely the last year of high school, the first semester at university, and the second semester at university. Using piecewise multilevel growth modeling, the results revealed that students who procrastinated more than their peers tended to have a larger grade decrease from high school to the first semester at university. Although procrastination did not influence the grade change from the first semester to the second semester at university, students who procrastinated more tended to maintain their achievement disadvantage compared to

students who procrastinated less. In *Article 2*, I examined whether procrastination could act as a mediator in the associations between two dimensions of motivation and achievement and affective outcomes both when comparing students to one another (i.e., between-person level) and when comparing the courses taken by each student during a semester to each other (i.e., within-person level). A sample of 359 university students completed self-reported measures of autonomous/controlled motivation, procrastination, and positive/negative affect in each course and their final course grades were obtained at the end of the semester. Using multilevel structural equation modeling, the results showed that procrastination was associated with worse achievement and affective outcomes at both levels of analysis. However, controlled motivation was significantly positively associated with procrastination only at the between-person level, whereas autonomous motivation was significantly negatively associated with procrastination only at the within-person level. This study highlights that, although procrastination tends to generally be detrimental to the success and emotional well-being of students, the motivational antecedent of procrastination differs depending on the level of analysis. In *Article 3*, I went beyond the academic domain by examining whether procrastination could act as a mediator in the associations between two dimensions of motivation and achievement and affective outcomes both when comparing students to one another (i.e., between-person level) and when comparing the life domains in which each student is invested to each other (i.e., within-person level). A sample of 330 undergraduate students completed self-reported measures of autonomous/controlled motivation, procrastination, self-actual-to-ideal proximity, goal progress, and positive/negative affect in each of their life domains. Using multilevel structural equation modeling, the results showed that autonomous and controlled motivation were associated with less and more procrastination, respectively, and in turn, procrastination was associated with

worse achievement and affective outcomes but only at the within-person level. At the between-person level, only controlled motivation was positively related to procrastination, and in turn, procrastination was related to more negative affect and, surprisingly, more goal progress. Overall, all three articles contribute in complementary ways to the idea that proposing new multilevel perspectives can enrich our understanding of procrastination and its associations with antecedents and outcomes. Specifically, the studies in my thesis showed that the multilevel findings sometimes corroborate existing knowledge in the literature (e.g., the negative association between procrastination and academic achievement) and other times offer nuances and unexpected insights in our comprehension of the nomological network related to procrastination (e.g., the motivational antecedents of procrastination and the different relation between procrastination and goal progress depending on the level of analysis).

Keywords: Procrastination, motivation, achievement, goal progress, affect, multilevel modeling

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Statement of Co-Authorship

All three articles presented in this doctoral thesis were prepared in collaboration with my supervisor, Dr. Patrick Gaudreau. The first article (Chapter 2), titled "Examining the association between procrastination and decreases in academic achievement during the transition from high school to university: A piecewise growth model", was published in the *European Journal of Psychology of Education* in October 2022. The second article (Chapter 3), titled "Why do students procrastinate more in some courses than in others and what happens next? Expanding the multilevel perspective on procrastination", was published as part of the research topic "New Perspectives on Procrastination, Volume II" in *Frontiers in Psychology* in February 2022. The versions of articles 1 and 2 presented in this thesis are slightly different than the published articles. The second article was prepared in collaboration with Dr. Benjamin Schellenberg, who is an assistant professor at the University of Manitoba. His role was to provide feedback and ideas on each version of the manuscript. The third article (Chapter 4) is titled "Beyond the academic experience: A multilevel perspective on students' procrastination across their life domains". This third article was also prepared in collaboration with Dr. Benjamin Schellenberg. His role was to provide feedback on each version of the manuscript and he also offered a needed new perspective to interpret some of the findings.

As the first author of all three articles, my role was to review the literature, conceptualize the research questions, develop the studies, write the ethical applications, collect and prepare the data, conduct the analyses, write the manuscripts, and revise the manuscripts based on feedback from colleagues and reviewers. Dr. Patrick Gaudreau provided me guidance in each of those steps, including teaching me how to conduct the analyses and providing extensive feedback, which considerably improved the study designs, final manuscripts, and overall dissertation.

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CHAPTER 1

GENERAL INTRODUCTION

During waking hours, Canadian adults spend their time doing various activities, such as transportation to and from places, working, studying, shopping, preparing meals, dish washing, paying bills, socializing, reading, and watching television (Statistics Canada, 2019). Given that individuals must perform multiple time-consuming activities throughout the day, they often have to decide which role they want to perform (Brenner, 2016) and which goals they want to pursue (George, 2012). The perception of a lack of time to accomplish goals or fulfill the demands of a role (e.g., student, parent, and worker) is an important stressor for many individuals across multiple contexts (e.g., Harwood et al., 2010; Hurst et al., 2013; Olusoga et al., 2009; Thomas et al., 2003; Wressle & Samuelsson, 2014). Results of a nationwide Canadian survey with over 10,000 participants have shown that 66.6% of respondents felt rushed on a daily basis or a few times a week (see Zuzanek, 2004). Moreover, perceived time pressure was negatively correlated to life, job, and health satisfaction and positively correlated to sleeping problems. The perceived time pressure experienced by the majority of adults as they try to manage all their roles, goals, obligations, and activities appears to take a toll on their physical and psychological well-being.

Although it is impossible to increase the number of hours in a day, the decision of many individuals to irrationally delay important tasks puts even more constraints on a precious resource (i.e., time) that is already limited. Sometimes described as a "thief of time" (e.g., Andreou & White, 2010b; Pychyl, 2016), procrastination implies that individuals voluntarily put off a necessary or important activity that they intended to accomplish (e.g., studying for an exam), despite the foreseeable negative consequences of the delay (e.g., higher stress, lower grades; Klingsieck, 2013b; Steel, 2007). Researchers have found that around 20% to 28% of adults would be considered as chronic procrastinators (Ferrari et al., 2007, 2009; Harriott & Ferrari, 1996). The prevalence of procrastination is even more staggering in the academic

domain where 28% to 59% of undergraduate students reported that they nearly always or always procrastinate when it comes to studying for exams, writing term papers, and keeping up with weekly readings (Clark & Hill, 1994; Özer et al., 2009; Rahimi & Hall, 2021; Solomon & Rothblum, 1984). Also, it appears that almost all students procrastinate to a certain extent (Schouwenburg, 2004b; Schraw et al., 2007). Procrastination is such a common problem that leading researchers in this domain have recently written self-help books for individuals who want to reduce their procrastination (Ferrari, 2010; Pychyl, 2013; Steel, 2010b).

Despite its high prevalence in modern societies, procrastination is a serious problem related to a wide range of undesirable correlates and outcomes. On the one hand, procrastination can obstruct the productivity, performance, success, and material gains of individuals. In the work context, higher procrastination has been significantly correlated to less job search intensity, less first and second interviews, less job offers (Turban et al., 2013), lower salary, lower period of employment, higher likelihood to be unemployed or work part-time instead of full-time (Nguyen et al., 2013), lower work engagement, higher counterproductive work behavior, lower task performance, and lower organizational commitment (Wang et al., 2021). In terms of finances, procrastination has been significantly correlated to more problems with personal finances and worse financial behavior (i.e., less impulse control and saving/budgeting; Gamst-Klaussen et al., 2019). In the academic context, procrastination has been significantly correlated to more social media use during lectures, more problematic smartphone use (Rozgonjuk et al., 2018), more mobile phone addiction (Yang et al., 2020), lower course grades (Grunschel et al., 2016), and lower GPA (Sanchez-Ruiz & El Khoury, 2019).

On the other hand, procrastination can also be harmful to the physical health and psychological well-being of individuals. Indeed, procrastination has been significantly correlated

to more acute physical health problems (e.g., headaches), less wellness behaviors (e.g., healthy eating), less medical and dental check-ups, less household safety (Sirois, 2007), more binge-eating (Yan et al., 2018), less sporting activity (Rapoport et al., 2022), more sleep problems (Przepiórka et al., 2019), less mindfulness, less self-compassion, more ruminative brooding (Flett et al., 2016), more depression, more stress, and more anxiety (Reinecke et al., 2018). Given all these findings, individuals who procrastinate more unsurprisingly also experience significantly more regrets across many life domains (e.g., education, health, finances, family interactions, and parenting) than individuals who procrastinate less (Ferrari et al., 2009). All in all, these past studies are representative examples showing that – although procrastination is a common phenomenon – it is also a serious problem deserving of empirical attention because it is related to a host of difficulties.

Researchers have focused, for the most part, on understanding the antecedents and consequences of procrastination for individuals who procrastinate more than their counterparts (e.g., Steel, 2007; van Eerde, 2003). However, researchers have also recognized that individuals experience fluctuations in their procrastination across time (e.g., Steel & König, 2006) and contexts (e.g., Klingsieck, 2013a). The recent increased interest in multilevel modeling techniques has allowed researchers to examine procrastination and its nomological network both when comparing individuals to one another (i.e., *between-person* level) and when comparing time points and contexts to each other within each individual (i.e., *within-person* level). These two levels of analysis offer complementary information to increase our understanding of not only *some* individuals who procrastinate more than their peers, but also of *any* individual who procrastinates more at some time points and in some contexts than in others.

Inspired by the burgeoning multilevel literature on procrastination, I proposed three original multilevel studies to better understand procrastination and its relations to motivational antecedents and achievement and affective outcomes. I decided to conduct all my studies with samples of undergraduate university students, not only because of the high prevalence of procrastination in this population, but also because most undergraduate students have a desire to decrease their procrastination (e.g., Rahimi & Hall, 2021). Specifically, I proposed to study the influence of between-person procrastination on the within-person achievement trajectory from high school to the first year at university (Study 1). Then, I proposed to investigate the between-person and within-person motivational antecedents and achievement and affective outcomes of procrastination across the courses taken by students during a semester (Study 2) and across the life domains in which students are invested (Study 3). Taken together, these three studies contribute to the development of new multilevel perspectives on procrastination and its nomological network.

Defining and Measuring Procrastination

In everyday life, many individuals probably think of procrastination, in simple terms, as delaying tasks until the last possible minute (Andreou & White, 2010a) or delaying until tomorrow the tasks that they should be doing today (Milgram et al., 1988; Schouwenburg et al., 2004). In a qualitative study in which university students were asked to describe procrastination, they defined procrastination as delaying – or putting off, deferring, or postponing – tasks that are considered important, necessary, or that need to be done (Schraw et al., 2007). Researchers would agree that delaying a task is a core element of the definition of procrastination (Steel, 2007), especially if the task is personally important or necessary (Klingsieck, 2013b). However, this definition would be considered too broad because delay is a necessary component of our everyday lives (Pychyl, 2013) and not all delay is procrastination (Knaus, 2000). At any given

moment, working on a task (e.g., writing an email) also means that people have to delay working on other tasks even if those tasks are considered personally important or necessary (e.g., writing a term paper, doing exercise, doing laundry). Therefore, many researchers also add the precision that procrastination occurs when people *intend* to do a task, but voluntarily delay acting on their intention (e.g., Chowdhury & Pychyl, 2018; Klingsieck, 2013b; Schouwenburg, 2004b; Schouwenburg & Lay, 1995; Silver & Sabini, 1981; Steel, 2007). For example, having the intention and the time to work on a term paper during the evening, but not working on the paper and doing other tasks instead (e.g., writing an email) may potentially be considered as procrastination. Taken together, these elements represent the basic features of the definition of procrastination, which is the voluntary delay of a necessary or personally important activity that one intends to do (Klingsieck, 2013b; Steel, 2007).

According to the seminal theoretical review of Steel (2007) – which introduced the most commonly accepted definition of procrastination – the delay has to also be *irrational* for it to be considered as procrastination (see also Ferrari et al., 1995a; Klingsieck, 2013b; Silver & Sabini, 1981). In other words, one would choose to delay working on a task despite an awareness that the delay will likely lead to negative outcomes, such as monetary deficits (Steel, 2007) or subjective discomfort (Solomon & Rothblum, 1984). The nuance that the concept of irrationality brings to the definition of procrastination is illustrated in the following two alternative scenarios. In the first scenario, a student named Charlie has one month left to write a term paper. Charlie intends to work on the paper during the evening, but receives a call from their friends to go to a party. In this case, Charlie decides to go to the party with the knowledge that they still have more than enough time to write their paper. In that context, the delay is rational and will probably be inconsequential. In the second scenario, Charlie has the same two options (i.e., work on their

paper as intended vs. going to a party with friends), except that they only have two days left to write the paper. In this case, Charlie is well aware that going to the party and writing the paper tomorrow will probably lead to negative consequences – such as more anxiety, sleep deprivation, and a poorer grade on the paper – but they still choose to go out with friends. The delay is thus irrational because the student is aware that it will most likely lead to negative outcomes. With this final element added to the contemporary definition of procrastination, procrastination is defined as the voluntary delay of an intended necessary or personally important activity, despite an expectation of potentially negative consequences due to the delay (Klingsieck, 2013b; Steel, 2007).

For my doctoral thesis, I thus relied on this commonly accepted definition of procrastination because it (a) situates my thesis within a broader literature on this topic; (b) informs the development of novel research questions according to a large corpus of established work; (c) facilitated the selection of a questionnaire with good psychometric properties (i.e., Irrational Procrastination Scale; Steel, 2010a); (d) facilitated the selection and modification of a brief procrastination questionnaire for intensive research designs including repeated measures across academic courses and life domains (Kljajic & Gaudreau, 2018). This definition of procrastination offered the needed foundation to propose testable hypotheses to investigate the motivational antecedents and the achievement and affective outcomes associated with procrastination.

Antecedents of Procrastination: Two Dimensions of Motivation

Motivation is one of the keywords that most frequently emerges in the literature on academic procrastination (Tao et al., 2021) and procrastination in general (Yan & Zhang, 2022). In this literature, many researchers have proposed that procrastination likely stems – to a certain

extent – from motivational difficulties (e.g., Klingsieck, 2013b; Schouwenburg, 2004a; Senécal et al., 1995; Steel & König, 2006).

A motivational difficulty that has received considerable attention in relation to procrastination is the relative absence of intrinsic motivation. Intrinsic motivation is defined as doing an activity because it is fun, interesting, enjoyable, and inherently satisfying (e.g., Ryan & Deci, 2000, 2020). It generally involves a fusion between the activity and the outcome (i.e., mean-end fusion; Kruglanski et al., 2018), meaning that no external outcome is required for the person to partake in the activity (Legault, 2020). The hypothesis is that individuals who are more intrinsically motivated (e.g., motivated to write a paper because it is enjoyable) would be less likely to procrastinate. This hypothesis has often been supported as shown in a meta-analysis with 19 samples (r = -.26; Steel, 2007) and in a recent study with more than 15,000 students from 17 countries (r = -.31; Pelikan et al., 2021). In addition, qualitative studies have shown that students often report an absence of intrinsic motivation or a lack of interest in the task as reasons for procrastinating (e.g., Grunschel et al., 2013; Klingsieck et al., 2013; Schraw et al., 2007). Overall, these findings demonstrate well that low intrinsic motivation can increase procrastination. However, an analysis of the motivational difficulties related to procrastination would probably be incomplete if extrinsic motivation was not taken into account.

Self-Determination Theory (SDT; Deci & Ryan, 2002; Ryan & Deci, 2017) is a well-developed macrotheory of human motivation that explains how motivational processes – including intrinsic motivation and various forms of extrinsic motivation – can facilitate or hinder important outcomes, such as persistence, learning, well-being, and achievement. SDT has great heuristic value because its key theoretical principles are readily applicable to a wide range of life domains (e.g., education, work, interpersonal relationships, and health; Deci & Ryan, 2008a;

Vallerand et al., 2008) and at multiple levels of analysis (i.e., global, contextual, and situational levels; Vallerand, 2000). In this theory, intrinsic motivation is understood as doing activities because they are inherently satisfying, whereas extrinsic motivation is understood as doing activities in order to obtain a separate outcome. However, extrinsic motivation is also considered as multifaceted and includes four regulatory styles that vary in the degree to which they are internalized into one's sense of self. By understanding the degree of internalization of each regulatory style, SDT researchers can regroup these regulatory styles and form two distinctive dimensions of motivation, namely autonomous and controlled motivation (see Deci & Ryan, 2008a, 2008b; Ryan & Deci, 2000, 2020; Ryan et al., 2021).

Autonomous motivation is defined as being actively committed to do an activity. Autonomous motivation includes intrinsic motivation and two forms of extrinsic motivation that are relatively internalized into one's sense of self (i.e., integrated and identified regulation). In this context, the person experiences the freedom, volition, choice, and willingness to do an activity. That is, a person would do the activity because it is interesting or enjoyable (i.e., intrinsic regulation), because it is congruent with their interests, values, beliefs, and needs (i.e., integrated regulation), or because it is personally important and self-endorsed (i.e., identified regulation). By contrast, *controlled motivation* is defined as a passive compliance to do an activity. Controlled motivation includes two forms of extrinsic motivation that are relatively or completely external to one's sense of self (i.e., introjected and external regulation). In that case, the person experiences control, pressure, and demands from the outside environment to do the activity. In other words, a person would do the activity because they want to experience ego-enhancement and pride in case of success or avoid shame and guilt in case of failure (i.e.,

introjected regulation) or because they want to satisfy the demands of their environment, obtain a reward, or avoid a punishment (i.e., external regulation).

The distinction between autonomous and controlled motivation is often used in the SDT literature due to its parsimony (Howard et al., 2020) and predictive power (Ryan et al., 2021). Although both dimensions of motivation reflect an intention to act, autonomous and controlled motivation are expected to be differentially related to various outcomes. Meta-analyses have shown that autonomous motivation (but not controlled motivation) is consistently associated with adaptive outcomes, such as indicators of persistence (e.g., more effort, more engagement; Howard et al., 2021), academic achievement (e.g., Howard et al., 2021; Taylor et al., 2014), goal progress (Gaudreau et al., 2012; Koestner et al., 2008), and various well-being outcomes (e.g., less anxiety and negative affect and more positive affect, general satisfaction, vitality, and enjoyment; Howard et al., 2021).

Of particular interest, many studies have shown that autonomous and controlled motivation are differentially related to procrastination. The hypothesis is that individuals would be less likely to procrastinate if activities are done out of volition, choice, or inherent satisfaction (i.e., autonomous motivation) and more likely to procrastinate if activities are done in order to comply with external demands or internal pressures (i.e., controlled motivation). In the academic context, studies have been conducted to understand the link between academic autonomous and/or controlled motivation and procrastination in general (Lee, 2005; Mih, 2013; Mih & Mih, 2016; Seo, 2013) or when it comes to studying and/or doing homework (Mouratidis et al., 2018; Vansteenkiste et al., 2009), or academic activities (Senécal et al., 1995). In other life domains, the associations between early motivation and later procrastination have been examined in the context of following the progress made on a weight loss goal during a one-week period (Powers

et al., 2007) and job search during a one-month period (van den Hee et al., 2020). For the most part, these studies have shown that autonomous motivation or its indicators (i.e., intrinsic and identified regulation) are negatively associated with procrastination, whereas controlled motivation or its indicators (i.e., introjected and external regulation) are positively associated with procrastination. Overall, these past findings revealed that the distinction between autonomous and controlled motivation is useful to understand when procrastination is respectively less and more likely to occur in the academic domain and in other life domains.

Outcomes of Procrastination: Achievement and Affect

The consequences of procrastination are often evaluated in terms of whether procrastination influences the quality of one's work and the quality of one's life (Schraw et al., 2007; Steel, 2007; van Eerde, 2003). In the context of my thesis, I have decided to consider academic achievement (i.e., course grades and semester GPAs) and subjective achievement outcomes (e.g., goal progress) as representative of the quality of students' work. Furthermore, I have decided to consider emotional well-being outcomes (i.e., positive and negative affect) as representative of the quality of students' lives. These outcomes represent complementary ways of examining the experience of students in the academic domain and in their other life domains.

Procrastination tends to be frequently studied as a risk factor for achievement difficulties, especially in the academic domain. Recent bibliometric analyses have shown that academic achievement stands out as a top 10 keyword or primary theme in the literature on academic procrastination (Tao et al., 2021) and procrastination in general (Yan & Zhang, 2022). Five meta-analyses have been published on this topic (Akpur, 2020; Kim & Seo, 2015; Richardson et al., 2012; Steel, 2007; van Eerde, 2003) and 33 studies were identified in one of the most recent meta-analysis (Kim & Seo, 2015). It is proposed that students who procrastinate experience more time pressure as they try to complete tasks before a deadline (Grunschel et al., 2013), which

tends to lead to less preparation time and a decrease in work quality and punctuality (van Eerde, 2003). Accordingly, meta-analytical findings have consistently shown a negative association between procrastination and academic achievement. Specifically, students with a higher tendency to procrastinate are generally more likely to have worse grades in exams (e.g., Steel et al., 2001; Tice & Baumeister, 1997), worse grades in written reports and term papers (e.g., Michinov et al., 2011; Tice & Baumeister, 1997), worse course grades (e.g., Fritzsche et al., 2003; Steel et al., 2001), and worse semester or overall GPAs (e.g., Gareau et al., 2019; Kim et al., 2017). Although much less research has been conducted on the influence of procrastination on other forms of achievement, some empirical evidence suggest that students who procrastinate more are also less likely to achieve their academic learning goals (Wäschle et al., 2014) and less likely to make progress in the pursuit of their personal health goals (Powers et al., 2007). All in all, these studies highlight that procrastination is a clear risk factor for achievement difficulties for students. As a next step to expand this literature, I eventually propose multilevel designs to also consider achievement as a variable that fluctuates across time, courses, and life domains.

Procrastination has also been frequently related to worse emotional well-being (Steel, 2007; van Eerde, 2003). By procrastinating, individuals increase the gap between the demands of the tasks that they have to accomplish (e.g., writing a term paper) and the resources that they have to successfully accomplish those tasks (e.g., time and energy; Pychyl & Sirois, 2016). This gap between the demands and the resources – combined with the time pressure experienced before a deadline – tend to increase the stress and distress of the students who procrastinate (Pychyl & Sirois, 2016; Sirois & Pychyl, 2013). As shown in qualitative studies in which students or university counsellors were interviewed regarding the procrastination of students, participants have reported that many forms of negative affect (e.g., anger, anxiety,

dissatisfaction, guilt, shame, sadness, and/or remorse) in addition to stress can occur as a result of procrastination (Fernie & Spada, 2008; Grunschel et al., 2013; Patrzek et al., 2012; Schraw et al., 2007). Likewise, procrastination has been found to be associated, on average, with more negative affect (r = .31) and less positive affect (r = -.29) in a small-scale meta-analysis with 8 samples of community participants and/or students who completed the General Procrastination Scale (i.e., GPS-9; Sirois et al., 2019). Studies that have used other questionnaires measuring general procrastination (e.g., Balkis & Duru, 2016; Gautam et al., 2019; Rebetez et al., 2016), academic procrastination (Blouin-Hudon & Pychyl, 2015; Moon et al., 2020), or job search procrastination (Turban et al., 2013) have also generally found that procrastination is correlated negatively to positive affect and positively to negative affect. Overall, these quantitative findings mostly suggest that individuals who procrastinate more tend to experience less positive affect and more negative affect than individuals who procrastinate less. As a next step in this literature, I propose that procrastination and affect are also variables that fluctuate across courses and life domains and the importance of these fluctuations can be better understood by introducing multilevel designs.

From Static to Dynamic: A Multilevel Wave of Research on Procrastination

The traditional line of research in procrastination – much like in any other discipline in personality psychology (e.g., Benet-Martínez et al., 2015) – has focused on studying individual differences. In these studies, the assumption is that procrastination is a personality trait that tends to display generally stable responses across time and a variety of settings (Schouwenburg, 2004b). Therefore, researchers have focused their attention on individuals who procrastinate more than others and have investigated whether a higher score of procrastination is associated with worse antecedents, processes, and outcomes. For example, individuals who procrastinate more tend to experience less self-esteem and more anxiety and depression than individuals who

procrastinate less (Steel, 2007; van Eerde, 2003). Of course, researchers are also aware that individuals procrastinate more at some time points (e.g., Steel, 2007; Steel & König, 2006), in some tasks (e.g., Özer et al., 2009; Solomon & Rothblum, 1984), and in some contexts (e.g., Hen & Goroshit, 2018; Klingsieck, 2013a) than in others. Nevertheless, studies focusing solely on individual differences (or between-person fluctuations) in procrastination and its nomological network work under the implicit statistical assumption that within-person fluctuations of these variables are trivial or measurement errors (Dalal et al., 2014).

In my doctoral thesis, I propose that within-person fluctuations in procrastination and/or its nomological network are much needed information to identify *when* or *under which circumstances* procrastination is likely to be associated with achievement and affective difficulties. Multilevel modeling was used to connect all the studies presented in my thesis. It should be noted, however, that I only propose multilevel models in which the relevant variables are expected to fluctuate when comparing students to one another (i.e., between-person level) and when comparing time points, courses, or life domains to one another within each student (i.e., within-person level). Some multilevel models in the procrastination literature have focused on higher-order levels, namely fluctuations across teams (Legood et al., 2018; Van Hooft & Van Mierlo, 2018) and across classrooms (Mouratidis et al., 2018), but these models go beyond the scope of this thesis. Given that procrastination is a construct naturally defined by the notion of passing time (e.g., Ferrari et al., 1995a; Steel & König, 2006), the large majority of multilevel studies conducted thus far have expectedly focused on time as a within-person unit of analysis. These studies can generally be divided into two perspectives (see Figure 1.1, panels A and B).

In the first perspective, researchers have generally been interested in the two following questions: What is the temporal trajectory of task progress (or procrastination) before a deadline?

Do individuals have different temporal trajectories of task progress depending on their level of trait procrastination?[1] In their influential article that integrates theories of motivation, Steel and König (2006) have proposed a Temporal Motivation Theory (TMT) that can be used to better understand procrastination (see also Steel, 2007). In simple terms, they propose that individuals would be less likely to work on a task if they think that the task is not feasible (i.e., low expectancy), if completing the task is not desirable (i.e., low value), if they are generally impulsive (i.e., high impulsiveness), and if the reward for completing the task or the punishment for not completing the task are distant (i.e., high delay). The main feature of the TMT is the notion of delay. Based on this theory, students would be less likely to work on a term paper if they have a few months to complete it. However, when they only have a few days or hours left to complete the term paper, they would be more likely to work on it because the reward for completing the task is nearer (i.e., getting a good grade) and the punishment for not completing the task is also nearer (i.e., failing the term paper and potentially the course). Studies have mainly found results that reasonably corroborate the expected trajectory of task progress before a deadline as proposed in the TMT (e.g., Dewitte & Schouwenburg, 2002; Goda et al., 2015; Steel et al., 2018; Wessel et al., 2019) or that corroborate the general idea that self-reported procrastination tends to decrease and task progress tends to increase over time before a deadline (e.g., Krause & Freund, 2014a; Schouwenburg, 1995). Furthermore, some of these studies have shown that students with lower trait procrastination tend to make more task progress earlier before the deadline than students with higher trait procrastination (Steel et al., 2018; Wessel et al., 2019). Taken together, these results suggest the presence of both within-person fluctuations

[1] Task progress is used as a generic umbrella term to cover similar outcomes measured in the different studies presented in this paragraph (e.g., number of completed assignments, the percentage of an assignment that has been completed, and the number of hours spent studying).

in task progress and procrastination across time and between-person differences in the temporal trajectories of task progress at different levels of trait procrastination.

In the second perspective, researchers have generally been interested in the two following questions: Why do individuals procrastinate more in some moments than in others? What are the consequences of procrastinating more in some moments than in others? In these studies, researchers typically examine the momentary fluctuations of procrastination over time (i.e., usually over days or weeks) and whether momentary procrastination relates to momentary antecedents and outcomes. These studies have been conducted with varied samples, namely high school students (Mouratidis et al., 2017), university students (e.g., Krause & Freund, 2016; Liborius et al., 2019; Mushquash & Sherry, 2012; Pollack & Herres, 2020; Smith et al., 2017; Wäschle et al., 2014), employees/workers (e.g., Kühnel et al., 2016, 2018a, 2018b; Liu et al., 2021; Prem et al., 2018; van Eerde & Venus, 2018), and adults from the community (Reinecke & Hofmann, 2016; Schnauber-Stockmann et al., 2018). Although summarizing these heterogeneous studies would be difficult, two elements can be extracted from this line of research. First, studies that have reported the intra-class correlation have shown that the within-person variance in procrastination is generally substantial (i.e., 39% to 75%) regardless of the sample of interest, the questionnaires used to measure procrastination, or the type of longitudinal design (e.g., Kühnel et al., 2018a, 2018b; Liu et al., 2021; Mushquash & Sherry, 2012; Smith et al., 2017; Wäschle et al., 2014). The considerable fluctuation in procrastination at the within-person level justifies the importance of studying this construct from a multilevel perspective. Second, some studies have revealed different results across levels of analysis. For example, in a model depicting a cycle of self-defeat, depressive affect was positively related to self-defeating behaviors (including procrastination) at the between-person level, but the association was non-significant at the

within-person level (Mushquash & Sherry, 2012). Moreover, in a daily diary study, procrastination was negatively correlated to positive affect at the within-person level, but the correlation was non-significant at the between-person level (Pollack & Herres, 2020). Such findings are consistent with the notion that we may not always find comparable results at the between-person and within-person levels of analysis (Hamaker, 2012), thus reinforcing the importance of continuing to study multilevel models of procrastination.

Taken together, these two perspectives show that there has been an increased interest – especially over the last few years – in studying fluctuations of procrastination across time. Inspired by these two perspectives, my doctoral thesis offers a new take on these lines of research. Instead of focusing on the influence of trait procrastination on the temporal trajectory of task progress before a deadline (first perspective), I focused on the influence of trait procrastination on the temporal trajectory of academic achievement during the critical academic transition from high school to university (Study 1). Moreover, instead of studying momentary fluctuations of procrastination over time (second perspective), I focused on fluctuations of procrastination across academic courses (Study 2) and across life domains (Study 3). An illustration of the designs proposed in my thesis is shown in Figure 1.1 (panels C to E).

A Multilevel Perspective on Procrastination and Achievement across Courses

The idea to conduct studies across contexts (i.e., across courses in Study 2 and across life domains in Study 3) was not only inspired by past studies on momentary fluctuations of procrastination, but also by our first multilevel study across courses (Kljajic & Gaudreau, 2018). Despite the large increase in multilevel research on procrastination over the last few years, our article was the only one in this literature focusing on contextual fluctuations (i.e., across courses) instead of temporal fluctuations (e.g., across days or weeks) of procrastination at the within-person level of analysis.

Essentially, we proposed a multilevel model in which academic procrastination was expected to negatively influence academic achievement not only when comparing students to one another (i.e., between-person level), but also when comparing courses to one another within each student (i.e., within-person level). Given that this study was a proof of concept, we also tested whether procrastination would negatively influence academic achievement over and above relevant control variables at the within-person level (i.e., course importance, course workload, course teaching evaluation, and course number of students) and at the between-person level (i.e., admission GPA, number of courses, and year of study).

Three key findings allowed us to determine the viability and usefulness of this multilevel study on procrastination and achievement across courses. First, we found a large amount of within-person variance in procrastination and grades across courses (i.e., 39%), which suggested that the within-person level of analysis was worthy of further consideration. Second, we found that procrastination was negatively related to grades at both levels of analysis. Although the size of the relation between the two variables did not differ when comparing the two levels, the results held a different conceptual meaning depending on the level of analysis. The *between-person* level revealed that students who procrastinated more than their peers tended to have a lower average grade than their peers. The *within-person* level revealed that in the courses in which students procrastinated more than their own average, they tended to have a lower final grade than their own average. Third, we found that the negative relation between procrastination and grades remained significant over and above relevant control variables at both levels of analysis. Overall, this study corroborated past meta-analytical findings showing a negative between-person association between procrastination and academic achievement (e.g., Richardson

et al., 2012; Steel, 2007), while also demonstrating that procrastination is a within-person risk factor for achievement difficulties.

In order to better understand the implications of such findings, we have presented, in our article, the fictional cases of two university students, Sophia and Philip, who were asked to report whether they never (score of 1), rarely (score of 2), sometimes (score of 3), frequently (score of 4), or always (score of 5) procrastinated in each of their courses. In this fictional example, we noted that Philip frequently procrastinated in all his courses, namely Psychology, Mathematics, and Economy. By contrast, we noted that Sophia never procrastinated in Psychology and Philosophy, rarely in Biology, and frequently in Chemistry. Philip's average score thus indicated that he frequently procrastinated (i.e., score of 4), whereas Sophia's average score indicated that she rarely procrastinated (i.e., score of 2), although she frequently procrastinated in Chemistry. Based on our *between-person* findings, Philip would be more likely to have a worse average grade than Sophia. Based on these findings alone, interventions would tend to focus on individuals like Philip who procrastinate more and offer help to those students. Yet, based on our *within-person* findings, Sophia would be more likely to have a worse grade in Chemistry than in her other courses. At first glance, Sophia's problem may seem less severe because she probably has better grades in her three other courses in which she procrastinates less. However, many important decisions made by the academic administration (e.g., getting scholarships, entering graduate school or another competitive program) are based on the level of achievement of students. For students like Sophia, getting a relatively low grade even in just one course can considerably decrease their average grade and be consequential for the rest of their academic journey. It is thus important to continue our research efforts to better understand not only *some*

students who procrastinate more than their peers (like Philip), but also *any student* who procrastinates more in some contexts than in others (like Sophia).

The Present Doctoral Thesis

The overarching goal of this doctoral thesis was to propose three new multilevel studies to further our understanding of the antecedents and outcomes of procrastination at the between-person and within-person levels of analysis. Specifically, I have examined the cross-level influence of between-person procrastination on within-person academic achievement measured at three *time points* during an academic transition (Article 1), the between-person and within-person antecedents and outcomes of procrastination measured in up to six *courses* taken by university students (Article 2), and the between-person and within-person antecedents and outcomes of procrastination measured in up to 12 *life domains* in which university students were invested (Article 3). Taken together, these studies represent different yet complementary multilevel perspectives to better understand the antecedents and outcomes of procrastination for university students in their academic and everyday lives.

In Article 1, I proposed that procrastination at the between-person level should negatively influence the within-person grade trajectory during the transition from the last year of high school to the first year at university. Given that procrastination is a consistent risk factor for achievement difficulties (e.g.., Richardson et al., 2012; Steel, 2007), I expected that students who procrastinate more should have an overall worse grade trajectory from high school to university than students who procrastinate less. Like in our first multilevel study on procrastination (Kljajic & Gaudreau, 2018), this study was a proof of concept. Therefore, I also stringently tested the influence of procrastination on the grade trajectory over and above relevant control variables. Article 1 – titled “Examining the association between procrastination and decreases in academic

achievement during the transition from high school to university: A piecewise growth model" – was published in the *European Journal of Psychology of Education*.

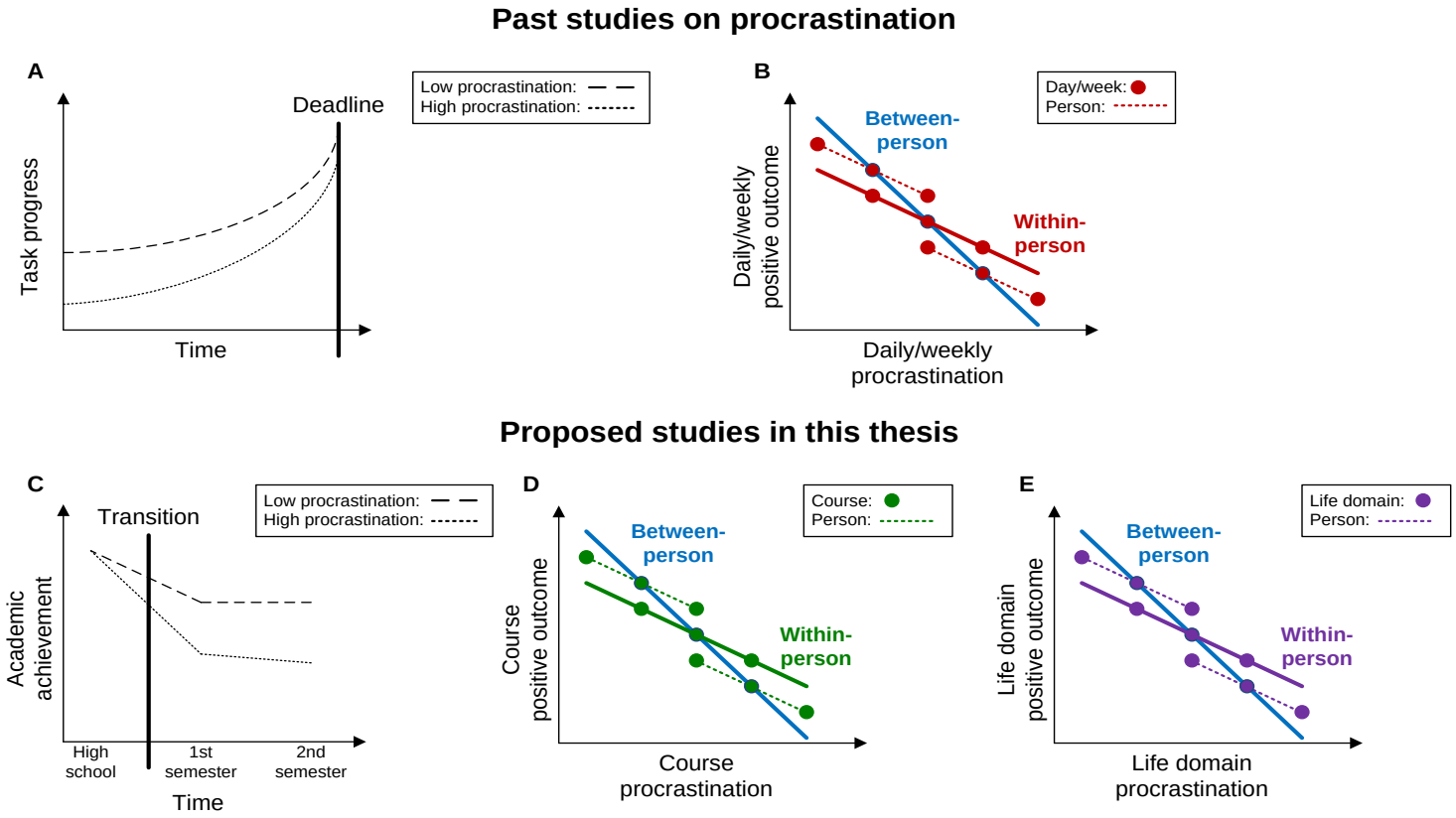
In Article 2, I proposed that procrastination could play a mediating role in the associations between two dimensions of motivation and indicators of achievement and emotional well-being both when comparing students to one another (i.e., between-person level) and when comparing courses to one another within each student (i.e., within-person level). This study builds upon our first multilevel study on the relation between procrastination and academic achievement across courses (Kljajic & Gaudreau, 2018) by adding motivational antecedents and affective outcomes and by testing a multilevel mediation model with procrastination at the heart of the model. At both levels, I hypothesized that autonomous and controlled motivation should be related to less and more procrastination, respectively. In turn, I hypothesized that higher procrastination should be related to lower academic achievement and positive affect and higher negative affect. Article 2 – titled "Why do students procrastinate more in some courses than in others and what happens next? Expanding the multilevel perspective on procrastination" – was published in *Frontiers in Psychology*.

In Article 3, I proposed that procrastination could act as a mediator of the associations between the two dimensions of motivation and indicators of achievement and emotional well-being both when comparing students to one another (i.e., between-person level) and when comparing life domains to one another within each student (i.e., within-person level). Articles 2 and 3 are similar in the sense that procrastination is at the heart of a multilevel mediation model including motivational antecedents and achievement and affective outcomes. However, the contribution of Article 3 is unique because it goes beyond the academic domain to consider that students are involved in many life domains and they are likely to procrastinate more in some

domains than in others (see Klingsieck, 2013a). At both levels, I hypothesized that autonomous and controlled motivation would be associated with less and more procrastination, respectively. In turn, I hypothesized that higher procrastination would be associated with lower self-actual-to-ideal proximity, goal progress, and positive affect and higher negative affect. Article 3 was titled "Beyond the academic experience: A multilevel perspective on students' procrastination across their life domains".

Figure 1.1

Simplified Illustration of the Designs Used in Past Studies on Procrastination and the Designs Used in My Doctoral Thesis



Note. Past studies have examined the influence of trait procrastination on the temporal trajectory of task progress before a deadline (panel A). In the Study 1 of my thesis, I examine the temporal trajectory of academic achievement during a transition and whether trait procrastination has an influence on this trajectory (panel C). Past studies have also examined the antecedents and outcomes of procrastination across days or weeks (panel B). In the Studies 2 and 3 of my thesis, I examine the antecedents and outcomes of procrastination across academic courses (panel D) and across life domains (panel E). All the research designs illustrated in this figure have been simplified to facilitate the comparisons of the studies.

CHAPTER 2

ARTICLE 1

Examining the Association between Procrastination and Decreases in Academic Achievement during the Transition from High School to University: A Piecewise Growth Model

Examining the Association between Procrastination and Decreases in Academic Achievement during the Transition from High School to University: A Piecewise Growth Model

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Abstract

The grades of students have been shown to severely decrease during the transition from high school to university. Although past findings have shown that procrastination negatively relates to academic achievement, no study has examined the influence of procrastination on the grade trajectory of students during this critical academic transition. Therefore, our main goal was to use a prospective design to examine the potentially detrimental role of procrastination on the grade trajectory from high school to the first year at university. We also examined the influence of procrastination over and above five demographic and socio-economic control variables. A sample of 269 first-year university students completed a procrastination questionnaire during their first semester at university. The official grades at three time points were obtained via the Registrar's Office: (a) the average grade of the last year of high school, (b) the average grade of the first semester at university, and (c) the average grade of the second semester at university. Results of piecewise multilevel growth modeling revealed that higher procrastination was associated with a larger grade decrease from high school to the first semester at university, which was maintained during the second semester at university even after considering demographic and socio-economic control variables. This study underscores that procrastination is a risk factor that tends to exacerbate the achievement difficulties experienced by students during the transition from high school to university.

Keywords: Procrastination, academic achievement, academic transition, postsecondary education

Examining the Association between Procrastination and Decreases in Academic Achievement during the Transition from High School to University: A Piecewise Growth Model

Rory and Blake are first-year university students who went to see the academic counsellor at the beginning of the second semester because they had difficulty to obtain excellent grades at university. The academic counsellor – who was concerned about their ability to manage their time and emotions – evaluated their level of procrastination and examined their first semester grade. Rory reported that they rarely procrastinate and their first semester grade was considerably above average when compared to their peers. Conversely, Blake reported that they frequently procrastinate and their first semester grade was considerably below average when compared to their peers. Although Blake's situation raised more concerns, the academic counsellor wondered why both students wanted help. Instead of only focusing on their first semester grade, the counsellor thought more broadly about their experience as first-year students. Did Rory and Blake experience a grade change from high school to university? Can these students expect an improvement, a stability, or a decline in their grade from the first semester to the second semester at university? Importantly, how does their level of procrastination influence their achievement trajectory?

Although the story above is fictional, the academic experiences of Rory and Blake as first-year students are far from uncommon. The transition from high school to university is considered as one of the critical developmental transitions during a lifetime (Hall, 2012). This transition phase is a stressful period for students (Hurst et al., 2013) as they develop new relationships, adapt to a new learning environment, and become independent young adults (Parker et al., 2004, 2006). Getting excellent grades is also a notable stressor during this period

partly because academic achievement plays a crucial role in the financial support (e.g., scholarships) and learning opportunities (e.g., cooperative education program, undergraduate research opportunity program) that will be offered to students during their undergraduate degree. Given that procrastination is a risk factor that makes it more difficult to get excellent grades at university (see Kim & Seo, 2015), we proposed that procrastination could also be a risk factor that increases the achievement difficulties faced by students during the transition from high school to university. In other words, we proposed that students like Blake who frequently procrastinate should have a worse overall grade trajectory during the transition from high school to university than students like Rory who rarely procrastinate.

Procrastination and its Relation to Academic Achievement

University students must complete many academic tasks (e.g., writing term papers, studying for exams) and tasks outside the academic domain (e.g., doing weekly chores, paying their bills). When students procrastinate, they voluntarily put off necessary or personally important activities even though they anticipate negative consequences due to the delay (Klingsieck, 2013; Steel, 2007).[2] This self-imposed time pressure has been positively correlated to anxiety (e.g, Glick et al., 2014; Sirois, 2014; Stöber & Joormann, 2001), depression (e.g., Stöber & Joormann, 2001; Uzun Ozer et al., 2014), worry (Stöber & Joormann, 2001), and psychological distress (Rice et al., 2012). Furthermore, students who procrastinate appear more likely to use various forms of academic misconduct, such as bringing and using prohibited means during exams (e.g., cheat sheet), copying from others in exams and in protocols/homework, and plagiarism (Patrzek et al., 2015). Overall, research has shown that students who procrastinate are

[2] In our review of the literature on procrastination, we did not report the results obtained based on positive definitions of procrastination because they were unrelated to the conceptualization of procrastination used in our study.

more likely to experience psychological maladjustment and use dishonest behaviors in the academic domain.

Procrastination also tends to have undesirable effects on academic achievement. For example, by procrastinating on a given academic task, students have less time to successfully accomplish that task. Accordingly, research has shown that procrastination negatively relates to short-term episodic or aggregated indicators of academic achievement, such as exam grade (e.g., Goroshit, 2018; Hensley, 2014) and course grade (e.g., Clarke & MacCann, 2016; Corkin et al., 2011; Grunschel et al., 2016; Hensley, 2014; Serrano Corkin et al., 2021). In addition, academic tasks in multiple courses that are constantly postponed can pile up quickly and leave little room to properly complete all the tasks (see Grunschel et al., 2013). Subpar achievement then accumulates beyond a single exam or a specific course. Therefore, procrastination also negatively relates to larger and long-term aggregated indicators of academic achievement, such as semester GPA (e.g., Gareau et al., 2019; Kljajic & Gaudreau, 2018) and cumulative GPA (e.g., Atalayin et al., 2018; Balkis, 2013; Batool, 2020). Meta-analytical findings have also shown a medium-to-large negative association between procrastination and GPA (r = -.12 to -.28; Kim & Seo, 2015; Richardson et al., 2012; Steel, 2007; van Eerde, 2003).[3] Overall, a consistent stream of research indicates that procrastination is an important risk factor associated with poorer academic achievement.

Given the consistent negative influence of procrastination on academic achievement, we proposed that procrastination could also potentially exacerbate the achievement difficulties during the transition from high school to university. Without taking into account the level of procrastination, most students experience a large grade decline during this academic transition. A

[3] Effect sizes were interpreted as small (i.e., $|r| < .09$), medium (i.e., $|r| = .09$ to .26), or large (i.e., $|r| > .26$) based on empirically-derived guidelines in applied psychology (see Bosco et al., 2015).

recent nationwide study with over 5,000 Canadian students has shown that students experience an average decline of almost 10% in their overall grade from high school to the first year at university (Finnie & Martinello, 2010). Likewise, another study with over 4,000 Canadian university students has shown a strong decrease in overall grade from high school to the first semester at university (d = -1.00) followed by a small decline from the first to the second semester at university (d = -0.11; Gaudreau, 2018). Although achievement difficulties are expected to occur for most students during this transition (Finnie & Martinello, 2010), procrastination is probably a risk factor that tends to increase those difficulties. Students with a higher tendency to procrastinate are prone to underestimate the needed time to complete their tasks (Ferrari et al., 1995). Those students also tend to have poorer organizational and study skills (Grunschel et al., 2013; Patrzek et al., 2012). A general tendency to procrastinate may thus be particularly problematic during the transition to university, when students need to be able to properly manage their time in order to deal with new stressors, heavier demands, and stringent grading standards. The possibility that procrastination could be related to a larger grade decrease from high school to university remains to be empirically tested.

The Present Study

The transition from high school to university is a critical period during which substantial decreases in academic achievement can have a long-lasting influence on the development and success of university students. Past studies have generally shown that students who procrastinate more tend to obtain worse grades than students who procrastinate less (e.g., Richardson et al., 2012; Steel, 2007). We do not know, however, when this achievement gap due to procrastination occurs and whether this achievement gap due to procrastination increases, decreases, or remains stable over time. Understanding when procrastination is most likely to have a negative effect on achievement would be informative to eventually deliver appropriate interventions to students

who procrastinate more than their peers before they start experiencing severe academic difficulties.

We conducted a study in which we measured procrastination during the first semester at university and we obtained, via the Registrar's Office, the official average grade of students at three time points, namely the last year of high school, the first semester at university, and the second semester at university. With this achievement data, we were able to examine the influence of procrastination on three achievement outcomes: (a) the first semester grade at university, (b) the grade change from high school to the first semester at university, and (c) the grade change from the first to the second semester at university. These achievement outcomes allowed us to estimate a grade trajectory from high school to university.

The *main goal* of this study was to investigate the influence of procrastination on these achievement outcomes. The *complementary goal* of this study was to *stringently* test the influence of procrastination on these achievement outcomes *over and above* relevant demographic and socio-economic control variables. More precisely, five demographic and socio-economic control variables were proposed: (a) gender, (b) age at entry, (c) living situation, (d) scholarship, and (e) financial support from parents. In Table 2.1, we present our hypotheses on the relations between the control variables and the achievement outcomes.

Our first hypothesis was that (1a) students who procrastinate more than their peers should be more likely to have a lower first semester grade at university and (1b) this result should remain significant even after we add the relevant demographic and socio-economic control variables. Our second hypothesis was that (2a) students who procrastinate more than their peers should be more likely to have a larger grade decrease from high school to the first semester at university and (2b) this result should remain significant even after we add demographic and

socio-economic control variables. Our third and last hypothesis was that (3a) students who procrastinate more than their peers should be more likely to have a larger grade decrease from the first to the second semester at university and (3b) this result should remain significant even after we add demographic and socio-economic control variables.

Method

Participants and Procedure

Participants were 269 first-year undergraduate students (83.3% female, 16.7% male) from a Canadian university.[4] On average, they were aged 18.36 years (*SD* = 1.74; 90.7% were aged 16–19 years, 7.8% were aged 20–25 years, and 1.5% were aged 26–35 years). Participants were enrolled at the faculties of health sciences (36.1%), social sciences (33.5%), science (19.7%), arts (10.4%), and law (0.4%). They identified their ethnic background as European Canadian/White (58.0%), Asian (11.5%), African Canadian/Black (8.2%), Arabic (6.3%), Hispanic/Latino (2.2%), Aboriginal/Native (1.1%), or others (12.6%). Participants reported that they were living with their parents (45.0%), in a residence (39.0%), or in an apartment (16.0%) and that they received a full scholarship (4.5%), a partial scholarship (73.6%), or no scholarship (21.9%) to cover their tuition fees. They also received full financial support (45.7%), partial financial support (36.8%), or no financial support (17.5%) from their parents for school.

This study was approved by the Research Ethics Board of the University of Ottawa. The study was conducted online during the fall semester 2014, between mid-October and early December. Participants were asked to complete the questionnaires alone and in a quiet place. All participants provided their informed consent to participate in this study. On a separate secured

[4] This sample was taken from a larger research project on the academic experience of students across their courses for which 394 undergraduate university students were recruited. This larger initial sample included first, second, third, and fourth year students. We decided to only keep first-year students (69.5% of the sample) in the present study given that we specifically focus on the transition of students to their first year at university.

web page, participants could decide if they wanted to grant access to their official grades from their student dossier via the Registrar's Office. A total of 189 students (70.3% of the sample) have granted access to their grades. All participants received one point toward their introductory psychology course for their participation in this study.

Measures

Procrastination. Procrastination was measured with the 9-item Irrational Procrastination Scale (IPS; Steel, 2010). Participants were instructed to rate the items (e.g., "I put things off so long that my well-being or efficiency unnecessarily suffers") on a scale ranging from 1 (*not at all agree*) to 5 (*totally agree*). The scores on the IPS have demonstrated excellent internal consistency in the past along with good convergent and divergent validity (Svartdal & Steel, 2017). However, the three reversed items of the IPS have been identified as problematic given that they tend to load on a different factor which can be attributable to a method effect (e.g., Gareau et al., 2019; Rozental et al., 2014). The results of a confirmatory factor analysis on the original 9-item one-factor model with our sample indeed revealed some issues with the three reversed items, χ^2 (27) = 104.01, $p < .001$, CFI = .91, TLI = .88, SRMR = .06, RMSEA = .10, 90% CI = [.08, .12]. More precisely, one reversed item had a relatively low standardized loading (i.e., loading < .70) and the two other reversed items did not significantly load on the factor (i.e., loading < .05). An alternative 6-item one-factor model without the reversed items had good standardized loadings (i.e., loadings > .70) and an acceptable level of fit, χ^2 (9) = 30.01, $p < .001$, CFI = .97, TLI = .95, SRMR = .03, RMSEA = .09, 90% CI = [.06, .13].[5] Thus, we conducted our analyses with the 6-item IPS which has better psychometric properties and items that are more

[5] Modification indices suggest that the fit indices of the 6-item questionnaire can be improved by correlating the residuals of some items. Although these analyses go beyond the scope of this manuscript, the data for these analyses are available upon request.

aligned with the concept of procrastination. In the current study, the internal consistency of this scale was good ($\alpha = .90$).

Academic achievement. For the participants who have granted access to their official grades, we obtained the following information: (a) the GPA of the last year of high school, (b) the semester GPA of the fall semester 2014, and (c) the semester GPA of the winter semester 2015. The following grading system is officially used at the university where the study was conducted: 0 = 0–39% (F), 1 = 40–49% (E), 2 = 50–54% (D), 3 = 55–59% (D+), 4 = 60–64% (C), 5 = 65–69% (C+), 6 = 70–74% (B), 7 = 75–79% (B+), 8 = 80–84% (A-), 9 = 85–89% (A), and 10 = 90–100% (A+). The high school GPA was converted from a percentage value (e.g., 83%) to the corresponding numerical value on the grading system of the university (e.g., 8).

Demographic and socio-economic variables. At the beginning of the survey, participants were asked to report (a) their gender (i.e., male or female), (b) their age, (c) where they currently live (i.e., with their parents, in an apartment, or in a residence), (d) whether they received a scholarship to cover their tuition fees (i.e., full scholarship, partial scholarship, or no scholarship), and (e) the level of financial support received from their parents for school (i.e., full support, partial support, or no support).

Plan of Analyses

The analyses were conducted in M*plus* version 8 (Muthén & Muthén, 1998-2017). We used multilevel piecewise growth modeling to test our hypotheses. Piecewise growth modeling (see Hindman et al., 2011) was preferred over traditional growth modeling (i.e., linear and quadratic terms) because the trajectory of academic achievement during the transition is known to be discontinuous (Gaudreau, 2018). Although discontinuity can be captured with a quadratic term, the quadratic term is difficult to interpret as it is confounded by the linear term (Gaudreau

et al., 2019). As such, a piecewise growth model was preferable to examine the influence of procrastination on the grade trajectory from high school to university.

We used a Bayesian estimator with non-informative priors to handle missing data and to estimate all the parameters in our piecewise growth model. With non-informative priors, the estimates found with the Bayes estimator are similar to the estimates that would be found with the traditional Maximum Likelihood (ML) estimator (see Muthén, 2010). However, the Bayes estimator has some computational advantages when compared to the ML estimator. In a growth model with two slopes, the ML estimator can only include the random effect of one of the two slopes. The Bayesian estimator is more flexible because it inherently assumes that all effects are random, thus alleviating the burden of selecting which effects should be treated as fixed and which effects should be treated as random. In the context of multilevel modeling, the Bayesian estimator is also less likely to yield estimation problems because of inadmissible estimates or non-converging models compared to the ML estimator (Zitzmann et al., 2016). Hence, the Bayesian estimator allows us to flexibly test our models in a way that is consistent with our research questions.

A few key elements had to be taken into consideration when using a Bayes estimator. First, the convergence of each model was assessed by verifying that the Proportional Scale Reduction (PSR) value was close to 1. We used 50,000 iterations for all the models and the PSR values were between 1.000 and 1.008. Second, the estimated value of a parameter corresponded to the median of its posterior distribution. Lastly, null hypothesis significance testing was assessed using the 95% credibility interval (i.e., 95% PPI) of the posterior distribution, with statistical significance being inferred when the interval did not cover zero. Both unstandardized

and standardized parameter estimates were reported in the results. The significance testing was based on the credibility intervals of the unstandardized estimates.

Our piecewise multilevel growth model included two slopes. The slopes were coded in a way so that the intercept would represent the first semester at university. The 1st slope – showing the grade change from high school to the first semester at university – was coded as follows: -1 = high school; 0 = first semester; 0 = second semester. The 2nd slope – showing the grade change from the first semester to the second semester at university – was coded as follows: 0 = high school; 0 = first semester; 1 = second semester. The two slopes were used to obtain the grade trajectory from high school to the first year at university.

Four nested models were tested and each new model built upon the previous model. In the *null model*, academic achievement was entered as an outcome without any predictors. In the *grade trajectory model*, the two slopes were entered as uncentered within-person predictors of academic achievement. In the *grade trajectory model with procrastination*, procrastination was entered at the between-person level as a grand-mean centered predictor of the intercept and the two slopes. Finally, in the *complementary model*, all the dummy coded control variables were entered at the between-person level as uncentered predictors of the intercept and the two slopes.

For the complementary model, the control variables were dummy coded, with the modal group defined as the reference group and coded as zero. For gender, one dummy variable was created to compare female (reference group) to male students. For age, students between 16 and 19 years of age who were the most likely to enter university directly after high school (reference group), were compared to those between 20 and 25 years of age (first dummy variable) and those between 26 and 35 years of age (second dummy variable). For the living situation, students living with their parents (reference group) were compared to those living in a residence (first

dummy variable) and those living in an apartment (second dummy variable). For the scholarship, students who received a partial scholarship (reference group) were compared to those who received a full scholarship (first dummy variable) and those who did not receive a scholarship (second dummy variable). For the financial support, students who received full financial support from their parents for school (reference group) were compared to those who received partial financial support (first dummy variable) and those who did not receive financial support (second dummy variable). Hence, nine dummy variables were entered in the complementary model.

Results

Preliminary Analyses

The initial sample of 274 first-year university students was screened for outliers on the main variables, namely procrastination, high school grade, and university grades. Given that we also study grade change, we computed three scores for each participant: the grade change from high school to the first semester, from high school to the second semester, and from the first semester to the second semester. At the univariate level, *z*-scores were examined for each of these seven variables. A participant was considered an outlier if (a) their *z*-score was higher than 3 or lower than -3 and (b) their *z*-score was clearly apart from the rest of the sample based on a visual examination of the distribution. At the multivariate level, the Mahalanobis distance was computed and participants with a score above the critical value (χ^2 (7) = 24.32, $p < .001$) were considered as outliers. Based on the screening results, five participants were found to be outliers. The main analyses, conducted with the outliers ($n = 274$) and without the outliers ($n = 269$), showed that some parameter estimates were considerably different. Therefore, these five outliers were excluded and our final sample consisted of 269 first-year university students. Descriptive statistics and correlations are shown in Table 2.2.

A large number of participants had missing data on academic achievement because they did not grant access to their official grades (n = 80; 29.7% of the sample). We decided to compare participants who did not grant access to their grades (coded as 0) to participants who granted access to their grades (coded as 1) to determine whether these two groups significantly differed on variables of interest (see Meyers et al., 2006). We first used independent samples *t*-tests for continuous dependent variables (i.e., procrastination and age). We had an additional item in which we asked participants to describe their semester GPA in the current fall semester based on the university's grading scale from 0 (*F (0-39)*) to 10 (*A+ (90-100)*). This item was relevant to include as a dependent variable in the comparisons because it is strongly correlated to the official first semester GPA (r = .77, p < .001). The independent samples t-tests revealed that the two groups did not significantly differ in their self-reported fall semester GPA (t (266) = 0.59, p = .558), their procrastination score (t (267) = 0.09, p = .925), or their age (t (266) = 0.16, p = .876). We then used chi-square tests for categorical dependent variables (i.e., most of our control variables). The chi-square tests revealed that the decision to grant access to grades was not significantly related to gender (χ^2 (1, N = 269) = 0.02, p = .891), where the participants lived (χ^2 (2, N = 269) = 1.88, p = .391), receiving a scholarship (χ^2 (2, N = 269) = 2.63, p = .268), or the financial supported received from the parents (χ^2 (2, N = 269) = 1.45, p = .485). Taken together, these results give us the confidence to suggest that the participants who did not grant access to their grades were not significantly different from participants who gave access to their grades on relevant variables in the context of this study.

Before we considered the role played by procrastination on the grade trajectory, we first examined (a) the between-person and within-person variability in academic achievement (i.e.,

the null model) and (b) the trajectory of achievement from high school to university (i.e., grade trajectory model). The parameters estimates of those two models are shown in Table 2.3.

In the null model, we entered grade as an outcome without predictors to estimate the percentage of variance in academic achievement that is attributable to each level of analysis. Based on the intra-class correlation (ICC), 25.3% of the variance was found to be attributable to the between-person level and 74.7% was found to be attributable to the within-person level. The large percentage of the total variance in grade that is attributable to within-person change across time indicates that academic achievement changes remarkably during the transition from high school to university.

In the grade trajectory model, we assessed the grade change from high school to the first semester at university (i.e., 1st slope) and from the first to the second semester at university (i.e., 2nd slope). The two slopes explained 56.9% of the within-person variance in grade. The results revealed a large and significant grade drop from high school to the first semester at university (d = -1.52) followed by a non-significant grade change from the first semester to the second semester at university (d = 0.02). The grade trajectory is illustrated in Figure 2.1. Each slope was characterized by a significant amount of between-person differences (see random effects r_1 and r_2 in Table 2.3), which suggests that adding relevant predictors to the model could further explain this trajectory.

Main Analyses

The main goal of this study was to determine whether procrastination would have an influence on three achievement outcomes that represent the grade trajectory from high school to the first year at university. Specifically, we added procrastination as a between-person predictor of the intercept (i.e., first semester grade) and the two growth parameters (i.e., 1st slope and 2nd

slope). The parameter estimates of *the grade trajectory model with procrastination* can be found in Table 2.3. The influence of procrastination on the overall grade trajectory is illustrated in Figure 2.2, panel A.

First, procrastination was a significant predictor that explained 7.5% of the between-person variance in the intercept. Students who procrastinated more tended to obtain a lower first semester grade ($\hat{y}$ = 5.82, *SD* = 0.17, 95% PPI [5.50, 6.15], $p < .001$) at university than students who procrastinated less ($\hat{y}$ = 6.58, *SD* = 0.17, 95% PPI [6.25, 6.90], $p < .001$). This result lent credence to Hypothesis 1a.

Second, procrastination was a significant predictor that explained 15.3% of the between-person variance in the 1st slope. Students who procrastinated more tended to have a larger decrease in their grade (*B* = -2.57, *SD* = 0.15, 95% PPI [-2.88, -2.28], $p < .001$) from high school to university than students who procrastinated less (*B* = -1.97, *SD* = 0.15, 95% PPI [-2.27, -1.66], $p < .001$).[6] The influence of multiple levels of procrastination on the grade change from high school to the first semester at university is illustrated in Figure 2.2, panel B. This result lent credence to Hypothesis 2a.

Third, procrastination was a non-significant predictor that explained 1.3% of the between-person variance in the 2nd slope. The amount of grade change from the first to the second semester at university did not significant differ across levels of procrastination. This result did not offer support to Hypothesis 3a.

Complementary Analyses

[6] The unstandardized parameter (B) at a high level of procrastination was calculated as follows: $\beta_{10} + (\beta_{11} \times (+1\ SD$ of procrastination)). The unstandardized parameter (B) at a low level of procrastination was calculated as follows: $\beta_{10} + (\beta_{11} \times (-1\ SD$ of procrastination).

As a stringent test, we wanted to determine whether procrastination would influence the achievement outcomes over and above five demographic and socio-economic control variables (i.e., gender, age, living situation, scholarship, and financial support). Specifically, we added nine dummy coded variables (representing the five control variables) as between-person predictors of the intercept, the 1st slope, and the 2nd slope. The parameter estimates of this complementary model can be found in Table 2.4.

First, the predictors in this model explained 23.2% of the variance in the intercept. Students who were living in a residence (vs. with their parents), students who received no scholarship (vs. a partial scholarship), and students who received full financial support from their parents for their studies (vs. partial financial support) tended to obtain a lower first semester grade at university. The significant negative influence of procrastination on the first semester grade at university remained, thus supporting Hypothesis 1b.

Second, the predictors in this model explained 67.3% of the variance in the 1st slope. Students who were living in a residence (vs. with their parents) and students who received full financial support from their parents for their studies (vs. partial or no financial support) tended to have a larger decrease in their grade from high school to university. The significant negative influence of procrastination on the grade decrease from high school to the first semester at university remained, thus supporting Hypothesis 2b.

Third, the predictors in this model explained 14.3% of the variance in the 2nd slope. None of the control variables significantly predicted grade change from the first to the second semester at university. Given that procrastination was also not significantly related to grade change from the first to the second semester at university, Hypothesis 3b was not supported.

Discussion

The main goal of this study was to examine the influence of trait procrastination on the achievement trajectory of students from the last year of high school to the first year at university. More precisely, we investigated the influence of procrastination on three achievement outcomes in this trajectory, namely (a) the first semester grade at university, (b) the grade change from high school to the first semester at university, and (c) the grade change from the first to the second semester at university. We also stringently tested the influence of procrastination on these three achievement outcomes over and above five demographic and socio-economic control variables (i.e., gender, age at entry, living situation, receiving a scholarship, and receiving financial support from parents). Over and above these control variables, our results indicate that trait procrastination is a risk factor for increased achievement difficulties during the transition from high school to the first semester at university and these achievement difficulties tend to be maintained during the second semester at university.

Procrastination and Academic Achievement: A Multifaceted Perspective

We found that students who procrastinated more had a tendency to (a) obtain a lower first semester grade at university and (b) experience a larger grade decrease from high school to the first semester at university compared to students who procrastinated less. These findings are consistent with past results that have shown a significant and negative relation between procrastination and semester GPA (e.g., Gareau et al., 2019; Kljajic & Gaudreau, 2018). They also corroborate the broader meta-analytical findings showing that procrastination is negatively related to academic achievement in various forms, such as assignment grades, final exam grades, course grades, and GPAs (see Steel, 2007; van Eerde, 2003). Based on the fictional case in the introduction, Blake would be expected to have a lower first semester grade at university and a larger grade decrease from high school to university compared to Rory. Having high levels of

procrastination is a risk factor that makes it difficult to perform well as early as the first semester at university. By extension, this risk factor could potentially increase the likelihood of losing scholarships and decrease the likelihood of entering a competitive program and receiving learning opportunities that are dependent on excellent grades. These findings may be of interest to researchers who want to conduct interventions to help students like Blake who procrastinate more than their peers. If the goal is to prevent the achievement gap associated with procrastination, researchers may want to intervene to help students with higher procrastination early during the first semester at university and perhaps even before those students enter university. For now, our study contributes to the literature by showing that trait procrastination is an important risk factor for greater achievement difficulties not only during the first semester at university, but also during the transition from high school to university.

We also found that procrastination did not significantly influence the grade change from the first to the second semester at university. At first glance, this finding may seem somewhat reassuring for students who procrastinate often because their academic achievement tends to remain stable during the first year at university. Regardless of their level of procrastination, students seem to experience a certain level of habituation to the requirements and expectations of their postsecondary institution. However, the absence of improvement for students who procrastinate often also means that they maintain a disadvantaged level of academic achievement compared to students who procrastinate less (see Figure 2.2, panel A). Based on the fictional case in the introduction, Blake would be expected to maintain their lower than average semester grade and Rory would be expected to maintain their higher than average semester grade during the second semester. Taken together, these findings show that the worrying achievement gap associated with procrastination is maintained during the first year at university.

Limitations and Future Directions

Given the novelty of the research questions proposed in this study, we decided to use a relatively simple and cost-effective prospective design in which we measured procrastination only once during the first semester at university. However, the transition to university is characterized by many personal and interpersonal changes (Parker et al., 2004, 2006) and the level of procrastination of students may have changed during the transition. Future studies could measure procrastination at the end of high school and during the first year at university to determine whether this variable fluctuates across time especially after a critical transition. A different way to explore this possibility would be to conduct semi-structured interviews with students early in their transition to university to determine if their procrastination tendencies have changed and whether those changes in their tendencies are related to new challenges and stressors that they faced during the academic transition.

Another potentially interesting avenue for future empirical work would be to measure academic procrastination (instead of trait procrastination) or compare multiple procrastination questionnaires to determine whether they influence differently the achievement trajectory of students from high school to university. Alternatively, the focus could be on measuring the grade trajectory beyond the first year at university. In his research, Gaudreau (2018) has found that after the grade drop from high school to the first year at university, academic achievement tends to increase to a certain extent from the end of the first year to the fourth year at university. Future research could examine whether low procrastination is associated with a better improvement in academic achievement after the first year at university.

Although we found that procrastination tends to exacerbate the achievement difficulties during the transition from high school to university, we also found that students who

procrastinate less are not immune to the challenges associated with this academic transition. In fact, these students also tend to experience a large grade drop, albeit significantly less pronounced than their counterparts who procrastinate more. This result suggests that even students with low procrastination and a better than average first semester grade – like Rory in the introduction – can find themselves struggling during the transition from high school to university. This finding sheds light on how difficult it can be to succeed at university, although it should not be surprising given that 72.8% of students experience a considerable grade decrease from high school to university (Finnie & Martinello, 2010). Future studies are needed to determine whether low levels of procrastination combined with other protective psycho-social factors (e.g., academic self-efficacy, intrinsic motivation; see Richardson et al., 2012) are needed to help attenuate even more the large grade drop experienced by most students from high school to university.

The average grade measured at the end of each semester at university (i.e., semester grade) is a large unit of analysis that encompasses final grades in multiple courses. Furthermore, final course grades are often calculated based on multiple evaluations (e.g., assignments, final exams, and term papers). Hence, researchers could also examine the achievement trajectory within a particular course and determine whether procrastination has an impact on that trajectory. By focusing on whether achievement trajectories within different courses are influenced by procrastination, we might increase our understanding of the timing and the type of courses in which students tend to have the most difficulty to obtain good grades as a result of their procrastination.

This study was conducted at one large public university in the province of Ontario in Canada. This specific context – combined with limited research on the grade trajectory of

students from high schools to postsecondary institutions – currently limits our ability to generalize our findings to other universities. Finnie and Martinello (2010) have found in their large nationwide study with Canadian students that the province where the university is located and the university enrolment/size have an influence on the extent to which the average grade decreases from high school to university. Therefore, we propose that future research replicate our study design to determine the extent to which procrastination has an impact on the grade trajectory of students at other universities.

Conclusion

During the transition from high school to university, most students experience a "grade shock" characterized by a large average drop of almost 10% in their academic achievement (Finnie & Martinello, 2010). In our study, we found that trait procrastination is a risk factor for more achievement difficulties during this transition. That is, students who generally procrastinated more than their peers tended to experience a larger grade decrease from high school to the first semester at university and this achievement disadvantage was maintained during the second semester at university. If researchers want to eventually focus on the prevention of achievement difficulties in university due to procrastination, they may find this study informative to propose interventions to reduce the procrastination of students before they enter university or early during the first semester at university. Overall, this study further demonstrated the importance of studying the dynamic changes in academic achievement over time and the negative influence of procrastination during an important academic transition.

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Table 2.1

Hypotheses on the Influence of Control Variables on Academic Achievement

Control variable	Hypotheses	Justification (Past Studies and/or Meta-Analyses)
Gender	Female students > Male students	Female students tended to have significantly better overall grades in college/university (Voyer & Voyer, 2014) and a significantly lower overall grade decrease from high school to university (Finnie & Martinello, 2010) than male students.
Age at entry	16–19 years < 20–25 years 16–19 years < 26–35 years	Age was significantly positively correlated to GPA in a sample of college students (Owen, 2003).
Living situation	Parents > Residence Parents > Apartment	Students living with parents tended to have a significantly lower overall grade decrease from high school to university than students living in a residence. Students living with parents tended to have a lower overall grade decrease than students in other living situations, although this tendency was not always statistically significant (Finnie & Martinello, 2010).
Scholarship	Partial < Full Partial > Non	Financial support from the institution was significantly positively associated with GPA (Robbins et al., 2004).
Financial support from parents	Full < Partial Full < Non	Parental financial support for college was significantly negatively associated with GPA (Hamilton, 2013).

Note. >: significantly better achievement outcomes. <: significantly worse achievement outcomes.

Table 2.2

Descriptive Statistics and Correlations at the Between-Person Level of Analysis

Variable	*M*	*SD*	1	2	3
1. Procrastination	2.94	0.96	–		
2. High school grade	8.47	1.04	-.08	–	
3. First semester grade	6.20	1.83	-.21*	.47*	–
4. Second semester grade	6.25	1.94	-.19*	.36*	.84*

Note. $N = 269$. * $p < .05$.

Table 2.3

Null Model and Piecewise Multilevel Growth Models

	Null Model		Grade Trajectory Model			Grade Trajectory Model w/ Procrastination		
	Estimate [95% PPI]	*SD*	Estimate [95% PPI]	*SD*	Std. E.	Estimate [95% PPI]	*SD*	Std. E.
Level 1 fixed effects								
β_{00} = Intercept	6.98* [6.78, 7.18]	0.10	6.21* [5.97, 6.44]	0.12		6.20* [5.97, 6.43]	0.12	
β_{10} = Slope 1			-2.27* [-2.48, -2.05]	0.11	-.72	-2.27* [-2.48, -2.06]	0.11	-.72
β_{20} = Slope 2			0.04 [-0.16, 0.24]	0.10	.03	0.04 [-0.16, 0.25]	0.10	.03
Level 2 fixed effects								
Intercept as outcome								
β_{01} = Procrastination						-0.39* [-0.63, -0.15]	0.12	-.27
Slope 1 as outcome								
β_{11} = Procrastination						-0.32* [-0.54, -0.09]	0.11	-.39
Slope 2 as outcome								
β_{21} = Procrastination						0.01 [-0.21, 0.22]	0.11	.02
Random effects								
σ^2	2.90* [2.53, 3.36]	0.21	0.74* [0.42, 1.15]	0.20		0.83* [0.46, 1.16]	0.19	
r_0	0.98* [0.60, 1.47]	0.22	1.98* [1.34, 2.78]	0.38		1.75* [1.22, 2.54]	0.35	
r_1			0.82* [0.08, 1.71]	0.46		0.54* [0.03, 1.49]	0.42	
r_2			0.38* [0.05, 0.77]	0.19		0.40* [0.08, 0.81]	0.19	

Note. * $p < .05$. PPI = posterior probability interval (also known as credibility interval). *SD* = standard deviation of the posterior distribution. Std. E. = standardized estimate. The estimates are unstandardized (except Std. E.). Random effects were included in all the models. The significance testing was based on the credibility intervals of the unstandardized estimates.

Table 2.4

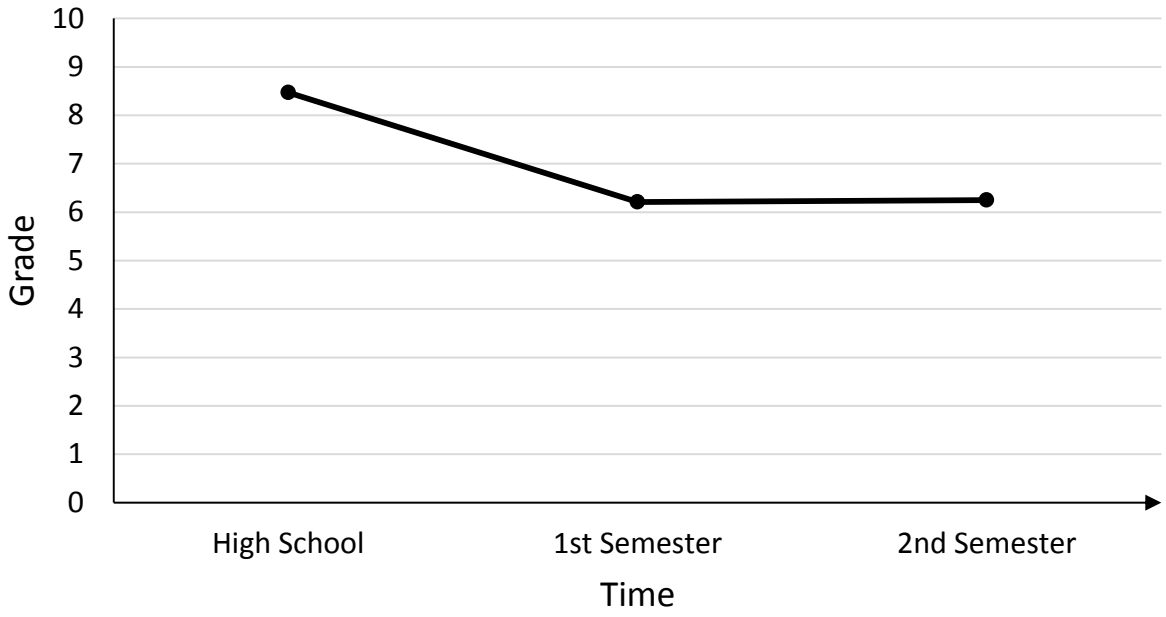
Complementary Piecewise Multilevel Growth Model

	Estimate [95% PPI]	*SD*	Std. E.
Level 1 fixed effects			
β_{00} = Intercept	6.19* [5.72, 6.64]	0.24	
β_{10} = Slope 1	-2.55* [-2.98, -2.11]	0.22	-.69
β_{20} = Slope 2	0.20 [-0.29, 0.68]	0.24	.03
Level 2 fixed effects			
Intercept as outcome			
β_{01} = Procrastination	-0.36* [-0.59, -0.13]	0.12	-.27
β_{02} = Female vs. Male (*Gender Dummy*)	0.37 [-0.21, 0.97]	0.30	.08
β_{03} = 16–19 years vs. 20–25 years (*Age Dummy 1*)	0.74 [-0.16, 1.62]	0.45	.11
β_{04} = 16–19 years vs. 26–35 years (*Age Dummy 2*)	-0.74 [-2.66, 1.17]	0.97	-.05
β_{05} = Parents vs. Residence (*Living Situation Dummy 1*)	-0.57* [-1.05, -0.09]	0.24	-.15
β_{06} = Parents vs. Apartment (*Living Situation Dummy 2*)	-0.18 [-0.87, 0.51]	0.35	-.04
β_{07} = Partial vs. Full (*Scholarship Dummy 1*)	0.81 [-0.16, 1.79]	0.50	.09
β_{08} = Partial vs. No (*Scholarship Dummy 2*)	-0.84* [-1.37, -0.32]	0.27	-.19
β_{09} = Full vs. Partial (*Financial Support Dummy 1*)	0.57* [0.09, 1.05]	0.25	.15
β_{010} = Full vs. No (*Financial Support Dummy 2*)	0.59 [-0.04, 1.24]	0.33	.12
Slope 1 as outcome			
β_{11} = Procrastination	-0.28* [-0.49, -0.07]	0.11	-.42
β_{12} = Female vs. Male (*Gender Dummy*)	0.25 [-0.31, 0.85]	0.30	.10
β_{13} = 16–19 years vs. 20–25 years (*Age Dummy 1*)	0.79 [-0.08, 1.62]	0.43	.22
β_{14} = 16–19 years vs. 26–35 years (*Age Dummy 2*)	-0.69 [-2.46, 1.05]	0.90	-.09
β_{15} = Parents vs. Residence (*Living Situation Dummy 1*)	-0.44* [-0.91, -0.01]	0.23	-.23
β_{16} = Parents vs. Apartment (*Living Situation Dummy 2*)	-0.10 [-0.74, 0.57]	0.33	-.04
β_{17} = Partial vs. Full (*Scholarship Dummy 1*)	0.13 [-0.80, 1.04]	0.47	.03
β_{18} = Partial vs. No (*Scholarship Dummy 2*)	0.19 [-0.34, 0.67]	0.26	.08
β_{19} = Full vs. Partial (*Financial Support Dummy 1*)	0.56* [0.10, 1.01]	0.23	.29
β_{110} = Full vs. No (*Financial Support Dummy 2*)	0.65* [0.05, 1.26]	0.31	.26
Slope 2 as outcome			
β_{21} = Procrastination	-0.01 [-0.24, 0.22]	0.12	-.02
β_{22} = Female vs. Male (*Gender Dummy*)	-0.08 [-0.70, 0.52]	0.31	-.03
β_{23} = 16–19 years vs. 20–25 years (*Age Dummy 1*)	0.14 [-0.83, 1.10]	0.49	.03
β_{24} = 16–19 years vs. 26–35 years (*Age Dummy 2*)	0.42 [-1.53, 2.36]	0.99	.05
β_{25} = Parents vs. Residence (*Living Situation Dummy 1*)	< 0.01 [-0.48, 0.51]	0.25	< .01
β_{26} = Parents vs. Apartment (*Living Situation Dummy 2*)	-0.11 [-0.82, 0.59]	0.36	-.04
β_{27} = Partial vs. Full (*Scholarship Dummy 1*)	-0.42 [-1.42, 0.61]	0.52	-.08
β_{28} = Partial vs. No (*Scholarship Dummy 2*)	-0.01 [-0.55, 0.54]	0.28	< -.01
β_{29} = Full vs. Partial (*Financial Support Dummy 1*)	-0.24 [-0.74, 0.28]	0.26	-.11
β_{210} = Full vs. No (*Financial Support Dummy 2*)	-0.13 [-0.79, 0.54]	0.34	-.04
Random effects			
σ^2	0.95* [0.60, 1.18]	0.14	
r_0	1.30* [0.93, 1.95]	0.26	
r_1	0.12* [< 0.01, 0.97]	0.26	
r_2	0.53* [0.14, 1.04]	0.23	

Note. * $p < .05$. PPI = posterior probability interval (also known as credibility interval). *SD* = standard deviation of the posterior distribution. Std. E. = standardized estimate. The estimates are unstandardized (except Std. E.). Random effects were included in this model. The significance testing was based on the credibility intervals of the unstandardized estimates.

Figure 2.1

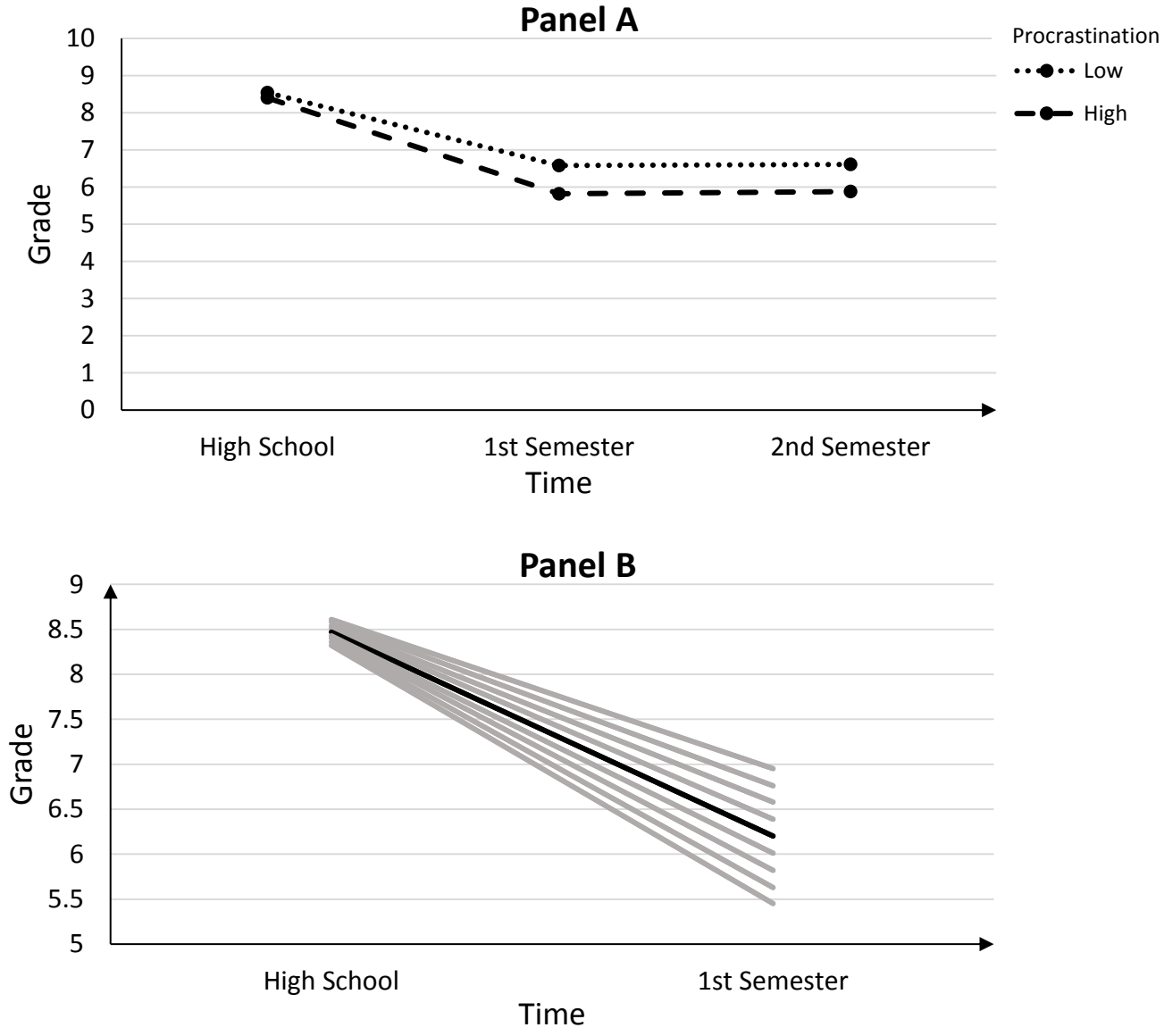
Predicted Values of the Grade Trajectory Model



Note. High school = last year of high school. 1st semester = first semester at university. 2nd semester = second semester at university.

Figure 2.2

Predicted Values of the Grade Trajectory Model with Procrastination



Note. High school = last year of high school. 1st semester = first semester at university. 2nd semester = second semester at university. Panel A shows the grade trajectory at low (-1.0 *SD*) and high (+1.0 *SD*) levels of procrastination. Panel B is a close-up of the first slope at multiple levels of procrastination. The black line represents the slope at an average level of procrastination. Each grey line above the black line represents a slope when procrastination is decreased by 0.5 *SD* (up to -2.0 *SD*). Each grey line below the black line represents a slope when procrastination is increased by 0.5 *SD* (up to +2.0 *SD*).

CHAPTER 3

ARTICLE 2

Why do Students Procrastinate More in Some Courses than in Others and What Happens Next?

Expanding the Multilevel Perspective on Procrastination

Why do Students Procrastinate More in Some Courses than in Others and What Happens Next? Expanding the Multilevel Perspective on Procrastination

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Abstract

Much is known about the antecedents and outcomes of procrastination when comparing students to one another (i.e., between-person level). However, little is known about the antecedents and outcomes of procrastination when comparing the courses taken by the students during a semester (i.e., within-person level). In this study, we proposed that examining procrastination at both levels of analysis should improve our understanding of the academic experience of students. At both levels, we examined the mediating role of procrastination in the associations between two dimensions of motivation (i.e., autonomous and controlled) and indicators of academic achievement (i.e., grades) and well-being (i.e., positive and negative affect). A sample of 359 university students completed questionnaires measuring their motivation, procrastination, and affect in each of their courses. The official final course grades were obtained at the end of the semester. Multilevel mediation analyses with structural equation modeling were conducted to test our hypotheses. At the between-person level, the indirect effects revealed that higher controlled motivation was significantly associated with worse outcomes (i.e., worse grades and higher negative affect) via higher levels of procrastination. At the within-person level, the indirect effects revealed that lower autonomous motivation was significantly associated with worse outcomes (i.e., worse grades, lower positive affect and higher negative affect) via higher levels of procrastination. Overall, this study shows that different pathways at each level of analysis may explain how procrastination can be detrimental for the success and well-being of university students.

Keywords: motivation, procrastination, academic achievement, well-being, multilevel modeling

Why do Students Procrastinate More in Some Courses than in Others and What Happens Next? Expanding the Multilevel Perspective on Procrastination

Learning to manage one's time is an integral part of university life (e.g., Abdulghani et al., 2014; Hurst et al., 2013; Rothschild-Checroune et al., 2012). Academic tasks (e.g., exams, papers, lab reports, team projects) often have strict deadlines and students need to study or work on these tasks regularly throughout the semester to avoid feeling overwhelmed at the last minute. Some students struggle to manage their time more than others and thus procrastinate by putting off their academic tasks even though they are aware that their delay will lead to negative consequences (Steel, 2007). The consequences of procrastination are well-documented with meta-analyses showing that it is associated with poorer well-being (Steel, 2007; van Eerde, 2003) and academic achievement (e.g., Kim & Seo, 2015; Richardson et al., 2012). Students who procrastinate more than others thus seem to have more difficulty adjusting to the demands of academic life.

However, students do not behave in the same way across all their courses during a semester. For example, a hypothetical student named Sam might say that they rarely procrastinate in general, but that they frequently procrastinate in their Biology course. Why does Sam procrastinate more in Biology than in their other courses? What are the consequences of Sam's frequent procrastination in Biology? A recently proposed multilevel perspective on procrastination across courses has shown that within-person course procrastination is negatively related to within-person final course grade (Kljajic & Gaudreau, 2018). This means that Sam would be expected to have a lower grade in Biology than in their other courses. As a next step in this new research venue, we propose to expand the nomological network of procrastination by examining its antecedents and outcomes. More precisely, we tested the mediating role of

procrastination in the relations between two dimensions of motivation and indicators of achievement and emotional well-being both across students (i.e., between-person level) and across the courses taken by each student during a semester (i.e., within-person level).

Two Dimensions of Motivation, Academic Achievement, and Well-Being

Students have various reasons for being engaged in their academic courses. According to Self-Determination Theory (SDT; Deci & Ryan, 2000; Ryan & Deci, 2020), these reasons can be described as regulatory styles and classified into two dimensions of motivation. The first dimension, called *autonomous motivation*, includes regulatory styles that reflect a deliberate choice to do an activity. Students with high autonomous motivation are engaged in their academic tasks because they are perceived as inherently interesting and enjoyable (i.e., intrinsic regulation), as closely aligned with their foundational values and interests (i.e., integrated regulation), or as personally valuable (i.e., identified regulation). The second dimension of motivation, called *controlled motivation*, includes regulatory styles that reflect internal or external pressure to do an activity. Students with high controlled motivation are engaged in their academic tasks because they want to avoid feelings of shame or guilt due to failure or want to experience better self-esteem due to success (i.e., introjected regulation) or because they want to receive a reward or avoid a punishment (i.e., external regulation). One of the main hypotheses of SDT is that more autonomous regulatory styles should be associated with more engagement, learning, and well-being in the academic domain (Ryan & Deci, 2020). As such, autonomous and controlled motivation are expected to be related differently to outcomes, with autonomous motivation being related to better academic outcomes.

Motivation is often considered as an important ingredient for academic success (Guay et al., 2008). Students who do their academic tasks for autonomous reasons would be most likely to be driven to produce high-quality work and, as a result, achieve very good grades. Several meta-

analytical findings have shown that indicators of autonomous motivation (i.e., intrinsic and/or identified regulation) are positively associated with achievement in the academic domain (Cerasoli et al., 2014; Howard et al., 2021; Richardson et al., 2012; Taylor et al., 2014). Likewise, recent studies with university students have generally found that autonomous motivation is significantly and positively correlated to academic achievement (e.g., Bonneville-Roussy et al., 2017; Gareau & Gaudreau, 2017; Orsini et al., 2019; Yu et al., 2018). By contrast, students who do their academic tasks for controlled reasons would most likely do just enough to finish their work without necessarily spending more time on improving its quality. One small-scale meta-analysis with studies using only the Academic Motivation Scale (Vallerand et al., 1992) has shown that indicators of controlled motivation (i.e., introjected and external regulation) are negatively associated with academic achievement (Taylor et al., 2014). However, another broader and more recent meta-analysis has instead found no significant association between indicators of controlled motivation and academic achievement (Howard et al., 2021). Similarly, recent studies with university students have generally found a negative, albeit mostly non-significant correlation between controlled motivation and academic achievement (e.g., Aydin & Michou, 2020; Bonneville-Roussy et al., 2017; Gareau et al., 2019; Jeno et al., 2018). Overall, these findings indicate that autonomous and controlled motivation play a differential role on academic achievement. Although the evidence of the negative role played by controlled motivation is somewhat inconclusive, having more autonomous motivation is clearly a relevant ingredient for greater academic success.

Motivation is also considered as a key variable that can enhance the emotional well-being of students (Ryan & Deci, 2009). Students with high autonomous motivation freely choose to do their academic tasks and, for them, those tasks are perceived as interesting, valuable or

personally important. Therefore, such students are more likely to experience better emotional well-being. Meta-analytical findings support this proposition by showing that indicators of autonomous motivation (i.e., intrinsic and identified regulation) are related to higher positive affect and lower negative affect in the academic setting (Howard et al., 2021). Also, when affect is measured in a dispositional/general way or during a medium time-frame (e.g., over a few weeks), autonomous motivation is correlated positively to positive affect and negatively to negative affect (e.g., Garn et al., 2019; Litalien et al., 2013, 2015; Waaler et al., 2013). Conversely, students with high controlled motivation feel an obligation to do academic tasks due to internal or external pressures and, as a result, they are more likely to experience conflicted emotions. A recent meta-analysis showed that indicators of controlled motivation (i.e., introjected and external regulation) are positively related to negative affect; however, conflicting evidence is found for positive affect (Howard et al., 2021). When affect is measured in a dispositional/general way or during a medium time-frame, negative affect is usually significantly and positively correlated to controlled motivation, whereas the correlation between positive affect and controlled motivation tends to be negative but mostly non-significant (e.g., Garn et al., 2019; Litalien et al., 2015; Sanjuán & Ávila, 2019). Taken together, these results suggest that autonomous motivation is related to better emotional well-being (i.e., higher positive affect and lower negative affect), whereas controlled motivation is related to worse emotional well-being to a certain extent (i.e., higher negative affect).

In order to experience success and well-being, students benefit not only from the right type of motivation, but also from an ability to prioritize the completion of academic tasks over other appealing options (e.g., spending time with friends, watching a movie). When students delay starting or completing an academic task even though they anticipate the negative

consequences due to their delay, they are said to be procrastinating (Steel, 2007). Students who procrastinate tend to produce low-quality work and experience more negative affect, such as anger, anxiety, shame, sadness, and dissatisfaction (Grunschel et al., 2013; Patrzek et al., 2012). As shown in Figure 3.1, we propose that procrastination could act as a mediator that can explain how two dimensions of motivation (i.e., autonomous and controlled) relate to academic outcomes (i.e., achievement and affect).

The Mediating Role of Procrastination

Motivation is recognized as playing an important role in the capacity to self-regulate (Molden et al., 2016). On the one hand, students with high autonomous motivation – who perceive their courses as engaging or valuable – would be less likely to constantly and irrationally delay the completion of their academic tasks. Accordingly, studies have found, for the most part, that autonomous motivation is significantly and negatively correlated to procrastination in the academic domain (e.g., Katz et al., 2014; Mouratidis et al., 2018; Vansteenkiste et al., 2009). Indicators of autonomous motivation (i.e., intrinsic and identified regulation) were also mostly negatively correlated to procrastination (Lee, 2005; Senécal et al., 1995; Seo, 2013). On the other hand, students with high controlled motivation – who put pressure on themselves or perceive an external pressure to work on their academic tasks – would be more likely to frequently postpone the completion of their academic tasks to another day. Indeed, most studies in the academic domain have shown a significant and positive correlation between controlled motivation and procrastination (e.g., Mih, 2013; Mouratidis et al., 2018; Vansteenkiste et al., 2009). Furthermore, indicators of controlled motivation (i.e., introjected and/or external regulation) tend to be positively – although not necessarily significantly – correlated to procrastination (Lee, 2005; Senécal et al., 1995; Seo, 2013). Overall, despite the limited number of studies conducted on the two dimensions of motivation and procrastination in

the academic setting, the results seem to be fairly consistent: Autonomous and controlled motivation are generally related to less and more procrastination, respectively.

Procrastination is expected to have a negative influence on academic achievement. Many students who procrastinate eventually experience the time pressure to complete an academic task before a deadline and the accumulation of multiple academic tasks to complete at the same time (Grunschel et al., 2013; Patrzek et al., 2012). As a result, these students often do not have enough time to produce high-quality work and get excellent grades. Meta-analytical findings have shown that students who procrastinate more tend to obtain lower grades than students who procrastinate less (Kim & Seo, 2015; Richardson et al., 2012; Steel, 2007; van Eerde, 2003). Even in the courses in which university students procrastinate more than their own average, they tend to obtain lower grades compared to their own average (Kljajic & Gaudreau, 2018). Hence, studies have generally shown that procrastination is negatively related to academic achievement.

Procrastination is also expected to be related to worse emotional well-being. When students procrastinate, they might experience temporary relief by avoiding an academic task that is considered aversive. However, procrastination tends to increase self-generated stress and students often end up feeling worse after they procrastinate (Sirois & Pychyl, 2013). A small-scale meta-analysis with samples of community participants and students revealed that procrastination was significantly negatively associated with positive affect (r = -.29) and significantly positively associated with negative affect (r = .31; Sirois et al., 2019). Likewise, many studies conducted with university students have shown that procrastination is associated with lower positive affect and greater negative affect (e.g., Balkis & Duru, 2016; Blouin-Hudon & Pychyl, 2015; Choy & Cheung, 2018; Gautam et al., 2019; Turban et al., 2013). Overall, these

findings indicate that procrastination is related to worse emotional well-being (i.e., lower positive affect and higher negative affect).

The Present Study

The multilevel perspective proposed by Kljajic and Gaudreau (2018) to measure procrastination and grades across courses was used as a foundation to develop the present study. In their study, Kljajic and Gaudreau (2018) examined the relation between procrastination and grades across students (i.e., between-person level) and across the courses taken by each student during the semester (i.e., within-person level). First, they found that a large percentage of the variance (i.e., 39%) in procrastination and grades was due to the fluctuations across courses (i.e., within-person level), which warranted the usage of a multilevel model. Second, they found a significant and negative association between procrastination and grades at both levels of analysis. However, the results were interpreted differently at each level of analysis. At the between-person level, they found that students who procrastinated *more than others* tended to obtain a lower average grade than others. At the within-person level, they found that in the courses in which students procrastinated *more than their own average*, they tended to obtain a lower final course grade than their own average. Taken together, these results revealed the value of investigating procrastination across the courses taken by university students during a semester.

The present study also measured the relation between procrastination and grades at two levels of analysis. However, we also built upon the study of Kljajic and Gaudreau (2018) in two ways: (a) we proposed two motivational antecedents of procrastination, and (b) we added two indicators of emotional well-being as outcomes of procrastination. More specifically, we investigated the mediating role of procrastination in explaining how autonomous and controlled motivation relate to three academic outcomes (i.e., grades, positive affect, and negative affect) at the between-person and within-person levels of analysis. We hypothesized that the findings

would be comparable at the two levels (see Figure 3.1). However, the results would hold a distinct conceptual meaning at each level.

Between-person interpretation (comparing students to one another): We hypothesized that students with lower autonomous motivation and higher controlled motivation would tend to procrastinate more. In turn, we hypothesized that students who procrastinate more would tend to have a lower average grade and positive affect and a higher negative affect.

Within-person interpretation (comparing courses to one another within each student): In the courses in which students have lower autonomous motivation and higher controlled motivation, we hypothesized that they would tend to procrastinate more. In turn, in the courses in which students procrastinate more, we hypothesized that they would tend to have lower course grades and course positive affect, and higher course negative affect.

Method

Participants

Participants were recruited in the student pool of the integrated system for participation in research at the University of Ottawa, in Canada. These students were recruited in their first-year introductory psychology or linguistics courses or in their second-year research methods in communication course. Participants in our study were 359 undergraduate students (71.3% female, 28.7% male). Their age ranged from 16 to 46 years (M = 19.27, SD = 3.24) and they were in their first (68.2%), second (18.1%), third (9.7%), or fourth (3.9%) year of study. Participants were enrolled in health sciences (30.4%), social sciences (29.2%), science (22.6%), arts (7%), engineering (2.8%), management (1.7%), or in multiple faculties (6.1%). They reported that they were taking two (0.8%), three (1.9%), four (22.3%), five (71%), or six (3.9%) courses during the semester. Participants described their ethnic background as European-Canadian/White (46.4%), Asian (22.3%), Arabic (10.9%), African-Canadian/Black (6.1%),

Hispanic/Latino (1.7%), Aboriginal/Native (0.6%), or other (12%). They were living with their parents (42.6%), in a residence (29.7%), or in an apartment (27.7%) and they received a full scholarship (3.9%), a partial scholarship (57%), or no scholarship (39.1%) to cover their tuition fees. Some students (41.2%) had to work during the semester and they worked on average 14.86 hours per week. This study was approved by the Research Ethics Board of the university.

Procedure

During the fall semester 2019, university students were recruited to participate in a study on their academic experience in each of their courses. The recruitment was conducted online via an integrated system for participation in research. We opened the survey a month after the beginning of the semester to ensure that the participants could reflect on their general experience in each of their courses. All participants completed the consent form for the study. Participants completed demographic and socio-economic questions before they reported how many courses they were taking in the current semester using a drop-down menu including options from one to six courses. Participants were then redirected to the course-related part of the survey that matched their answer on the drop-down menu. For example, if a participant indicated that they had five courses, they were redirected to the webpage "Questions about your five courses" in which they were asked to complete the same questionnaires for each course. For each course, participants were asked to report the course code (e.g., PSY-1101-C) and the name of the professor before they completed questionnaires referring to that course. After the questionnaires for the last course were completed, participants were thanked for their participation in the study and they received one point toward their introductory psychology or linguistics course or their research methods in communication course as compensation.

Measures

Course autonomous and controlled motivation (independent variables). A 10-item questionnaire was used to measure motivation according to SDT (Gareau & Gaudreau, 2017). Participants indicated the extent to which each item corresponded to a reason why they were enrolled in the referred course on a scale from 1 (*not at all for this reason*) to 7 (*totally for this reason*). The items measuring intrinsic regulation (e.g., "Because I truly love it"; two items), integrated regulation (e.g., "It is part of who I am as a person"; two items), and identified regulation (e.g., "In order to pursue goals that are important to me"; two items) were averaged to create a score of autonomous motivation (within-person $\alpha = .83$; between-person $\alpha = .91$). The items measuring introjected regulation (e.g., "Otherwise, I would feel guilty"; two items) and external regulation (e.g., "Somebody is putting pressure on me"; two items) were averaged to create a score of controlled motivation (within-person $\alpha = .74$; between-person $\alpha = .94$).

Course procrastination (mediating variable). A 3-item questionnaire was used to measure procrastination (Kljajic & Gaudreau, 2018) based on items from past questionnaires (Solomon & Rothblum, 1984; Steel, 2010). For each course, participants were presented with a definition of procrastination ("Procrastination refers to when we delay starting or completing some task even though we are aware that negative consequences will probably follow the delay") and were then asked to think about their procrastination on academic tasks (e.g., studying for an exam or writing a term paper) outside of class. They then rated the degree to which they agreed with each item for the referred course on a scale from 1 (*Not at all agree*) to 5 (*Totally agree*). The reliability of this questionnaire was good in this study (within-person $\alpha = .84$; between-person $\alpha = .93$).

Course final grade (dependent variable). For the purposes of this study, participants were given the option to grant access to their official final grades in each of their courses at the

end of the semester via the Registrar's Office. A total of 240 participants (67% of the sample) agreed to grant access to their final grades in all their courses. The final grades were based on the official 11-point grading system used by the university: 0 = F (0-39%), 1 = E (40-49%), 2 = D (50-54%), 3 = D+ (55-59%), 4 = C (60-64%), 5 = C+ (65-69%), 6 = B (70-74%), 7 = B+ (75-79%), 8 = A- (80-84%), 9 = A (85-89%), and 10 = A+ (90-100%).

Course positive and negative affect (dependent variables). A 9-item questionnaire was used to measure positive and negative affect (Emmons, 1992). Participants indicated the extent to which they felt a certain way over the past two weeks in the referred course on a scale from 1 (*Not at all*) to 7 (*Totally*). Four adjectives measured positive affect (e.g., happy, joyful) and five adjectives measured negative affect (e.g., frustrated, worried/anxious). In this study, the reliability of this questionnaire was excellent for positive affect (within-person $\alpha = .94$; between-person $\alpha = .95$) and very good for negative affect (within-person $\alpha = .88$; between-person $\alpha = .91$).

Plan of Analyses

The analyses were conducted in M*plus* version 8 (Muthén & Muthén, 1998–2017). We used Multilevel Structural Equation Modeling (MSEM; see Preacher et al., 2010) to test our hypothesized mediation model at each level of analysis. In MSEM, the within-person variables are implicitly group-mean centered (Preacher et al., 2010). The full information maximum likelihood (FIML) was used to handle missing data and the robust maximum likelihood estimator (MLR) was used to obtain robust standard errors and chi-square test statistics correcting for non-normality. All paths were treated as fixed effects, because random effects are computationally demanding for such a complex model and would lead to errors in model estimation.[1] Multiple fit indices were used, namely the chi-square (χ^2), CFI, TLI, RMSEA, and SRMR (the last one

includes a value at each level of analysis). Nested models were compared with a scaled chi-square difference test (Satorra & Bentler, 2010) using an online calculator (http://www.thestatisticalmind.com/calculators/SBChiSquareDifferenceTest.htm).

Results

Preliminary Analyses

When we examined our initial sample of 378 university students, we found that 12 participants did not complete any of the relevant questionnaires for this study and we thus removed them for the analyses. We then examined whether the sample included potential outliers. At the within-person level, we calculated the within-person correlations between all the variables of interest for each participant. Each participant could have up to 15 within-person correlations, which were then transformed into z-scores. At the between-person level, the average scores of each variable were also transformed into z-scores. Participants were considered to be potential outliers at each level of analysis if the two following conditions were met: (a) they had a z-score above 3 or below -3 and (b) they were clearly apart from the rest of the sample based on a visual inspection of the distribution. Furthermore, participants could be considered as potential multivariate outliers at the between-person level if their computed score of Mahalanobis distance was higher than the critical value (χ^2 (6) = 22.46, $p < .001$). Based on these screening methods, we found no outliers at the within-person level and seven outliers at the between-person level. We conducted the analyses with the outliers (n = 366) and without the outliers (n = 359) and we found that some parameters changed considerably once the outliers were removed. Therefore, we decided to exclude the seven outliers for the analyses and our final sample included 359 university students.

Descriptive statistics and bivariate correlations can be found in Table 3.1. Of particular interest, we found substantial within-person variability for all the variables in this study (i.e.,

between 34% and 76%). In other words, all the variables fluctuated considerably across the courses that the students were taking during the semester, which indicated the relevance of using a multilevel framework to test our hypotheses.

We conducted a step-by-step model building approach to determine the model that would provide the best fit to the data while also being the most parsimonious (see Table 3.2 for the fit indices of each model). In Model 1, procrastination was assumed to be a full mediator of the relations between the two dimensions of motivation and academic outcomes. None of the direct effects were thus estimated at both levels of analysis. All the fit indices of this first model were poor and unacceptable. In Model 2, procrastination was assumed to be a full mediator at the between-person level, but a partial mediator at the within-person level. That is, all the direct effects were added at the within-person level only. The scaled chi-square difference test revealed that Model 2 provided a better fit to the data compared to Model 1. However, the fit indices of the second model remained unsatisfactory for the most part. All the within-person direct effects were significant and were thus kept in the next model. In Model 3, procrastination was assumed to be a partial mediator at both levels of analysis. In other words, all the direct effects were also added at the between-person level. The scaled chi-square difference test showed that Model 3 provided a better fit than Model 2. However, the third model was fully saturated (i.e., zero degree of freedom). Two between-person direct effects were found to be non-significant, namely the relation between controlled motivation and positive affect and the relation between autonomous motivation and negative affect. These two direct effects were removed in the fourth model. The scaled chi-square difference test indicated that Model 4 did not significantly differ from Model 3. Nevertheless, the fit indices of Model 4 were excellent and this model was more parsimonious than Model 3. Therefore, Model 4 was chosen as the final model.

Main Analyses

The unstandardized parameter estimates of the final model at both levels of analysis are illustrated in Figure 3.2. The total, direct, and indirect effects are shown in Table 3.3.

Between-person findings. Autonomous motivation was associated with higher grades and positive affect. By contrast, controlled motivation was associated with lower grades and higher negative affect. Procrastination did not significantly mediate the relations between autonomous motivation and any of the outcomes. However, procrastination was a significant mediator of the relations between controlled motivation and two of the outcomes (i.e., grades and negative affect). Students who experienced more controlled motivation than others were more likely to procrastinate more than others. In turn, students who procrastinated more than their counterparts were more likely to get worse grades and experience more negative affect than their counterparts.

Within-person findings. Autonomous motivation was associated with marginally higher grades, higher positive affect, and lower negative affect. Conversely, controlled motivation was associated with lower grades, lower positive affect, and higher negative affect. Procrastination did not significantly mediate the relations between controlled motivation and any of the outcomes. However, procrastination was a significant mediator of the relations between autonomous motivation and all the outcomes. In the courses in which students experienced less autonomous motivation than their own average, they were more likely to procrastinate more than their own average. In turn, in the courses in which students procrastinated more than their own average, they were more likely to get worse grades and experience less positive affect and more negative affect than their own average.

Discussion

The current study was designed to take into consideration that procrastination fluctuates not only from one university student to another (i.e., between-person level), but also across the courses that each student is taking during a semester (i.e., within-person level). With the goal of also investigating its nomological network, we proposed that procrastination could mediate the influence of two dimensions of motivation (i.e., autonomous and controlled) on academic achievement (i.e., grades) and well-being (i.e., positive and negative affect) at both levels of analysis. Our main finding was that the antecedent of procrastination differed across levels of analysis. On the one hand, procrastination was negatively associated with *between-person* differences in achievement and well-being because some students experienced more controlled motivation than others. On the other hand, procrastination was negatively associated with *within-person* differences in achievement and well-being because students experienced less autonomous motivation in some courses compared to others. Overall, our results showcase that rich insights can be gained by looking at procrastination and its nomological network through the lens of a multilevel perspective.

Expanding the Multilevel Perspective on Procrastination

The most consistent finding at both levels of analysis was that procrastination was negatively associated with academic achievement and well-being. More precisely, higher procrastination was related to lower grades and more negative affect at both levels, while also being related to less positive affect at the within-person level. These findings are consistent with the recent multilevel study of Kljajic and Gaudreau (2018) which has shown a negative relation between procrastination and grades across students (i.e., between-person level) and across the courses taken by each student (i.e., within-person level). Our results also corroborate meta-analytical findings at the between-person level showing that procrastination relates to lower

academic achievement, more psychological maladjustment (Steel, 2007; van Eerde, 2003), and more negative affect (Sirois et al., 2019). Although the outcomes of procrastination are comparable at both levels of analysis, the conceptual meaning and implications of our results differ at each level. If we refer to the fictional example presented in the introduction, Sam – who has a low score of general procrastination – would probably have a better average grade and experience less negative affect than their counterparts who procrastinate more. Yet, because Sam procrastinates more in Biology compared to their other courses, we would expect Sam to have a lower grade and experience less positive affect and more negative affect in Biology compared to their other courses. Overall, these results highlight that although students like Sam probably do not struggle as much as their counterparts with their procrastination, they are still at risk of experiencing negative outcomes in the courses in which they procrastinate more.

Based on these findings, we might wonder how to help students who struggle with their procrastination in different ways. First, what are some ideas that could potentially help students who – unlike Sam – tend to procrastinate a lot in general? At the between-person level, we found that students with high controlled motivation tend to procrastinate more, which is consistent with results found in past studies (e.g., Mih, 2013; Mouratidis et al., 2018; Vansteenkiste et al., 2009). Thus, if a student procrastinates more than students procrastinate on average, our finding suggests that decreasing controlled motivation (rather than increasing autonomous motivation) would potentially be a good way to reduce their procrastination. It is possible that students who experience high controlled motivation in university feel an external pressure from significant others to be enrolled in a program of study or at an academic institution that is not closely aligned with their own values, interests, and priorities. As such, these students may have enrolled in a program or at an institution that would not have been their personal choice. Furthermore,

they may believe that they do not have the required skills to succeed in this program or they might not feel connected to their colleagues in the program. Understanding how basic psychological needs according to SDT (i.e., autonomy, competence, and relatedness; e.g., Ryan & Deci, 2000) are associated with procrastination via controlled motivation could provide some important insights to eventually develop interventions that could help students who generally procrastinate across all of their courses.

Second, what are some ideas that could potentially help students who – like Sam – procrastinate more in some specific courses? At the within-person level, we found that students tend to procrastinate more than their own average in the courses in which they have lower autonomous motivation. Therefore, if a student procrastinates more in a course compared to their own average, our finding suggests that increasing autonomous motivation (rather than decreasing controlled motivation) could be a good way to reduce their procrastination in that course. An avenue that may increase autonomous motivation in the classroom would be for professors to use teaching strategies that support autonomy (Reeve & Jang, 2006), such as giving options to students whenever possible (e.g., evaluation methods, topic of the term paper), explaining why a given academic project that may seem uninteresting is relevant and important for their career, and encouraging an active learning process by creating small discussion groups and asking the students to discuss and summarize a course topic (e.g., Kusurkar et al., 2011). Alternatively, students could perhaps benefit from personal strategies to increase their autonomous motivation outside of the classroom. For example, in a course in which a student has low autonomous motivation, they could write a short paragraph explaining why they believe the topic of a book chapter is relevant to their life or useful for them before they start studying it (e.g., Canning et al., 2018; Hulleman et al., 2010). Such strategies would be especially important in compulsory

courses that students are required to take to graduate, compared to elective courses that are selected by choice. All of these strategies could potentially increase the autonomous motivation of a student in a given course. However, we do not know yet whether such strategies could also reduce the procrastination of a student in that course. In future studies, randomized field trials could be designed to assess the extent to which course autonomy-supportive strategies – both inside and outside the classroom – could increase course autonomous motivation and, in turn, reduce course procrastination.

On a final note, we might wonder if students with high levels of average academic procrastination may benefit from focusing on reducing their procrastination in a specific course. In some cases, reducing the general academic procrastination by reducing the controlled motivation of these students may not be a realistic option. For example, if they have already invested a significant amount of resources in their education, some students may feel that they do not have the luxury to change their program or academic institution. Could these students still benefit from attempting to reduce their procrastination in a given course? On the one hand, intervening at such a contextual level may not be enough to reduce the general academic procrastination of a student who already procrastinates a lot in school. On the other hand, having at least one course in which a student experiences more autonomous motivation and less procrastination may spillover to positively influence their experiences in other courses or potentially even encourage the student to decrease their procrastination in general. After all, courses are not completely independent of each other; they coexist within a same timeframe (i.e., academic semester). Our findings offer novel insights to inspire future randomized field trials to determine whether attempting to decrease procrastination in a course can influence other courses or the general academic procrastination of a student.

Limitations and Future Directions

An unexpected finding in this research was that autonomous motivation was not significantly correlated to procrastination at the between-person level (r = .02). This finding stands apart from a few past studies which have found a moderate negative correlation between autonomous motivation and procrastination (r = -.40 to -.50; Katz et al., 2014; Mouratidis et al., 2018; Vansteenkiste et al., 2009; for an exception, see Mih, 2013). This difference in the results can potentially be due to the way that the variables have been measured. In past studies, the variables have been measured with a single questionnaire assessing the general experience of students in a given task such as studying (Mouratidis et al., 2018; Vansteenkiste et al., 2009; Study 1) or doing homework (Katz et al., 2014) or the experience in a given course (Vansteenkiste et al., 2009; Study 2). In our study, motivation and procrastination at the between-person level are instead a combination of the experiences across all courses taken by each student. When students complete a general questionnaire, it is unlikely that they use a mental algorithm to calculate their average experience across all their courses. Instead, their assessment might even be partially biased by a course in which they have a strong positive or negative experience. In future research, we would thus encourage researchers to measure the variables at the between-person level both with a general questionnaire and a summation of experiences across courses to determine whether methodology has a significant influence on the results.

Another finding that would merit further attention is the association between controlled motivation and academic achievement. In our study, we found a significant small-to-moderate negative correlation between these two variables at the between-person level. Although this finding was expected, it does not explain why past empirical evidence on the association

between controlled motivation and academic achievement has been inconclusive. To allow us to partially speculate on this topic, we have examined two past studies that have used the same questionnaire of academic motivation and the same measure of objective academic achievement that we used in our study. Both previous studies have shown a non-significant correlation between controlled motivation and academic achievement (Gareau et al., 2019; Gareau & Gaudreau, 2017). One of the possible reasons why our finding differs from the results of these two studies might be because our instructions in the motivation questionnaire are not the same. In our study, participants were asked why they are enrolled in each of their courses whereas, in the two previous studies, participants were asked why they pursue academic activities. When thinking about academic activities in general, students might not only think about their experience in their courses, but also about their general experience on campus (e.g., involvement in student associations, recreational or competitive sports). Alternatively, they may think only about their courses, but their way of "averaging" their motivation might not be the same as when we compute their motivation score across all their courses. Future research could randomize participants in different groups that use the same motivation questionnaire, but with slightly different instructions, to determine whether this experimental manipulation has an influence on students' responses and ultimately, on the correlation between controlled motivation and academic achievement.

In our study, we proposed that procrastination would influence affect. Accordingly, participants were asked to report their course procrastination in general during the semester and their course affect only during the last two weeks. Our reasoning was that participants were likely to think about procrastination episodes that occurred before the assessment of their affect. However, the procrastination episodes could have occurred at the same time and even after their

reported affect. For example, an academic task that was perceived as being unclear and uninteresting could have increased the negative affect of a student (e.g., unhappy, frustrated) and, in turn, that student would have been more likely to procrastinate (see Sirois & Pychyl, 2013). Although future studies are needed, untangling the complex bidirectional relations between procrastination and affect may prove to be especially difficult because students experience many fluctuations in procrastination and affect within a short time span (see Pychyl et al., 2000). Nonetheless, our multilevel perspective offers a useful framework to inspire future studies using experience sampling methods. Participants could complete short questionnaires measuring affect and procrastination multiple times during the day (level 1) for several consecutive days (level 2) in the lives of each student (level 3). We could then properly estimate whether previous affect influences subsequent procrastination, whether previous procrastination influences subsequent affect, or both.

We found a noteworthy difference in direction of the correlation between positive and negative affect when comparing the two levels of analysis. At first glance, these findings may seem contradictory. However, this is not a novel finding (e.g., Dunkley et al., 2014; Rush & Hofer, 2014) and previous theories and research have already proposed explanations for this phenomenon (Russell & Carroll, 1999). On the one hand, the correlation is *negative* at the within-person level. In the courses in which students experience more positive affect (e.g., happy, joyful) than their own average, they also tend to experience less negative affect (e.g., frustrated, worried/anxious). We could thus suggest that university students are unlikely to simultaneously experience strong positive and negative affect in the same course within a moderate time frame of two weeks. On the other hand, the correlation is *positive* at the between-person level. Students who experience more academic positive affect also tend to experience

more academic negative affect than other students. In their broader academic lives (across all of their courses), students are more likely to experience a wider range of affect-inducing events likely to produce both positive and negative emotions (see Folkman & Moskowitz, 2000). Overall, these findings illustrate why a multilevel perspective can be useful to uncover associations likely to differ across levels of analysis.

Most variables in this study were measured at the same time, except for grades which were obtained at the end of the semester. Despite the limitations of a cross-sectional design, this type of design is wise to use as a time-efficient and cost-effective way of answering questions in a new research program (Spector, 2019). In our study, we first needed to establish whether the variables of interest were significantly related – especially at the within-person level – before proposing more complex designs (e.g., longitudinal, experimental). Although we have proposed a theoretically-sound mediational model and we want to encourage researchers to replicate this study, we also recognize that focusing mostly on cross-sectional associations is limitative and does not allow us to infer causality. Future studies could thus come up with more robust designs that could rule out alternative explanations (e.g., adding control variables such as goal setting) or even potentially infer causality. For example, researchers could teach students some strategies to increase their autonomous motivation and then examine whether in the courses in which students use these strategies more often at the beginning of the semester, they are less likely to procrastinate later in the semester.

One of the main goals of this study was to examine the antecedents and outcomes of procrastination, which is why procrastination is the only mediator in this model. However, given that motivation implies moving *toward* an academic task (Ryan & Deci, 2000) rather than *away* from an academic task like in procrastination, the model could have benefited from adding

mediators that imply moving toward an academic task, such as resource management strategies (e.g., time and study environment, effort regulation; see Credé & Phillips, 2011). Therefore, adding other relevant mediators in this multilevel model could be an interesting expansion for future research. Another way to expand the model would be to not only measure personal antecedents (e.g., course motivation), but also contextual antecedents (e.g., course climate, course content) that could influence achievement and well-being via procrastination. Alternatively, researchers could simply examine whether the mediating paths found in this study could also be found with other samples, like high school students or graduate students. By having a better understanding of this multilevel model across various samples, it would be easier to propose and tailor future interventions to reduce procrastination both at a student level and at a course level.

Conclusion

In this multilevel study, we found that some students procrastinate more than others (i.e., between-person level) and that students procrastinate more in some courses than in others (i.e., within-person level). In both cases, procrastination was significantly related to lower academic achievement and well-being. However, the antecedents of procrastination were not the same at each level of analysis. This finding suggests that applied psychologists attempting to reduce procrastination would benefit from determining the level at which they want to intervene. If the goal is to reduce the general academic procrastination of a student (compared to other students), it seems preferable to reduce controlled motivation toward school in general. If the goal is to reduce procrastination in a given course (compared to one's own average), it seems preferable to increase autonomous motivation toward that course specifically. Future research will be needed to determine the optimal format and content of potential intervention programs to reduce

procrastination at each level. Overall, our study demonstrated that a new understanding of academic procrastination can be gained by examining it from a multilevel perspective.

Footnote

[1] Parameter estimates with fixed vs. random effects were compared using traditional multilevel modeling. The first model examined the relations from the two types of motivation to procrastination. The second model examined the relations from the two types of motivation and procrastination to the three outcomes. All the compared parameter estimates were very similar. Only the association between controlled motivation and grades was noticeably different in a model with fixed effects (B = -0.248, 95% CI = -0.469, -0.027, p = .028) vs. random effects (B = -0.202, 95% CI = -0.425, 0.022, p = .077). Although the statistical significance of this association changes from one model to another, the effect sizes are comparable. Furthermore, the association between controlled motivation and grades is not a central link in our mediation model and we have no evidence that this small change in effect size affects the rest of the model in significant ways. Overall, we believe that these sensitivity analyses suggest that our final results are most likely not affected in important ways by the absence of random effects in our MSEM model.

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Table 3.1

Descriptive Statistics and Bivariate Correlations at Each Level of Analysis

	M [a]	*SD* [a]	*SD* [b]	1 – ICC	1	2	3	4	5	6
1. Autonomous motivation	3.10	0.90	1.06	.58	–	.06*	-.24*	.11*	.59*	-.26*
2. Controlled motivation	1.59	0.81	0.59	.34	.34*	–	.04	-.09*	-.10*	.16*
3. Procrastination	2.56	0.86	0.77	.44	.02	.24*	–	-.24*	-.34*	.35*
4. Grades	6.55	1.86	1.64	.44	.08	-.21*	-.38*	–	.30*	-.36*
5. Positive affect	3.40	0.74	1.33	.76	.60*	.22*	.00	.03	–	-.52*
6. Negative affect	2.60	0.77	1.10	.67	.26*	.51*	.33*	-.21*	.26*	–

Note. *$p < .05$. Within-person $N = 1668$ courses. Between-person $N = 359$ students. Between-person correlations are below the diagonal and within-person correlations are above the diagonal. ICC: intra-class correlation. 1 – ICC: the amount of within-person variance. [a] Between-person level. [b] Within-person level.

Table 3.2

Fit Indices and Comparisons of the Tested Models

	χ^2	*df*	CFI	TLI	RMSEA	SRMR $_{within}$	SRMR $_{between}$	Contrast	Δdf	$\Delta\chi^2$
Model 1	663.719*	12	.514	-.216	.180	.123	.178			
Model 2	139.724*	6	.900	.501	.116	.009	.179	1 vs. 2	6	470.846*
Model 3	0	0	1.000	1.000	.000	.000	.000	2 vs. 3	6	139.724*
Model 4	3.255	2	.999	.986	.019	.002	.030	3 vs. 4	2	3.255

Note. * $p < .05$. Model 1: None of the direct effects was estimated at both levels of analysis. Model 2: Direct effects were estimated at the within-person level only. Model 3: Direct effects were estimated at both levels of analysis. Model 4: Direct effects were estimated at both levels of analysis except for two non-significant direct effects at the between-person level.

Table 3.3

Unstandardized Estimates and Confidence Intervals of the Total, Direct, and Indirect Effects at Each Level of Analysis

	Total effect		Direct effect		Indirect effect	
	B	95% CI	*B*	95% CI	*B*	95% CI
Between-person level						
Autonomous motivation to grades	0.416*	[0.057, 0.776]	0.335*	[0.022, 0.649]	0.055	[-0.045, 0.155]
Controlled motivation to grades	-0.630*	[-0.982, -0.279]	-0.427*	[-0.780, -0.074]	-0.206*	[-0.325, -0.086]
Autonomous motivation to positive affect	0.499*	[0.395, 0.602]	0.499*	[0.395, 0.604]	0.001	[-0.008, 0.010]
Controlled motivation to positive affect	0[a]		0[a]		-0.003	[-0.035, 0.029]
Autonomous motivation to negative affect	0[a]		0[a]		-0.015	[-0.042, 0.012]
Controlled motivation to negative affect	0.485*	[0.365, 0.605]	0.436*	[0.310, 0.561]	0.056*	[0.017, 0.094]
Within-person level						
Autonomous motivation to grades	0.173*	[0.077, 0.269]	0.088†	[-0.004, 0.179]	0.082*	[0.049, 0.115]
Controlled motivation to grades	-0.274*	[-0.474, -0.073]	-0.234*	[-0.429, -0.039]	-0.034	[-0.077, 0.010]
Autonomous motivation to positive affect	0.743*	[0.678, 0.807]	0.683*	[0.618, 0.747]	0.060*	[0.037, 0.082]
Controlled motivation to positive affect	-0.315*	[-0.405, -0.225]	-0.290*	[-0.380, -0.199]	-0.024	[-0.055, 0.006]
Autonomous motivation to negative affect	-0.276*	[-0.340, -0.213]	-0.202*	[-0.262, -0.142]	-0.073*	[-0.100, -0.047]
Controlled motivation to negative affect	0.338*	[0.212, 0.465]	0.307*	[0.193, 0.422]	0.030	[-0.009, 0.069]

Note. * $p < .05$. † $p < .10$. All indirect effects were tested via procrastination. [a] The total/direct effect was fixed at zero.

Figure 3.1

Hypothesized Multilevel Mediation Model

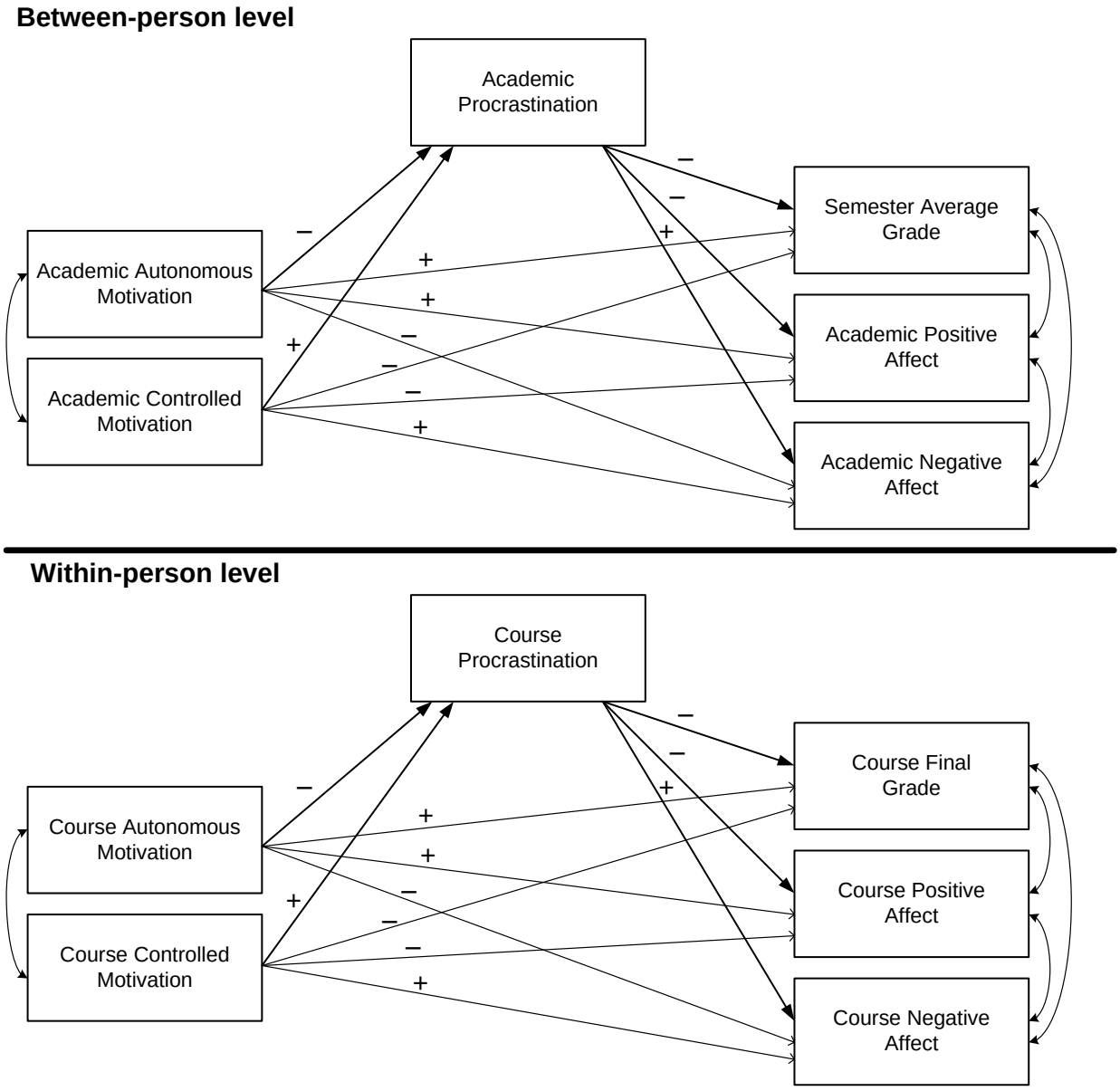
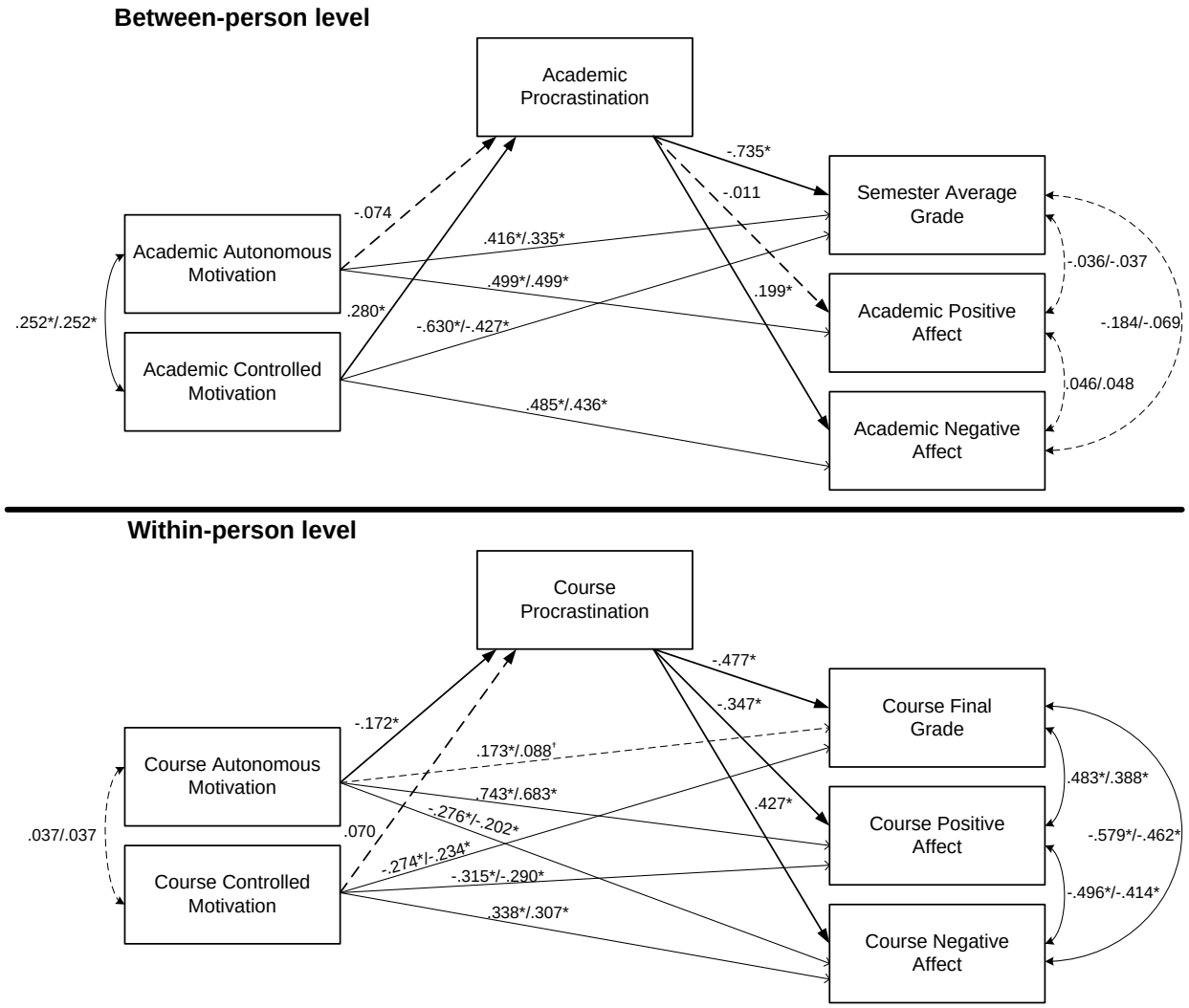


Figure 3.2

Unstandardized Parameter Estimates at Each Level of Analysis



Note. * $p < .05$. † $p < .10$. Full lines represent significant relations; dashed lines represent non-significant or marginally significant relations. The value at the left of the slash is the estimate in the total effect model; the value at the right of the slash is the estimate in the direct effect model.

CHAPTER 4

ARTICLE 3

Beyond the Academic Experience: A Multilevel Perspective on Students' Procrastination across Their Life Domains

Beyond the Academic Experience: A Multilevel Perspective on Students' Procrastination across Their Life Domains

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Abstract

University students juggle multiple life domains, such as education, career, family, friends, and community. In our multilevel study, we examined the antecedents of achievement and affective outcomes not only by using the traditional approach of comparing students to one another (i.e., between-person level) but also by using a relatively novel approach of comparing the life domains in which the students are invested (i.e., within-person level). Specifically, we used a multilevel design to test whether motivational variables (i.e., autonomous and controlled motivation) influence four outcomes (i.e., self-actual-to-ideal proximity, goal progress, positive affect, and negative affect) and we tested for the mediating role of procrastination to explain these associations. A sample of 330 university students reported all the domains in which they were invested from a list of 12 life domains (M = 7.09) and completed repeated self-reported questionnaires in each of these domains. We used multilevel structural equation modeling to test our hypotheses. At the within-person level, we found that lower autonomous and higher controlled motivation were related to worse achievement and affective outcomes via higher procrastination, thus supporting our hypotheses. At the between-person level, we found that only higher controlled motivation was related to higher procrastination which, in turn, was related to more negative affect and, unexpectedly, more goal progress. Taken together, our results emphasize the importance of distinguishing and comparing two levels of analysis to better understand the experience of university students across their life domains.

Keywords: multilevel modeling; self-determination theory; procrastination; goal progress; affect

Beyond the Academic Experience: A Multilevel Perspective on Students' Procrastination across Their Life Domains

University students lead busy lives as they try to make room for many responsibilities and activities across various life domains that are important to them (Schraw et al., 2007). On any given week, students may plan to study for an exam, cook healthy meals, make a budget for groceries, call their parents, attend a friend's birthday party, and participate in a sport recreationally. Although being invested in multiple life domains is the norm, the experience of each person can vary quite significantly. For example, some students may make more progress in their goals and have better emotional experiences in general in their life domains than other students. Yet, even students who generally manage their life domains well (e.g., school, interpersonal relationships) might experience difficulties in some specific domains (e.g., health).

In this study, we proposed a multilevel framework to better understand why *some students* experience more success and better emotional well-being in general in their life domains than other students (i.e., between-person level) and why students experience more success and better emotional well-being in *some life domains* than in others (i.e., within-person level). Inspired by findings from past research (e.g., Howard et al., 2021; Koestner et al., 2008), we hypothesized that the reasons why students are involved in their life domains (i.e., autonomous and controlled motivation) should relate to indicators of achievement (e.g., goal progress) and emotional well-being (i.e., positive and negative affect). Furthermore, based on theoretical propositions and empirical evidence (e.g., Klingsieck, 2013b; Steel, 2007), we investigated whether procrastination acts as a mediator in the associations between the two dimensions of motivation and both achievement and affective outcomes.

Autonomous/Controlled Motivation and their Associations with Outcomes

The topic of motivation – involving the understanding of what moves individuals to take action – has received much theoretical and empirical attention in psychology research. Self-Determination Theory (SDT), in particular, has guided research on human motivation across multiple life domains over the last decades (e.g., Deci & Ryan, 2008, 2009; Ryan & Deci, 2000; Ryan et al., 2021). A key principle of SDT is that qualitative differences in regulatory styles (i.e., motivation types) are particularly relevant to predict many life outcomes. On the one hand, individuals can be motivated to act because the activity itself is considered inherently enjoyable and interesting (i.e., intrinsic regulation), the activity is congruent with their deep values, beliefs, and goals (i.e., integrated regulation), or the activity is accepted as being personally important (i.e., identified regulation). *Autonomous motivation* – which encompasses intrinsic, integrated, and identified regulatory styles – implies that individuals behave according to their own choice and will. On the other hand, individuals may be motivated to act because of internal pressures, such as avoiding shame and guilt or experiencing self-worth and pride (i.e., introjected regulation) or because of external pressures, such as satisfying the expectations of other people, avoiding a punishment, or obtaining a reward (i.e., external regulation). *Controlled motivation* – which encompasses introjected and external regulatory styles – implies that individuals behave according to internal/external pressures or demands that come from people other than oneself. According to SDT, multiple adaptive outcomes (e.g., perseverance, achievement, and well-being) would be positively influenced by autonomous motivation and negatively or non-significantly influenced by controlled motivation (see Deci & Ryan, 2008; Vallerand et al., 2008). Overall, the theoretical principles of human motivation from the perspective of SDT highlight the heuristic value and importance of distinguishing the two dimensions of motivation as they, more often than not, differentially relate to processes and outcomes.

Motivation has been proposed as a key variable to increase our understanding of goal pursuit (Powers et al., 2007). Individuals with high autonomous motivation – driven by more self-determined motives, such as perceiving a goal as enjoyable or important – are expected to be more likely to make progress and attain their goals. Two meta-analyses (Gaudreau et al., 2012; Koestner et al., 2008) have indeed shown that autonomous motivation is significantly and positively related to goal progress (r = .14 to .37). Likewise, research conducted with university students in academic (Gaudreau et al., 2012; Gillet et al., 2014; Koletzko et al., 2015), sports (Gaudreau & Braaten, 2016), or various life settings (Holding et al., 2017; Hortop et al., 2013; Levine et al., 2021) have found positive correlations between autonomous motivation and goal progress. Individuals with high controlled motivation, however, might experience more conflict in the pursuit of their goals. Although these individuals are motivated to take action, their motivation stems from internal or external pressures which are considered less self-determined. Such pressures may result in ambivalent engagement whereby the person fails to fully internalize and sustainably commit to the pursuit of their goal. Controlled motivation may provide some impetus to act without energizing long-term commitment, and thus would fail to have a clear positive or negative influence on the progress and attainment of goals. As such, meta-analytical findings have indicated that controlled motivation is not significantly related to goal progress (r = -.18 to .08; Gaudreau et al., 2012; Koestner et al., 2008). Similarly, studies with university students did not find significant correlations between these two variables (e.g., Holding et al., 2017; Hortop et al., 2013; Koletzko et al., 2015), although a few studies have indicated a significant negative correlation (Gaudreau et al., 2012) or a significant positive correlation (e.g., Gillet et al., 2014). Overall, although controlled motivation has a somewhat ambiguous influence

on goal progress, research shows more evidently that autonomous motivation generally increases the likelihood of making progress and attaining goals.

The two dimensions of motivation are also expected to play distinct roles on the affective outcomes of individuals (Ryan & Deci, 2000). The idea is that doing activities mostly out of volition (i.e., autonomous motivation) would more likely lead to greater emotional well-being. By contrast, doing activities mostly because of internal pressures or demands from other people (i.e., controlled motivation) would more likely be associated with worse emotional well-being. A considerable number of studies adopting different methodological approaches have examined the relations between these variables with students. Some studies with university students have examined whether autonomous and controlled motivation were related to affect in specific domains, namely school (Bonneville-Roussy et al., 2017; Gillet et al., 2014; King & Ganotice, 2015; Michou et al., 2014), sports (Gaudreau & Braaten, 2016), and interpersonal relationships (Chen et al., 2021; Gravel et al., 2020). Other studies have examined these associations across multiple domains or life in general (Hortop et al., 2013; Levine et al., 2021; Marcinko, 2015; Sanjuán & Ávila, 2019). Recently, the associations between four motivational regulatory styles and affect in the academic domain were summarized in a meta-analysis (Howard et al., 2021). Despite methodological differences across these studies, the results were generally consistent. For the most part, autonomous motivation or its indicators (i.e., intrinsic and identified regulations) were significantly positively correlated to positive affect and negatively or non-significantly correlated to negative affect. Conversely, controlled motivation or its indicators (i.e., introjected and external regulations) were significantly positively correlated to negative affect and generally non-significantly or inconclusively correlated to positive affect. Taken together, these findings suggest that autonomous motivation would be beneficial to the emotional

well-being of students (mostly due to an increase in positive affect), whereas controlled motivation would be detrimental to their emotional well-being (mostly due to an increase in negative affect).

Making progress on multiple goals can be particularly challenging (e.g., Neal et al., 2017). Furthermore, managing multiple life domains is a source of stress for many university students (Hurst et al., 2013). If university students have difficulty moving toward their goals and they experience worse emotional well-being in some life domains, it could potentially be explained by more than having low autonomous motivation or high controlled motivation. When students pursue goals across multiple domains, they need to properly manage finite resources, such as time (Kaftan & Freund, 2018). Individuals who have issues with managing their time are likely to procrastinate (e.g., Schouwenburg, 2004) by putting off an intended course of action even though they are aware that the delay will probably lead to negative consequences (Steel, 2007). In this study, we suggested that procrastination acts as a mediator that could explain how two dimensions of motivation are differentially associated with achievement and affective outcomes.

Procrastination and its Associations with Motivation and Outcomes

Motivation – through the lens of SDT – has been considered as one of the main approaches that can be used to explain procrastination (Klingsieck, 2013b). According to this perspective, the irrational delay of tasks is *less* likely to occur if individuals perceive those tasks as inherently interesting, congruent with their values, or personally important (i.e., autonomous motivation) and *more* likely to occur if they put pressure on themselves or perceive pressure from others to accomplish those tasks (i.e., controlled motivation). Research on this topic – conducted in the school (Mih, 2013; Mih & Mih, 2016; Mouratidis et al., 2018; Vansteenkiste et al., 2009), work (van den Hee et al., 2020), and health domains (Powers et al., 2007) – has

generally supported these propositions. More specifically, studies have mostly found that autonomous and controlled motivation were significantly negatively and positively correlated to procrastination, respectively. Therefore, procrastination seems more likely to happen when individuals experience low autonomous motivation or high controlled motivation.

Procrastination is considered to be an obstacle that can interfere with making progress and attaining important goals (Krause & Freund, 2014; Schweiger Gallo et al., 2013). When individuals procrastinate, they seem to be derailed by distractions in the present (e.g., spending time on social media) instead of focusing on the pursuit of their long-term goals (e.g., finding a job; Sirois & Pychyl, 2013). Thus far, only a few studies have examined this association in the academic (Mühlberger & Traut-Mattausch, 2015; Wäschle et al., 2014), work (Pierro et al., 2011), and health domains (Powers et al., 2007). Most of these studies have found a negative and sometimes significant correlation between procrastination and goal progress or attainment (for an exception, see Mühlberger & Traut-Mattausch, 2015). These results, however, should be cautiously interpreted because two studies have used an experimental design in which some variables have been manipulated (Mühlberger & Traut-Mattausch, 2015; Powers et al., 2007) and such a design may have influenced the strength of the correlation between procrastination and goal progress. Furthermore, one study measured procrastination a few months after the measure of goal attainment was originally taken (Pierro et al., 2011), which means that this study was designed to look at the influence of goal attainment on procrastination, instead of the other direction. Although additional research is needed to improve our understanding of the association between procrastination and goal progress, these preliminary findings at least generally suggest a negative correlation between those two variables.

Procrastination is expected to be associated with worse emotional well-being. When procrastinating, students often choose to do alternative activities that are considered more appealing (e.g., more pleasant and less difficult) than the task they should be doing (Pychyl et al., 2000). However, as time becomes more limited to accomplish the avoided task (often resulting in time pressure or urgency), individuals who procrastinate are more likely to experience elevated and frequent bouts of negative affective outcomes (e.g., more anxiety; Pychyl & Sirois, 2016). Meta-analytical findings with 8 samples of community participants and/or students have shown that procrastination is significantly related to less positive affect (r = -.29) and more negative affect (r = .31; Sirois et al., 2019). Furthermore, some recent studies conducted with university students have measured procrastination in the academic (Blouin-Hudon & Pychyl, 2015; Moon et al., 2020) and work-related contexts (Turban et al., 2013), while other studies have examined it across multiple contexts or in general (e.g., Balkis & Duru, 2016; Choy & Cheung, 2018; Gautam et al., 2019; Martinčeková & Enright, 2020; Rebetez et al., 2016; Sirois & Giguère, 2018; Tibbett & Ferrari, 2015). Most of these studies have found that procrastination significantly correlates to less positive affect and more negative affect. Overall, research has mostly shown that procrastination is associated with worse emotional well-being, characterized by lower and higher levels of positive and negative affect, respectively.

The Present Study

In this study, we proposed that procrastination plays a mediating role to explain how autonomous and controlled motivation relate to indicators of achievement (e.g., goal progress) and emotional well-being (i.e., affect). A similar mediation model has been tested in the academic context, in which university students were asked to report their academic experiences across all the courses that they were taking during a semester (Kljajic et al., 2022). More specifically, the model was tested at the between-person level (to compare students to one

another) and at the within-person level (to compare courses taken by each student to one another). Although the associations were expected to be similar at each level of analysis, some of the results differed in significant ways. At the between-person level, only higher controlled motivation had a deleterious influence on two of the outcomes (i.e., academic achievement and negative affect) via higher procrastination. At the within-person level, only lower autonomous motivation had a deleterious influence on all the outcomes (i.e., academic achievement, positive affect, and negative affect) via higher procrastination. Kljajic et al. (2022) concluded that these differences depending on the level of analysis were noteworthy because they could potentially guide future interventions to help university students who procrastinate more in general than their counterparts (i.e., between-person level) and/or to help students when they procrastinate more in a particular aspect of their lives (i,e., within-person level).

This multilevel perspective – combined with the call to study procrastination beyond the academic domain (e.g., Klingsieck, 2013b) and an increased interest in studying it across multiple life domains (e.g., Ferrari et al., 2009; Goroshit et al., 2020; Hen & Goroshit, 2018; Klingsieck, 2013a) – inspired the development of the present study. In the present study, we asked university students to report their procrastination, motivation, goal progress, and affect in all the life domains in which they were invested. We proposed a multilevel mediation model in which procrastination was expected to mediate the associations between two dimensions of motivation (i.e., autonomous and controlled) and four outcomes (i.e., self-actual-to-ideal proximity, goal progress, positive affect, and negative affect). Given the absence of research studying such a mediation model across life domains, we hypothesized that the results would be comparable at the two levels of analysis (see Figure 4.1). Nonetheless, the results should be interpreted differently according to the level of analysis.

Interpretation when comparing students to one another (i.e., between-person level): We hypothesized that students who have less autonomous motivation and more controlled motivation than their counterparts would tend to procrastinate more. We then expected that students who procrastinate more than their counterparts would tend to experience less self-actual-to-ideal proximity, less goal progress, less positive affect, and more negative affect.

Interpretation when comparing the life domains within the same student (i.e., within-person level): We hypothesized that in the life domains in which students have less autonomous motivation and more controlled motivation than their own average, they would tend to procrastinate more. We then expected that in the life domains in which students procrastinate more than their own average, they would tend to experience less self-actual-to-ideal proximity, less goal progress, less positive affect, and more negative affect.

Method

Participants and Procedure

A sample of 330 undergraduate university students (66.1% female and 33.9% male) participated in this study. Their age ranged from 17 to 40 years (M = 19.40, SD = 2.33). They reported that they were involved in 7.09 life domains on average (SD = 2.37). More precisely, participants were involved in one (2.7%), two (1.8%), three (4.2%), four (5.2%), five (10%), six (10.6%), seven (18.2%), eight (17.6%), nine (14.2%), ten (10.9%), eleven (3.9%), or twelve (0.6%) life domains.

Participants were recruited online during the winter semester 2020 in a research participation program ran by the School of Psychology of the University of Ottawa. The study was described as a survey on the experience of students across life domains. All participants had to complete a consent form before they could participate in the study. Following a few demographic questions and general personality questionnaires, participants were randomly

assigned to complete one of 12 possible sections of the survey. All the sections had the same questionnaires, but the life domains were presented in a different order (i.e., counterbalancing).

Participants were asked to select all the domains in which they were involved from a list of 12 life domains: (a) Career (e.g., jobs, employment, earning a living), (b) Community (e.g., volunteering, political activism), (c) Education (e.g., school, studying, getting good grades), (d) Parenting (e.g., interactions with offspring or children), (e) Family (e.g., interactions with parents and siblings), (f) Finance (e.g., creating a budget, decisions about money), (g) Friends (e.g., interactions with close others), (h) Health (e.g., exercise, diet, avoiding or treating illness), (i) Leisure (e.g., sports, recreation, hobbies), (j) Romance (e.g., love, sex, dating, marriage), (k) Spirituality (e.g., religion, philosophy, the meaning of life), and (l) Self-improvement (e.g., improving oneself in terms of abilities, attitudes, behaviors). This list was based on the 12-category framework of life domains (Roese & Summerville, 2005), which has been used to a certain extent in past research on procrastination (e.g., Ferrari et al., 2009; Goroshit et al., 2020; Hen & Goroshit, 2018). The university students in our sample reported that they were involved in the following life domains: education (94.5%), friends (91.2%), family (87.9%), health (75.8%), self-improvement (71.5%), leisure (68.2%), career (53.6%), finance (47.9%), romance (46.1%), spirituality (42.1%), community (26.4%), and parenting (3.9%).[7] For each life domain, participants were first asked whether they were involved in that life domain. If their answer was "yes", they were asked to complete a set of questionnaires referring to that life domain. If their answer was "no", they were redirected to the next life domain or to the end of the survey if it was

[7] A small number of participants reported that they were not invested in the education domain (n = 18; 5.5%), which may seem surprising given that all participants were university students. A possible interpretation of this statistic is that the status of a participant as a university student does not automatically mean that they are considerably invested in the corresponding domain (e.g., education). Similarly, a student may have friends, but report that they are not invested in the corresponding domain because they are rarely in contact with those friends.

the last life domain. At the end of the survey, participants were thanked for their participation in the study and they received their compensation (i.e., one course point in the course in which they were recruited). This study was approved by the Research Ethics Board of the university.

Measures

Autonomous and controlled motivation (independent variables). We used a 10-item questionnaire (Gareau & Gaudreau, 2017) to measure motivation in each life domain. Participants were instructed to indicate the degree to which each item corresponded to a reason why they were involved in the referred life domain on a scale from 1 (*not at all for this reason*) to 7 (*totally for this reason*). The items represented five regulatory styles according to SDT: intrinsic (e.g., "Because I truly love it"; two items), integrated (e.g., "It clearly defines me as a person"; two items), identified (e.g., "I feel that it is important for me"; two items), introjected (e.g., "Otherwise, I would feel guilty"; two items), and external (e.g., "I feel that others are pushing me to do it"; two items). Autonomous motivation was computed by averaging intrinsic, integrated, and identified regulatory styles (within-person $\alpha = .77$, between-person $\alpha = .94$). Controlled motivation was computed by averaging introjected and external regulatory styles (within-person $\alpha = .81$, between-person $\alpha = .95$).

Procrastination (mediator). We used a 3-item questionnaire (Kljajic et al., 2022) to assess procrastination in each life domain. Participants were first presented with a definition of procrastination based on the definition proposed by Steel (2007). They were then instructed to think about the referred life domain and rate each item (e.g., "…you procrastinate") on a scale from 1 (*not at all agree*) to 5 (*totally agree*). In this study, the internal consistency of this procrastination questionnaire was excellent (within-person $\alpha = .92$; between-person $\alpha = .95$).

Self-actual-to-ideal proximity (dependent variable). We created one item to measure the proximity to one's personal ideal in each life domain. Participants were asked to think of their behaviors and accomplishments in the referred life domain and to rate how close they feel to their personal ideal on a scale from 1 to 7. Each option on the scale had a corresponding visual analogy of two circles – one was named "me" and the other one was named "my ideal" – that gradually went from *no overlap* (i.e., score of 1) to *almost complete overlap* (i.e., score of 7).

Goal progress (dependent variable). We used three items (Carraro & Gaudreau, 2015) to measure goal progress in each life domain. Participants were asked to think about the goals that they have been pursuing in the referred life domain and to rate the items (e.g., "…you have progressed on your goals") on a scale from 1 (*not at all*) to 7 (*totally*). In our study, the internal consistency of this questionnaire was excellent at both levels of analysis (within-person $\alpha = .94$, between-person $\alpha = .97$).

Positive and negative affect (dependent variables). We used a 9-item questionnaire (Emmons, 1992) to assess affect in each life domain. Participants were asked to rate the degree to which they felt a certain way over the past two weeks during their involvement in the referred life domain on a scale from 1 (*not at all*) to 7 (*totally*). Four adjectives represented positive affect (e.g., pleased, happy) and five adjectives represented negative affect (e.g., depressed, frustrated). The reliability of this questionnaire in this study was excellent for positive affect (within-person $\alpha = .92$, between-person $\alpha = .97$) and very good for negative affect (within-person $\alpha = .85$, between-person $\alpha = .96$).

Plan of Analyses

We tested our mediation model using Multilevel Structural Equation Modeling (MSEM; see Preacher et al., 2010). The analyses were conducted in M*plus* version 8.6 (Muthén &

Muthén, 1998-2017) with the robust maximum likelihood estimator (MLR). In MSEM, the variables at Level-1 (i.e., within-person level) are group-mean centered by default (Preacher et al., 2010). Given that random effects are computationally burdensome and lead to errors, we decided to consider all paths as fixed effects. Nonetheless, we decided to perform sensitivity analyses outside of MSEM to determine whether the results were likely to differ if the paths were treated as fixed vs. random. Using traditional multilevel modeling, we examined the associations from motivation to procrastination (first model) and the associations from motivation and procrastination to the four outcomes (second model). The compared parameter estimates in both models were highly similar, which suggests that our findings are most likely not biased by the absence of random effects in the MSEM model.

We assessed whether the models fit the data well using multiple fit indexes, namely the model chi-square (MLR χ^2), the comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), and the within-person and between-person standardized root mean squared residual (SRMR). Good fit indices were .95 or higher for CFI and TLI, .06 or lower for RMSEA, and .08 or lower for SRMR (Hu & Bentler, 1999). Using an online calculator, we compared nested models with a scaled chi-square difference test (Satorra & Bentler, 2010).[8]

The sufficient sample size was determined based on a simulation study in the context of MSEM (Hox et al., 2010). Based on this simulation, when using MLR, a between-person sample size of 200 seems sufficient to perform well and produce accurate estimates. Of course, more complex models (e.g., computing random effects and estimating latent variables) can make it challenging to determine the right minimal sample size (Hox & McNeish, 2020). However, given

[8] http://www.thestatisticalmind.com/calculators/SBChiSquareDifferenceTest.htm

that our model is relatively simple (i.e., we computed fixed effects and we used observed variables) and that 200 participants is generally considered a large sample size in SEM (Kline, 2005), we believe that this sample size was adequate for the purposes of our study. Furthermore, since we decided to collect data until the end of the winter semester 2020, we ended up surpassing the required sample size.

Results

Preliminary Analyses

The initial sample included 353 university students. Among those participants, four did not complete any of the questionnaires across life domains used in this study and were thus removed for the analyses. Furthermore, nine participants were removed because they reported, at the end of the survey, that they did not answer the questions honestly. The sub-sample of 340 participants was then examined for outliers. At the within-person level, we calculated up to 21 within-person correlations per participant between all the variables of interest, which were transformed into *z*-scores. At the between-person level, we examined the univariate score of each variable, which were also transformed into *z*-scores. At each level, two conditions had to be met to consider a participant as an outlier: (a) the *z*-score had to be higher than 3 or lower than -3 and (b) the correlation or value had to be clearly apart from the rest of the sample based on a visual inspection of the distribution. We also examined multivariate outliers at the between-person level by calculating a Mahalanobis distance with all the variables of interest for each participant. A participant was considered as a multivariate outlier if their value was higher than the critical cut-off value ($\chi^2(7) = 24.322$, $p < .001$). Based on these criteria, we found 7 within-person outliers and 10 between-person outliers. We conducted the analyses with and without the outliers at each level of analysis to determine whether the findings changed in important ways (i.e., considerable changes in effect sizes or change in the interpretation of the results). We found that the results

did not change considerably when removing within-person outliers, but some estimates did change considerably when removing between-person outliers. Consequently, we decided to remove the between-person outliers only and our final sample included 330 university students.

The descriptive statistics and correlations at the within-person and between-person levels can be found in Table 4.1. Of particular interest, the findings regarding the intra-class correlation (i.e., 1 – ICC) indicate that all the variables fluctuate more at the within-person level (i.e., 58% to 79%) than at the between-person level. These results show the importance of using multilevel modeling where psychological variables are allowed to fluctuate within each person across life domains.

As shown in Table 4.2, we used a step-by-step model building approach to find a parsimonious model that would provide a good fit to the data. In the first model, we assumed that procrastination was a full mediator at both levels of analysis, which meant that the direct effects between the independent and dependent variables were not estimated. All the fit indices of this first model were very poor. In the second model, we assumed that procrastination would be a full mediator at the between-person level only. In other words, the direct effects between the independent and dependent variables were estimated at the within-person level, but not at the between-person level. The chi-square difference test revealed that the second model provided a better fit to the data than the first model. However, most fit indices were poor in the second model as well. In the third model, we assumed that procrastination was a partial mediator at both levels of analysis and all the direct effects were estimated. Although the chi-square difference test showed that the third model provided a better fit to the data than the second model, the third model did not have any degree of freedom because this model was fully saturated. In this model, we found two direct effects that were non-significant, namely the within-person association

between controlled motivation and goal progress and the between-person association between controlled motivation and self-actual-to-ideal proximity. These two relations were removed in the fourth model.[9] The chi-square difference test indicated that the third and fourth model were not significantly different from one another. Nonetheless, we decided to keep the fourth model for our final analyses because the fit indices were excellent, the model was identified (i.e., positive degrees of freedom), and the model was more parsimonious than the third model.

Main Analyses

The total, direct, and indirect effects can be found in Table 4.3. The unstandardized parameter estimates of the final model (i.e., fourth model) are shown in Figure 4.2.

Between-person effects

Higher *general autonomous motivation* was significantly related to higher general self-actual-to-ideal proximity, goal progress, and positive affect and lower general negative affect. General procrastination was not a significant mediator of the associations between autonomous motivation and any of the outcomes.

Higher *general controlled motivation* was significantly related to lower general positive affect, higher general negative affect, and marginally lower general goal progress. General procrastination was a significant mediator of the associations between controlled motivation and two of the outcomes (i.e., goal progress and negative affect). More specifically, students who had more controlled motivation than their counterparts were more likely to procrastinate. In turn, students who procrastinated more than their counterparts were more likely to experience more negative affect and, unexpectedly, *more* goal progress than students who procrastinated less.

Within-person effects

[9] In the third model, the between-person relation between controlled motivation and goal progress could be considered as marginally significant ($p < .10$). Therefore, we decided to keep this link in the fourth model

Higher *life domain autonomous motivation* was significantly related to higher life domain self-actual-to-ideal proximity, goal progress, and positive affect and lower life domain negative affect. Life domain procrastination was a significant mediator of the associations between autonomous motivation and all the outcomes. In the life domains in which students had less autonomous motivation than their own average, they were more likely to procrastinate. In turn, in the life domains in which students procrastinated more than their own average, they tended to experience less self-actual-to-ideal proximity, goal progress, and positive affect and more negative affect than their own average.

Higher *life domain controlled motivation* was significantly related to lower life domain self-actual-to-ideal proximity and positive affect and higher life domain negative affect. Life domain procrastination was a significant mediator of the associations between controlled motivation and those three outcomes. In the life domains in which students had more controlled motivation than their own average, they were more likely to procrastinate. In turn, in the life domains in which students procrastinated more than their own average, they tended to experience less self-actual-to-ideal proximity and positive affect and more negative affect than their own average.

Discussion

The main goal of this study was to examine the mediating role of procrastination in the associations between two dimensions of motivation (i.e., autonomous and controlled) and indicators of achievement (i.e., self-actual-to-ideal proximity and goal progress) and emotional well-being (i.e., positive and negative affect). The novelty of our study mainly resides in our multilevel design which allowed us to test this model by not only comparing university students to one another (i.e., between-person level) but also by comparing the life domains in which each university student is invested (i.e., within-person level). At the within-person level, the

hypothesized model was almost fully supported. That is, lower autonomous motivation and higher controlled motivation were significantly related to worse achievement and affective outcomes via higher levels of procrastination. At the between-person level, only one mediation hypothesis was supported with higher controlled motivation being significantly related to more negative affect via higher procrastination. Although procrastination was also found to be a mediator of the association between controlled motivation and goal progress, the specific relation between procrastination and goal progress was found to be significant and *positive*, which was an unexpected finding. The direct associations from motivation to outcomes, the mediating role played by procrastination, and the unforeseen positive link between procrastination and goal progress are each discussed and interpreted in the context of our multilevel design across life domains.

Two Dimensions of Motivation and their Relations to Outcomes

The most consistent finding was that autonomous motivation has a favorable influence on achievement and affective outcomes at both levels of analysis. Some university students were generally invested in their life domains for more autonomous reasons; consequently, they were generally more likely to feel closer to their personal ideal, to make more progress on their goals, to experience more positive affect, and to experience less negative affect. These results corroborate previous between-person meta-analytical findings showing that autonomous motivation or its indicators (i.e., intrinsic and identified regulation) relate to a host of desirable life outcomes (Gaudreau et al., 2012; Howard et al., 2021; Koestner et al., 2008). University students were also invested in some life domains for more autonomous reasons; in these life domains, they tended to experience more self-actual-to-ideal proximity, goal progress, and positive affect and less negative affect compared to their own average. These within-person

findings offer new insights in the SDT literature where motivation has been rarely examined across multiple life domains in a multilevel context (for exceptions, see Milyavskaya & Koestner, 2011; Vasalampi et al., 2014). Specifically, our findings show that better achievement and affective outcomes are likely to occur not only when students have more autonomous motivation in general (compared to other students), but also when they have more autonomous motivation in a life domain (compared to their other life domains).

The associations between controlled motivation and indicators of success and emotional well-being changed depending on the level of analysis. At the between-person level, controlled motivation was significantly associated with higher negative affect and marginally lower positive affect. However, controlled motivation was not related to the two indicators of achievement. These results are consistent with meta-analyses suggesting that, although controlled motivation is significantly positively related to negative affect, its associations with positive affect (Howard et al., 2021) and goal progress (Gaudreau et al., 2012; Koestner et al., 2008) tend to be non-significant or inconclusive. The absence of significant associations between controlled motivation and multiple outcomes could potentially hide moderators that cancel each other out. Controlled motivation entails a perceived social pressure and doing activities to avoid feelings, such as guilt and shame. Therefore, future studies should examine if fear of negative evaluation and cognitive factors, such as rumination, negative self-talk, or perfectionistic concerns could exacerbate the influence of controlled motivation on achievement and affective outcomes. At the within-person level, higher controlled motivation in some life domains was associated with less proximity to one's personal ideal, less positive affect, and more negative affect in those life domains. These results show that the detrimental outcomes associated with controlled motivation are more easily revealed at the within-person level, where life domains experiences are compared

to each other within the same student. In sum, future research could try to replicate and expand our findings for controlled motivation at the within-person level, while also investigating the role of potential moderators that could explain our non-significant results for controlled motivation at the between-person level.

The Mediating Role of Procrastination

The associations from autonomous motivation to indicators of achievement and well-being were partially mediated by procrastination, but only at the within-person level. In other words, our findings suggest that having lower levels of procrastination does not explain the beneficial role of autonomous motivation when comparing students to one another, but it does partially explain the beneficial role of autonomous motivation in some life domains compared to the other life domains of a student. Given the absence of mediation at the between-person level, we may have to consider the possibility that other mediators could be better suited to explain these associations. For example, in a multilevel study where academic and friendship goals were the unit of analysis (instead of life domains), the willingness to invest energy and effort in pursuing goals was positively related to autonomous motivation for pursuing goals at the within-person level and, to a certain extent, at the between-person level (Vasalampi et al., 2014). Therefore, it is possible that a behavioral mediator that focuses on *approaching* activities (e.g., effort investment) rather than *avoiding* activities (i.e., procrastination) could better explain the positive influence of autonomous motivation on outcomes at the between-person level. Future multilevel studies across life domains could thus test whether more effort investment in life domains could act alone (at the between-person level) and/or complement lower procrastination (at the within-person level) to explain the beneficial influence of autonomous motivation on achievement and affective outcomes.

The associations from controlled motivation to achievement and affective outcomes were mediated by procrastination at both levels, although the results differed in important ways when comparing the two levels of analysis. At the within-person level, the results were straightforward and consistent with our expectations. That is, in the life domains in which students had higher controlled motivation than their own average, they were more likely to procrastinate. In turn, in the life domains in which students procrastinated more than their own average, they were less likely to feel close to their personal ideal, to make progress on their goals, and to experience positive affect, and they were more likely to experience negative affect. At the between-person level, procrastination only mediated the relations between controlled motivation and two of the outcomes (i.e., goal progress and negative affect). Students with higher controlled motivation were more likely to procrastinate and, in turn, they were more likely to experience more negative affect and to experience *more* goal progress. The positive association between procrastination and goal progress was unexpected and deserves further attention.

Procrastination and Goal Progress: Some Possible Interpretations

In our study, we found that university students who procrastinate more in general than their counterparts are *more likely* to make progress on their goals than their counterparts. We found a significant between-person relation between those two variables both when we considered the bivariate correlation (r = .19) and the unstandardized parameter in the multilevel mediation model controlling for other variables (B = .21). This finding is striking for at least two reasons. First, although limited research has examined the relation between procrastination and goal progress, most studies have found a negative and sometimes significant correlation between those variables (Pierro et al., 2011; Powers et al., 2007; Wäschle et al., 2014). Second, if we consider another indicator of achievement that has received much more attention in the literature

(i.e., academic achievement), meta-analytical findings suggest that procrastination relates to lower overall performance in the academic domain (Kim & Seo, 2015; Richardson et al., 2012; Steel, 2007; van Eerde, 2003). These past studies, however, have been conducted in specific life domains (e.g., education, health). Given that our consideration of multiple life domains may have influenced the results in a unique way, we propose four different interpretations that take into account the context of our study.

The first interpretation relies on the assumption that the questionnaire about goal progress could refer to not only personal goals, but also interpersonal goals. Thinking about interpersonal goals would be even more probable in life domains that are, by nature, interpersonal (e.g., community, parenting, family, friends, and romance). In interpersonal goals, the burden of making goal progress does not solely sit on the shoulders of the participants themselves. In fact, if participants tend to procrastinate more in their life domains in general, the burden of making goal progress may be carried more by other people in their lives (e.g., friends, romantic partner, parents, siblings, colleagues, and teammates). As such, participants may procrastinate in their life domains but, at the same time, get closer to their goals if other people make important contributions to reaching those goals. Conversely, individuals who procrastinate less in their life domains may actually carry most of the burden in those life domains, which could lead them to experience less goal progress in general. Some support for this interpretation was found in a study examining small-group work in a psychology class. Specifically, academic procrastination was found to be positively correlated to academic social loafing; in other words, students who procrastinated more in school were more likely to put less effort in academic teamwork (see Ferrari & Pychyl, 2012). To test for this possibility across multiple life domains, future studies could ask participants to write their most important goal in each life domain before they answer

the questionnaire on goal progress. Researchers could then code whether the goal is personal or interpersonal and determine whether the type of goal plays a moderating role on the association between procrastination and goal progress.

The second interpretation would be that having a generally low level of procrastination across life domains may be an indicator of a tendency to pre-crastinate, which could potentially hinder goal progress in some situations. Pre-crastination (or precrastination) is a fairly new concept that refers to the tendency to speed up the completion of tasks as early as possible, even if it requires additional effort (Rosenbaum et al., 2014, 2019). Rosenbaum and colleagues suggested that keeping a goal in mind is cognitively taxing and pre-crastination would occur to reduce the burden placed on the working memory. In other words, completing a goal as soon as possible would mean that the individual has one less thing to think about. However, pre-crastination is sometimes a non-optimal approach that can even lead to errors and injuries. For example, an individual moving out of their apartment might – in an attempt to accelerate the moving – carry multiple heavy boxes at the same time and experience a painful back injury that makes it difficult for a few days or weeks to make progress in other aspects of their lives (e.g., doing physical activity, participate in social activities). Another example could be an employee who hurries to reply to emails but, in doing so, makes important mistakes, which makes it more difficult for them to get a promotion and advance in their career goal. Future qualitative studies could be conducted using semi-structured interviews to determine whether students with low general procrastination across life domains tend to do their tasks in a hurry (i.e., pre-crastinate) and to explore what are the possible positive and negative consequences of doing tasks in this manner.

The third interpretation is based on the notion that students who procrastinate more may have more room to make progress on their goals. In our study, we found that students who procrastinate more in general are marginally less likely to feel close to their personal ideal in general. How could students who procrastinate more than others make *more progress* on their goals and, at the same time, feel *less close* to their ideal? We propose that students who procrastinate may have more room to make progress on their goals. We could imagine, for example, a fictional student with a high score of procrastination (Taylor) and a fictional student with a low score of procrastination (Jordan). On the 7-point scale of closeness to one's ideal used in this study, Taylor could generally feel moderately close to their ideal (e.g., a score of 4), whereas Jordan could generally feel very close to their personal ideal (e.g., a score of 6). In such a case, Taylor has probably more options and possibilities to improve their situation, whereas Jordan is already very close to their ideal in general and may simply have less actions that can be accomplished at that point in their life to move even closer to their ideal. Accordingly, students like Taylor may make more progress on their goals and be farther away from their ideal compared to students like Jordan. Overall, this interpretation implies that students who procrastinate more have more possibilities to make progress on their goals although they may not be closer to their ideal in their life domains.

Finally, the fourth interpretation would lean toward the idea that students who procrastinate may perceive that they generally make more goal progress across their life domains because of the way that they distribute their energy and efforts over time. Findings from a qualitative study with university students who frequently procrastinate has shown that they often prioritize interpersonal relationships and work earlier in the semester and thus minimize the amount of time they spend on schoolwork in order to "safeguard their personal time" (Schraw et

al., 2007, p. 21). However, later in the semester, these university students reported that they work on their academic tasks in a few larger blocks of time instead of multiple smaller blocks of time (Schraw et al., 2007). If we extrapolate from these findings, we could suggest that students who procrastinate more in general may be more likely to be invested in each life domain in fewer larger blocks of time, whereas students who procrastinate less may tend to be invested in their life domains here and there in smaller blocks of time. If we go back to the earlier fictional example, Taylor (who procrastinates more) might devote entire weekends to go on a road trip with friends *or* studying, whereas Jordan (who procrastinates less) might find time to call friends *and* study during the same weekend. If students who procrastinate more are invested in their life domains in larger blocks of time, they may perceive that they are making more progress toward their goals in general. However, if individuals who procrastinate more have a more "all or nothing" viewpoint regarding their investment in life domains, it could mean that they tend to neglect some life domains during certain periods of time, such as health and/or social relationships (e.g., Grunschel et al., 2013; Laybourn et al., 2019; Patrzek et al., 2012) and that they tend to experience more role conflict (Senécal et al., 2003). This may explain why we also found that more procrastination in general also relates to more general negative affect. In sum, this interpretation implies that university students who procrastinate more in general may be invested in their life domains in an "all or nothing" manner, which leads them to perceive that they make more goal progress in general, but this way of managing life domains could also potentially explain why they experience more negative affect overall.

Of course, all four interpretations are speculative and future research will be needed to examine why students who procrastinate more in general also perceive that they make more goal progress in general. Regardless of the interpretation that is preferred, we believe that the positive

between-person relation between procrastination and goal progress should not be interpreted alone, because students who procrastinate more are also more likely to experience more negative affect and be marginally less close to their ideal. We should also remember that procrastination was *negatively* related to goal progress at the within-person level. In other words, in the life domains in which students procrastinated more than their own average, they were less likely to make goal progress than their own average. Therefore, procrastination has a negative influence on one's goal progress at a more personal level, which underscores the value and importance of examining the nomological network of procrastination from a multilevel perspective.

Limitations and Future Directions

We used a cross-sectional design in which all the variables were measured at the same time. To some extent, our multilevel study is comparable to intensive longitudinal studies (e.g., daily diaries) because it provides repeated measures for each participant. However, the limitation remains that we cannot infer a directionality or test alternative models (e.g., bidirectional associations), nor test for causality between our variables at both levels of analysis. A different ordering of the variables in our mediation model could be proposed and lead to a different interpretation of the findings. For example, a plausible fifth interpretation of the unexpected between-person relation between procrastination and goal progress could be that goal progress influenced procrastination. In this case, perhaps students who made more progress in general in their life domains exerted a lot of effort to accomplish their multi-domain goals. If their energy and resources were depleted, they could have become more likely to procrastinate in general. In order to test this hypothesis, a daily diary study could be conducted in which general goal progress and general procrastination would both be measured every day for multiple consecutive

days. Researchers could then test whether goal progress influences subsequent procrastination, vice versa, or both.

We tested our multilevel model with only one sample of undergraduate university students, which limits our ability to generalize these findings to other populations. Most university students – who are between 18 and 25 years of age – are in a life stage called emerging adulthood. This life period is characterized by relatively independent exploration, changes, and possibilities in the areas of work, love, and worldviews (Arnett, 2000). By contrast, individuals in young adulthood (i.e., between 30 and 45 years of age) tend to be more immersed in their roles, which includes getting married (or being in a stable romantic relationship), becoming a parent, and having a stable job or career path (Arnett, 2012). Subtle differences in how people at various life stages invest themselves across life domains would need to be explored to understand how procrastination and its effects vary over the course of one's life. For example, we could expect that many individuals in emerging adulthood would be more invested in education and individuals in young adulthood would probably be more invested in parenting. Whether these life domain differences would lead to different associations between the variables when comparing two samples at different life stages is a research question that awaits future investigation.

We conducted this study from February 18th to April 4th, 2020. During our data collection, COVID-19 was officially declared a pandemic on March 11th, 2020 (World Health Organization, 2020). Canadian adults have faced many stressors especially early in the pandemic including frequent news about the virus, social isolation, the fear of catching the virus or that a loved one catches the virus, the possibility of becoming unemployed (or having less working hours or a lower salary), the difficulties associated with getting necessities (e.g., groceries), and

less access to mental health support (Dozois & Mental Health Research Canada, 2021). The academic context also included specific stressors for students, such as waiting for further clarifications on the adjustments in the courses and evaluations format and the fear that they will be disadvantaged in their next level of study or in the job market when compared to students who previously had a pre-pandemic "normal" education (Daniel, 2020). Given that this global event unexpectedly occurred during our data collection, we ended up having some participants who took part in the study before the pandemic and many others took part during the first few weeks of the pandemic. Although our findings mostly went in the expected direction according to our hypotheses, the consequences of the pandemic could have exacerbated or attenuated some of our results. We thus recommend that future studies retest our multilevel design across life domains to determine whether the results found in this exceptional context can be replicated.

Conclusion

In this study, we proposed a multilevel model in which procrastination was expected to explain why autonomous and controlled motivation were related to achievement and affective outcomes across students (i.e., between-person level) and across the life domains in which students were invested (i.e., within-person level). Although our model was almost fully supported at the within-person level, only the relation between controlled motivation and negative affect was mediated by procrastination in a way that was consistent with our hypotheses at the between-person level. Our results suggest that procrastination plays a more relevant mediating role in the personal experience of students when we examine their fluctuations across their life domains compared to their own personal average. By also finding many differences when comparing the between-person and within-person levels, our study highlights that using a multilevel perspective can offer complementary insights on the complex multifaceted experience of university students. For example, the unanticipated positive between-person relation between

procrastination and goal progress would merit further empirical attention especially because it contrasts with the expected and observed negative within-person relation between those variables. Overall, our multilevel design offers a stepping stone to develop future research that will increase our understanding of the complex relations between motivation, procrastination, achievement, and affect across the many life domains in which individuals invest their limited time, effort, and energy.

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Table 4.1

Descriptive Statistics and Bivariate Correlations at Each Level of Analysis

Variable	*M* [a]	*SD* [a]	*SD* [b]	1 – ICC	1	2	3	4	5	6	7
1. Autonomous motivation	4.92	0.71	1.03	.68	–	-.21*	-.17*	.42*	.42*	.57*	-.22*
2. Controlled motivation	2.71	0.98	1.18	.59	.19*	–	.39*	-.32*	-.16*	-.46*	.44*
3. Procrastination	2.52	0.66	1.00	.70	.11*	.47*	–	-.35*	-.16*	-.33*	.33*
4. Self-actual-to-ideal proximity	4.32	0.77	1.25	.73	.35*	-.03	-.09	–	.52*	.53*	-.33*
5. Goal progress	4.24	0.72	1.15	.72	.54*	.05	.19*	.61*	–	.39*	-.17*
6. Positive affect	4.76	0.69	1.31	.79	.71*	.02	.07	.57*	.72*	–	-.49*
7. Negative affect	2.72	0.91	1.07	.58	-.09	.68*	.53*	-.29*	-.14*	-.27*	–

Note. *$p < .05$. Between-person $N = 330$ university students. Within-person $N = 1941$ life domains. Between-person correlations are reported below the diagonal and within-person correlations are reported above the diagonal. ICC: Intra-class correlation. 1 – ICC: the proportion of within-person variance. [a] Between-person level. [b] Within-person level.

Table 4.2

Fit Indices and Comparisons of the Tested Models

	χ^2	*df*	CFI	TLI	RMSEA	$SRMR_{within}$	$SRMR_{between}$	Contrast	Δdf	$\Delta\chi^2$
Model 1	1316.88*	16	.56	.00	.21	.17	.18			
Model 2	245.40*	8	.92	.58	.12	.03	.21	1 vs. 2	8	898.40*
Model 3	0	0	1.00	1.00	.00	.00	.00	2 vs. 3	8	245.40*
Model 4	3.13	2	1.00	.99	.02	.01	.01	3 vs. 4	2	3.13

Note. $^*p < .05$. Model 1: All the direct effects were not estimated at both levels. Model 2: The direct effects were estimated at the within-person level only. Model 3: All the direct effects were estimated at both levels. Model 4: All the direct effects were estimated at the within-person level, except for the non-significant direct effect from controlled motivation to goal progress. All the direct effects were also estimated at the between-person level, except for the non-significant direct effect from controlled motivation to self-actual-to-ideal proximity.

Table 4.3

Unstandardized Estimates and Confidence Intervals of the Total, Direct, and Indirect Effects

	Total effect		Direct effect		Indirect effect	
	B	95% CI	B	95% CI	B	95% CI
Between-person level						
Autonomous motivation to self-actual-to-ideal proximity	0.39*	[0.24, 0.53]	0.39*	[0.25, 0.54]	-0.003	[-0.02, 0.02]
Controlled motivation to self-actual-to-ideal proximity	-0.05	[-0.11, 0.01]	0[a]		-0.05	[-0.11, 0.01]
Autonomous motivation to goal progress	0.55*	[0.41, 0.68]	0.54*	[0.40, 0.68]	0.004	[-0.02, 0.03]
Controlled motivation to goal progress	-0.03	[-0.12, 0.06]	-0.10†	[-0.20, 0.002]	0.07*	[0.004, 0.13]
Autonomous motivation to positive affect	0.70*	[0.58, 0.81]	0.70*	[0.58, 0.81]	0.001	[-0.01, 0.01]
Controlled motivation to positive affect	-0.07†	[-0.15, 0.01]	-0.09*	[-0.18, 0.00]	0.02	[-0.03, 0.07]
Autonomous motivation to negative affect	-0.28*	[-0.43, -0.14]	-0.29*	[-0.43, -0.15]	0.01	[-0.04, 0.06]
Controlled motivation to negative affect	0.67*	[0.55, 0.78]	0.55*	[0.42, 0.67]	0.12*	[0.05, 0.19]
Within-person level						
Autonomous motivation to self-actual-to-ideal proximity	0.46*	[0.40, 0.52]	0.43*	[0.37, 0.49]	0.03*	[0.01, 0.04]
Controlled motivation to self-actual-to-ideal proximity	-0.24*	[-0.29, -0.19]	-0.15*	[-0.20, -0.10]	-0.09*	[-0.12, -0.07]
Autonomous motivation to goal progress	0.46*	[0.40, 0.52]	0.45*	[0.39, 0.51]	0.01*	[0.00, 0.02]
Controlled motivation to goal progress	-0.03*	[-0.05, -0.01]	0[a]		-0.03*	[-0.05, -0.01]
Autonomous motivation to positive affect	0.63*	[0.57, 0.68]	0.61*	[0.56, 0.67]	0.02*	[0.004, 0.03]
Controlled motivation to positive affect	-0.39*	[-0.44, -0.35]	-0.34*	[-0.38, -0.29]	-0.06*	[-0.07, -0.04]
Autonomous motivation to negative affect	-0.14*	[-0.19, -0.08]	-0.12*	[-0.18, -0.06]	-0.02*	[-0.03, -0.01]
Controlled motivation to negative affect	0.38*	[0.33, 0.43]	0.32*	[0.26, 0.38]	0.06*	[0.04, 0.08]

Note. *$p < .05$. †$p < .10$. All indirect effects were tested via procrastination. [a] The direct effect was fixed at zero.

Figure 4.1

Hypothesized Multilevel Mediation Model at Two Levels of Analysis

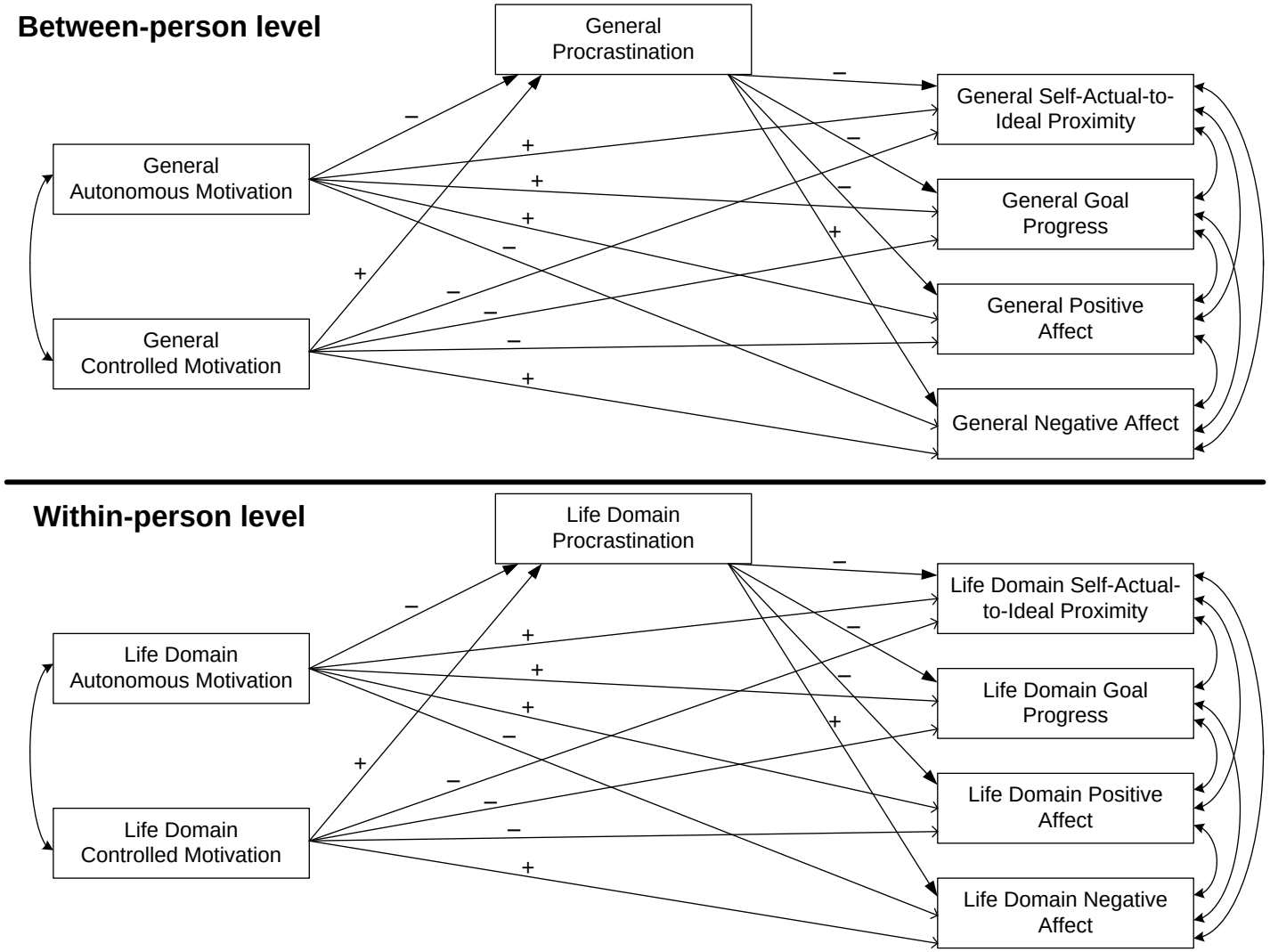
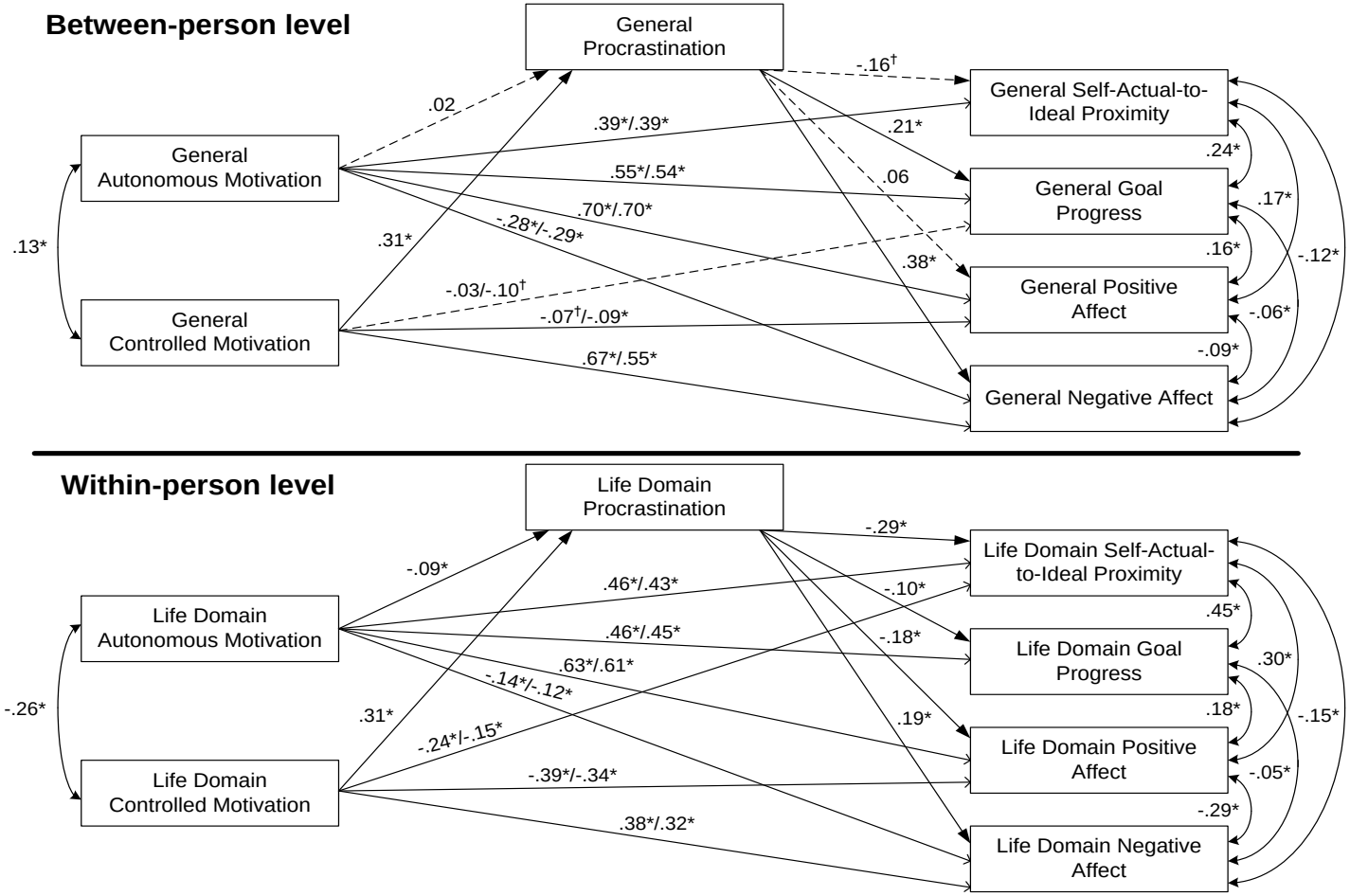


Figure 4.2

Unstandardized Parameter Estimates of the Multilevel Mediation Model



Note. $^{*}p < .05$. $^{\dagger}p < .10$. Full lines denote significant relations, whereas dashed lines denote non-significant or marginally significant relations. When applicable, values at the left of the slash are total effect estimates, whereas values at the right of the slash are direct effect estimates.

CHAPTER 5

GENERAL DISCUSSION

Procrastination has been often described and studied as a personality trait that is relatively stable across time and situations (see Klingsieck, 2013b; Schouwenburg, 2004b). Recently, however, researchers have been increasingly interested in studying temporal changes in procrastination and task progress before a deadline (e.g., Steel et al., 2018; Wessel et al., 2019) or momentary fluctuations in procrastination across time (e.g., Smith et al., 2017; van Eerde & Venus, 2018). This abundant focus on temporality is understandable given that procrastination refers to putting off a task to a later point in time (e.g., Klingsieck, 2013b) and that the notion of time is considered as a key theoretical element to better understand procrastination (e.g., Steel, 2007; Steel & König, 2006). Although the value of these burgeoning temporal perspectives cannot be overstated, their preponderance may have inadvertently overshadowed other relevant multilevel research questions deserving of empirical attention in the procrastination literature.

Accordingly, the overarching aim of this doctoral thesis was to propose and put the spotlight on three new multilevel studies to increase our understanding of procrastination and its associations with antecedents and outcomes with samples of university students. Instead of focusing on a typical evaluative setting to study procrastination (e.g., submitting an assignment before a deadline), I decided to focus on the consequences of procrastination during and after the academic transition to a postsecondary institution (Article 1). Furthermore, instead of examining procrastination and its nomological network across time, I decided to examine procrastination and its antecedents and outcomes across the courses taken by students during a semester (Article 2) and across the life domains in which students are invested (Article 3). A brief summary of each article is presented in Table 5.1. In the sections below, I will describe the findings and discuss the contributions of these new multilevel studies to the procrastination literature.

Table 5.1

Summary of Main Goals, Methodological Features, and Key Findings across the Three Articles

Main Goal	Methodological Features	Key Findings
Article 1 – Procrastination and Grade Trajectory across Time		
Test the influence of procrastination on the grade trajectory of students from high school to university.	Sample: 269 first-year undergraduate students. Measures: Self-reported trait procrastination was measured once. Academic achievement (i.e., high school GPA, 1st semester GPA, and 2nd semester GPA) was obtained at the end of the academic year. Analyses: Multilevel piecewise growth modeling.	Students who procrastinated more were more likely to have a larger grade decrease from high school to the first semester at university than students who procrastinated less and this achievement disadvantage tended to be maintained during the second semester at university.
Article 2 – Procrastination across Courses		
Test the mediating role of procrastination in the associations between autonomous/controlled motivation and indicators of achievement and well-being with a multilevel model across courses.	Sample: 359 undergraduate students (between-person) and 1668 courses (within-person). Measures: Participants reported the number of courses (max. 6) that they were taking during the semester. Self-reported motivation, procrastination, and affect were measured in each course. The final grade in each course was obtained at the end of the semester. Analyses: Multilevel structural equation modeling.	Between-person level: Students with more controlled motivation were more likely to procrastinate and, in turn, they tended to have a lower semester average grade and experience more negative affect. Within-person level: In the courses in which students had lower autonomous motivation than their own average, they tended to procrastinate more and, in turn, had lower final course grades, less positive affect, and more negative affect.
Article 3 – Procrastination across Life Domains		
Test the mediating role of procrastination in the associations between autonomous/controlled motivation and indicators of achievement and well-being with a multilevel model across life domains.	Sample: 330 undergraduate students (between-person) and 1941 life domains (within-person). Measures: Participants selected the life domains in which they were involved (max. 12): career, community, education, parenting, family, finance, friends, health, leisure, romance, spirituality, and self-improvement. Self-reported motivation, procrastination, self-actual-to-ideal proximity, goal progress, and affect were measured in each life domain. Analyses: Multilevel structural equation modeling.	Between-person level: Students with more controlled motivation were more likely to procrastinate and, in turn, they tended to experience more negative affect and, *unexpectedly*, more goal progress. Within-person level: In the life domains in which students had less autonomous and more controlled motivation, they were more likely to procrastinate and, in turn, they tended to experience less self-actual-to-ideal proximity, goal progress, and positive affect and more negative affect.

An Overview of Three New Multilevel Perspectives on Procrastination

We know from past research that some individuals procrastinate more frequently than others. We also know – thanks to original studies and meta-analytical findings – that individual differences in procrastination tend to relate to individual differences in other variables (e.g., higher fear of failure, lower self-esteem, higher depression, lower GPA; see Steel, 2007; van Eerde, 2003). My doctoral thesis partly builds upon this long-established and influential line of research by examining whether procrastination relates to antecedents and outcomes at the between-person level of analysis. Specifically, I examined the relation between trait procrastination and semester average grade when comparing students to one another (Article 1). I also examined the motivational antecedents and the achievement and affective outcomes of procrastination when comparing students to one another in university (i.e., aggregate scores representing all their courses; Article 2) and in general (i.e., aggregate scores representing all their life domains; Article 3). Overall, these three articles complement past research and meta-analytical findings by examining whether individual differences in procrastination relate to individual differences in motivational, achievement, and affective variables.

Moreover, I used this doctoral thesis as an opportunity to examine within-person fluctuations in procrastination and/or its nomological network. In Article 1, I investigated the influence of trait procrastination on the grade trajectory from the last year of high school to the first year at university. Do students who procrastinate more experience a larger grade decrease during this critical academic transition than students who procrastinate less? In Articles 2 and 3, I wanted to understand the motivational antecedents and the achievement and affective outcomes of procrastinating more in a given context (i.e., course or life domain) compared to one's personal average. In other words, why would *any* student – not necessarily a typical "procrastinator" – tend to procrastinate more in some contexts than in others and what happens

in those contexts? Taken together, these approaches enrich our comprehension of (a) the role of procrastination in the dynamic and changing nature of achievement and (b) how within-person fluctuations in procrastination are associated with motivational antecedents and both achievement and affective outcomes. The specific contribution of each study is detailed below.

Article 1. Based on a large nationwide study, we knew that Canadian students tended to experience a large grade decrease of almost 10% from high school to the first year at university (Finnie & Martinello, 2010). Based on another large study with students from the University of Ottawa, we also knew that the grade trajectory was discontinuous; the grade decrease from high school to the first semester at university was large, whereas the grade decrease from the first to the second semester at university was small (Gaudreau, 2018). Given that lack of time is a considerable source of concern for university students in general (Hurst et al., 2013), we proposed that students with high scores of trait procrastination – who not only delay their tasks but also tend to underestimate the needed time to complete those tasks (Ferrari et al., 1995b) – would be particularly at risk of getting poorer grades during their transition to university. Accordingly, we investigated whether procrastination could influence the first semester grade at university (i.e., a static indicator of achievement), the grade change from the last year of high school to the first semester at university, and the grade change from the first semester to the second semester at university (i.e., two successive and dynamic indicators of achievement).

The static indicator of achievement and the two dynamic indicators of achievement offered different yet complementary insights on the influence of procrastination on grades. *First*, we found a negative association between procrastination and first semester grade, which was consistent with meta-analytical findings showing a negative relation between procrastination and academic achievement (Kim & Seo, 2015; Richardson et al., 2012; Steel, 2007; van Eerde,

2003). The conclusion from that finding is that students who procrastinated more tended to have a lower semester grade than students who procrastinated less. *Second*, we found that procrastination was negatively associated with grade change from high school to the first semester at university, but non-significantly associated with grade change from the first semester to the second semester at university. Three conclusions from these findings are especially noteworthy: (a) students who procrastinated less had a better overall grade trajectory than students who procrastinated more; (b) students who procrastinated less nonetheless experienced a large grade decrease during the transition from high school to university; (c) students who procrastinated more experienced a stability in their grade from the first to the second semester, which may seem reassuring, but this stability meant that they maintained their achievement disadvantage when compared to students who procrastinated less.

When taking all these findings into consideration, we have a better understanding of why it would be important to intervene early during the first semester at university. If we wait too long to intervene, students may be discouraged that their grades in university are considerably lower than what they used to be in high school. In addition, these lower grades could put them at risk of being on academic probation, losing scholarships, and not having access to learning opportunities that could enrich their academic experience and be helpful for their future career. Students who tend to procrastinate more than others would be even more likely to experience these issues. All in all, this study shows that procrastination is a considerable risk factor for increased achievement difficulties during the transition from high school to university.

Article 2. In Article 1, we were interested in whether individual differences in procrastination could influence academic achievement. However, even students who would not necessarily describe themselves as “procrastinators” could procrastinate more than their own

average in some courses. In our first multilevel study on this topic, our simple question was: "Does it matter if students procrastinate more in some courses than in others?" Simply put, the answer was "yes"; in the courses in which students procrastinated more, they tended to have lower final course grades than in courses in which they procrastinated less (Kljajic & Gaudreau, 2018). To build upon this multilevel study, we wanted to also examine the motivational antecedents (i.e., autonomous and controlled motivation) and the affective outcomes (i.e., positive and negative affect) of procrastination. In a multilevel model in which we compared students to one another (i.e., between-person level) and the courses to one another within each student (i.e., within-person level), the following hypotheses were proposed: Autonomous and controlled motivation would be associated with less and more procrastination, respectively; in turn, procrastination would be associated with lower academic achievement, less positive affect, and more negative affect. Although the associations were hypothesized to be comparable at both levels of analysis, their interpretation would be different.

Three main conclusions can be taken from this study. *First*, the hypotheses on the associations between procrastination and the achievement and affective outcomes were generally supported at both levels of analysis. These findings highlight that (a) procrastination tends to be detrimental to the between-person success and emotional well-being of students who procrastinate more academically than their peers and (b) procrastination tends to be detrimental to the within-person success and emotional well-being of any student who procrastinates more in a course than their own average. *Second,* only controlled motivation (not autonomous motivation) was related to procrastination at the between-person level. That is, students with higher controlled motivation in school than their peers tended to have a greater propensity to procrastinate in school. *Third*, only autonomous motivation (not controlled motivation) was

related to procrastination at the within-person level. Specifically, any student with lower autonomous motivation in a course than their own average had a greater propensity to procrastinate in that course.

These differences in motivational antecedents depending on the level of analysis could potentially inform applied psychologists who want to decrease the procrastination of university students. Increasing autonomous motivation in a course may be a preferable strategy if a student procrastinates more in that course than in their other courses. Decreasing controlled motivation in school may be a preferable strategy if a student procrastinates more in school than their peers. Considering both increasing course autonomous motivation and decreasing school controlled motivation could be an interesting avenue to explore for students who both procrastinate more than their counterparts and procrastinate more in some courses than their own average. Although these intervention ideas will, of course, need to be tested empirically in future research, our results nevertheless highlight that the motivational source of procrastination may not be the same at each level of analysis. In sum, in this second multilevel study on procrastination across courses, we found that the deleterious influence of procrastination on achievement and affective outcomes is applicable across students and across courses, although the motivational antecedent of procrastination differs depending on the level of analysis.

Article 3. Given the importance that students attribute to having positive academic experiences, the first two articles in this thesis have focused on the antecedents and/or outcomes of procrastination in the academic domain. However, we also wanted to take into account that university students have a life beyond attending classes, studying for exams, and writing assignments, lab reports, and term papers. Many students have responsibilities and activities outside of the academic realm (e.g., Hurst et al., 2013; Klingsieck, 2013a), such as having a job,

managing their finances, taking care of their health, spending time with their loved ones, and doing leisure activities. Hence, I decided to test a similar mediation model as the one proposed in Article 2, but this time, I compared the life domains to one another within each student (i.e., within-person level) and students were compared to one another on their general scores across life domains (i.e., between-person level). In this adapted model, the following key hypotheses were proposed: Autonomous and controlled motivation should be associated with less and more procrastination, respectively; in turn, procrastination should be associated with lower self-actual-to-ideal proximity, goal progress, and positive affect and higher negative affect. Once again, the findings had to be appropriately interpreted depending on the level of interest.

Two key conclusions emerged from our findings. *First*, almost all our hypotheses were supported at the within-person level of analysis. Students who had less autonomous motivation or more controlled motivation in a life domain compared to their own average had a greater propensity to procrastinate in that life domain; in turn, procrastinating more in a life domain was associated with less self-actual-to-ideal proximity, goal progress, and positive affect and more negative affect in that life domain. Hence, our initial hypotheses seem to be most fitting to the within-person experience of university students across their life domains. *Second*, our hypotheses were only partially supported at the between-person level of analysis. On the one hand, only students with higher general controlled motivation than their counterparts were more likely to generally procrastinate. On the other hand, students with higher general procrastination tended to have more negative affect in general. The most puzzling finding was that students with higher general procrastination were also more likely to experience *more* general goal progress, which was completely unexpected and inconsistent with our initial hypothesis.

This final article can be considered as an intriguing example of a multilevel study in which almost all the hypothesized associations are found at one level but not at the other. At the within-person level, our findings suggest that both decreasing controlled motivation and increasing autonomous motivation in a life domain (compared to a student's average) could potentially reduce their procrastination in that life domain and also lead to better achievement and affective outcomes in that life domain. At the between-person level, the results suggest that only decreasing the controlled motivation of a student in general (compared to other students) could potentially reduce their general procrastination and lead to less general negative affect. But the question that remains is why would procrastination be positively associated with goal progress at the between-person level?

Procrastination and Achievement: The Special Case of Between-Person Goal Progress

In the academic context, the accumulated evidence on the negative association between procrastination and academic achievement has led to the conclusion that procrastination is generally detrimental and never beneficial (Steel, 2007). Students who procrastinate more tend to have less time to prepare for their tasks and are more likely to miss a deadline (van Eerde, 2003), which can directly result in a grade penalty (e.g., losing 5% per late day). Meta-analyses conducted by various researchers at various time points have consistently shown that procrastination tends to be negatively associated with multiple indicators of academic achievement (Akpur, 2020; Kim & Seo, 2015; Richardson et al., 2012; Steel, 2007; van Eerde, 2003). In my own research, I found that students who procrastinate more than their peers tend to have a worse overall grade trajectory from high school to university (Article 1) and a worse semester average grade (Articles 1 and 2). Moreover, any student who procrastinates more in a course is more likely to have a worse final grade in that course than in their other courses (Article 2; see also Kljajic & Gaudreau, 2018). This is not to say that students who procrastinate

cannot get satisfactory and sometimes even very good grades (see Schraw et al., 2007), but the odds of *consistently* getting excellent grades and being "straight A students" are simply not in their favor.

Although procrastination is a clear risk factor for achievement difficulties in the academic domain, could it also lead to achievement difficulties across life domains? This question was at the heart of Article 3. At the within-person level, the answer is simple and straightforward. That is, any student who procrastinates more in a life domain (than their own average) tends to make less goal progress and be less close to their personal ideal in that domain. Given that procrastination is expected to interfere with goal attainment (e.g., Krause & Freund, 2014b), this finding is consistent with our initial hypothesis. The between-person level, however, portrays a more confusing picture. While students who procrastinate more in general tend to be marginally *less* close to their personal ideal, they also tend to make *more* goal progress in general than students who procrastinate less. Some of the interpretations that we proposed in the Discussion of Article 3 have methodological implications (e.g., the subjective perception of the goal progress scale). However, in order to keep this section more streamlined, I decided to focus on and expand only two interpretations that have broader theoretical implications to help us understand whether procrastination can be beneficial in the context of achievement across life domains.

First interpretation. In order to illustrate the first interpretation, I will describe two fictional university students, Jules and Max, who have to work together to write a paper. Jules frequently procrastinates across life domains, whereas Max rarely procrastinates in their life domains. Jules and Max are in the same psychology course and they have to work as a team to write a 12-page term paper. Both students want to get a good grade and they agree early in the

semester that each one will write 6 pages of the paper. Max finishes the first part a week in advance. In contrast, Jules waits until the very last day to write the second part. The problem is that Jules experiences technical issues with their laptop and, as a result, cannot write the paper that day. Since Max does not want to face grade penalties for submitting the paper late, they accept to write the second part of the paper as well. Therefore, Max has to put much more time in the academic domain than expected and maybe cancel plans with friends. Max may even neglect their health by not having time to cook healthy meals for the week and by disrupting their sleep schedule because they have to finish the paper late at night. Although Jules may feel guilty and anxious, they suddenly have more free time to do other activities, maybe see their family, pay their bills, read a novel or do a workout. In the end, Max and Jules may get the good grade that they both wanted, but only Max did all the hard work to help them both attain that goal.

This simple scenario illustrates how students like Jules, who procrastinate more, may make more progress in their goals in general than students like Max who procrastinate less. In other words, our first interpretation was that general procrastination could indeed be related to more general goal progress, but it would also come at a *social cost*. Procrastination has been identified as a source of problems and conflicts between people (Grunschel et al., 2013; Patrzek et al., 2012). Disagreements due to procrastination may be even more likely to occur between people who have many shared responsibilities and goals, such as family members or romantic partners (Ferrari et al., 1995a). The procrastination of an individual negatively affects their social circle not only because procrastination is a stressor, but also because the individual may need that their significant others step in to help meet important deadlines (Pychyl & Flett, 2012). In the fictional scenario above, Jules' procrastination has two important consequences: (a) Max can

get a good grade *only if* they fully devote time and energy to writing the paper (i.e., the academic domain); (b) Jules can get a good grade *while also* spending time and energy doing other activities in other life domains. Therefore, university students who procrastinate frequently (like Jules) could potentially make more progress in their goals with the help (or even sole contribution) of other people, whereas university students who procrastinate rarely (like Max) could potentially make less progress in their goals if they have to carry the responsibilities of other people. Based on this interpretation, general procrastination could relate to more general goal progress, but the social cost is problematic and should not be ignored.

Second interpretation. In order to illustrate the second interpretation, I will refer to Max again – the student with low general procrastination – but describe them in a different light. For Max, any new task that appears on their to-do list – preparing a meal, sending a job application, and carrying heavy grocery bags – must be done earlier rather than later. Max wants to unclutter their mind as early and as often as possible. The problem is that doing everything in a hurry sometimes leads to mistakes and injuries. When preparing a meal, Max might burn the dish or forget an important ingredient. When preparing a job application, Max might make grammatical mistakes in their resume or send a generic cover letter. When carrying grocery bags, Max might hurt their back or have fragile items fall from the bags and break. In many of these situations, Max could have avoided mistakes and injuries if they only had taken a bit more their time.

This scenario illustrates that, in an attempt to unclutter their working memory, some university students may prefer to generally pre-crastinate by rushing to complete their tasks as early as possible (see Rosenbaum et al., 2014, 2019). In other words, some students would not only start their tasks early, but they would also actively seek to finish them in a hastily manner. In the context of tasks and activities with a deadline (e.g., writing a paper, paying bills, getting

ready for a wedding, organizing a social event), pre-crastination could be similar to procrastination in that, in both cases, individuals have a limited time to accomplish the tasks. The main difference is that students who procrastinate would tend to work to meet *other-imposed later* deadlines (see Steel, 2007; Steel & König, 2006), whereas students who pre-crastinate would tend to work to meet *self-imposed early* deadlines. If we accept these propositions, students who pre-crastinate and those who procrastinate may be equally likely to make mistakes and/or experience injuries (due to rushing because of limited time). The main question then remains: Why does more general procrastination lead to more general goal progress? Part of the explanation could reside in the first interpretation regarding the social cost of procrastination for the people who pre-crastinate and social benefits for the people who procrastinate. However, I would like to propose an alternative interpretation that deconstructs the way that we define procrastination.

Given that procrastination may occur at various stages during goal pursuit (e.g., Wieber & Gollwitzer, 2010), many researchers agree that procrastination implies a delay in starting and/or completing tasks (e.g., Fernie et al., 2017; Ferrari & Díaz-Morales, 2014; Krause & Freund, 2014b; Sirois, 2004; Strunk et al., 2013). Even in Articles 2 and 3 of my doctoral thesis, I specifically asked participants to think about their delay in starting or completing some task or activity. Is it possible, however, that generally procrastinating on both starting *and* finishing tasks versus generally procrastinating *only* on finishing tasks has different implications for general goal progress? The main assumption here would be that students who do not procrastinate on starting tasks but procrastinate on finishing tasks may have more time to find an optimal way to deal with various tasks (instead of rushing). The reason why those students who take their time might make the most goal progress is fairly simple: some things in life cannot and

should not be rushed. Healing properly from physical injuries often requires a period of relative rest (e.g., Patel & Villalobos, 2017; Spiker et al., 2012). Gardening – nurturing plants as they grow – requires patience (e.g., O'Brien, 2013). Setting aside a problem for a while before trying to solve it again (i.e., incubation period) can lead to improved problem solving (e.g., Sio & Ormerod, 2009). Sleeping can also be associated with gained insights that improve problem solving (e.g., Wagner et al., 2004). Overall, these varied examples show that the passage of time is sometimes important – if not necessary – for successful task completion.

In the context of Article 3, I did not make the distinction between procrastinating on starting versus finishing tasks and it could potentially explain the unexpected finding that more general procrastination is associated with more general goal progress. The potential benefits of general procrastination could thus perhaps be inflated by including students who do not procrastinate on starting their tasks, but do take their time to finish them. This is not only a plausible interpretation, but also an interesting working hypothesis that has important theoretical ramifications. Most researchers – including us – have chosen to measure and study negative forms of procrastination (see Steel, 2007). A few researchers have conceptualized positive forms of procrastination (e.g., active procrastination) which includes characteristics such as a preference for time pressure, an ability to meet deadlines, and a satisfaction with outcomes (Choi & Moran, 2009; Chu & Choi, 2005). Even if we do not necessarily agree with the way that this form of active procrastination has been conceptualized (see also Chowdhury & Pychyl, 2018), we have to nonetheless take into account that some students do perceive that their procrastination has sometimes positive consequences, such as improving one's creative thinking, giving more preparation and reflection time, and coming back to the task later with a fresher perspective (e.g., Abramowski, 2018; Fernie & Spada, 2008; Schraw et al., 2007). This is probably why simply

getting *started* is considered a simple but powerful strategy to counteract procrastination and some of its negative effects (Pychyl, 2013). Even if students do not necessarily finish their tasks early, they may at least have a more positive outlook on those tasks early (e.g., perceiving them as more pleasant and less confusing, difficult, and stressful than expected; Pychyl et al., 2000), thus making them more likely to come back eventually and finish those tasks on time. Hence, I believe that the procrastination literature may benefit – both theoretically and empirically – from a clearer distinction between procrastinating on *only* finishing tasks versus *both* starting and finishing tasks. Only then can we determine if students who generally start their tasks earlier but also give themselves time to reflect and prepare for those tasks potentially make the most goal progress in general.

Limitations and Future Directions

Population of interest and generalizability. All three studies in this doctoral thesis were conducted with samples of undergraduate university students. Making sure that these students learn how to manage their time and resources properly is invaluable not only for themselves, but also for society in general because they represent a large part of the workforce and leaders of tomorrow. In that context, procrastination research with undergraduate students – even if this population is overrepresented in the literature (Klingsieck, 2013b) – remains meaningful and needed especially if it offers new theoretical and empirical insights on this topic. However, I must underscore that the results found in this doctoral thesis have mostly the potential to be generalizable in the university context with undergraduate students in North America. These findings should not be generalized to populations at other educational levels (e.g., high school, graduate school) or populations outside of the academic context (e.g., non-student adults). Each study that I conducted, however, could be retested and adapted to other populations. For

example, as explained in Article 3, the multilevel hypotheses across life domains could be tested with a sample of non-students in young adulthood (i.e., between 30-45 years of age).

Future studies could also examine the multilevel hypotheses across courses with a sample of secondary school students. There are quite a few differences between the secondary school and the university experience. For instance, getting a high school degree is compulsory, whereas getting an undergraduate degree is optional. Furthermore, high school students have a larger number of courses and a firm schedule, whereas many university students have less courses and a more flexible schedule, but also higher expectations. Although I do not necessarily expect contradictory findings when comparing the results in secondary school and university, there could be some important differences in the strength of the associations that influence the interpretation of some results. For example, the average correlation between procrastination and academic achievement tends to be higher in high school (r = -.32) than in college or university (r = -.16) at the between-person level (Kim & Seo, 2015). Additionally, the between-person correlation between autonomous motivation and procrastination tends to be negative and large in secondary school (Mouratidis et al., 2018; Vansteenkiste et al., 2009, Study 1), whereas mixed results were found in post-secondary institutions (Kljajic et al., 2022; Mih, 2013; Vansteenkiste et al., 2009, Study 2). Overall, testing the same multilevel hypotheses – but next time with high school students – could reveal either that the multilevel model is generalizable at another educational level or differences that could help us eventually better tailor interventions to decrease procrastination depending on the educational level.

Another example of an adapted study to another sample would be to examine the achievement trajectory of students during the transition from undergraduate to graduate studies. This transition could be characterized by subjective achievement difficulties (e.g., lower goal

progress and attainment). Given that time management is probably one of the main challenges faced by graduate students (Schlemper, 2011), many students may find that their procrastination is more problematic in their graduate studies. Specifically, students who have heavily relied on the rigid deadlines in their undergraduate courses to stop procrastinating and finish their tasks on time may find it difficult to avoid procrastination in graduate school where deadlines are often lenient or non-existent. Moreover, following the subjective achievement trajectory for many years during graduate studies and the role played by procrastination could also offer some insights on whether students who procrastinate more tend to struggle early (i.e., when they are generally involved in courses and beginning to plan their dissertation) and/or later in the program (i.e., when they usually have to collect data, publish articles, and write their dissertation).

Adding levels of analysis. In procrastination research, most multilevel studies have been conducted at two levels of analysis, namely the between-person and the within-person levels. In my thesis, I followed a similar format, except that I used different units of analysis at the within-person level (i.e., time points before and after an academic transition, courses, and life domains) compared to past research. Both levels were pertinent to include in my research. Findings at the between-person level could be compared to past research on procrastination, while findings at the within-person level offered new insights on the personal fluctuations of procrastination and/or its nomological network across time and contexts. Nevertheless, these multilevel perspectives could and should be expanded to include broader levels or more specific levels of analysis to answer new research questions and gain a deeper and more comprehensive understanding of procrastination across time, situations, and contexts.

On the one hand, future research could add a level of analysis below within-person courses or within-person life domains. For example, each course could be divided into the tasks

that need to be done to successfully complete the course (e.g., writing a paper, studying for an exam). In order to explain why adding a lower level can offer new insights, I will refer to the association between autonomous motivation and procrastination. Many researchers have argued that procrastination mainly stems from motivational issues or deficits (e.g., Klingsieck, 2013b; Schouwenburg, 2004a; Steel & König, 2006). My own research corroborates this proposition, but only at the within-person level. Even then, the effect sizes (r = -.24 across courses and r = -.17 across life domains) would be interpreted as medium according to empirically-derived benchmarks in psychology (Bosco et al., 2015). One possibility that could explain why the effect sizes are not larger is that autonomous motivation (especially intrinsic motivation) could potentially have a stronger negative influence on procrastination if we examine their relation on a task-to-task basis. This hypothesis is based on qualitative studies in which university students often say that the lack of personal interest toward a task (i.e., lack of intrinsic motivation) is what leads them to procrastinate on that task (Grunschel et al., 2013; Klingsieck et al., 2013; Patrzek et al., 2012; Schraw et al., 2007). If researchers were to test such a model, they would have tasks (level 1) nested within courses or life domains (level 2) nested within students (level 3). The research question that would be answered at level 1 would be: Does more task intrinsic motivation in a course or life domain (compared to one's average) tend to be associated with less task procrastination in that course or life domain?

On the other hand, future studies could focus on a broader perspective, such as comparing the procrastination of groups of people (i.e., between-group) and comparing the procrastination of individuals within each group (i.e., within-group). Research could, for example, examine the procrastination of students in work groups (see Van Hooft & Van Mierlo, 2018), athletes in sport teams before a competition, or family members who live together and share common chores and

responsibilities. Group work is a surprisingly understudied area in the procrastination literature (Klingsieck et al., 2013). Yet, individuals often choose or have to work in a group to attain common goals. Investigating antecedents that could explain why some groups tend to procrastinate more than other groups (i.e., between-group) and why some individuals procrastinate more than their group members (i.e., within-group) can have important practical implications to design interventions adapted to decrease procrastination at the individual and group level. Furthermore, finding out whether more procrastination from a team member can decrease the performance and emotional well-being of the whole team (i.e., cross-level interaction) could help raise an awareness that individual procrastination hurts not only the person who procrastinates, but also the group to which they are affiliated. This information could be particularly relevant in contexts when a person is not aware of the social negative consequences of their procrastination because other group members who procrastinate less do not state it clearly in order to avoid conflicts. Hence, multilevel studies within- and between-groups could answer many important research questions about procrastination in social contexts.

Psychological needs according to SDT. In this thesis, one of my main aims was to examine the motivational antecedents of procrastination. Hence, I decided to focus on autonomous and controlled motivation based on SDT. However, SDT is also a broader theory of human motivation that encompasses three basic psychological needs which are proposed to foster the internalization and integration of behaviours. Specifically, individuals are expected to do activities for more autonomous or self-determined reasons if (a) they feel that they can use their free will (i.e., need for autonomy), (b) they feel effective or competent in those activities and in their ability to grow and succeed (i.e., need for competence), and (c) they feel that they belong and are connected to a group and that others care about them (i.e., need for relatedness;

Ryan & Deci, 2020; Ryan et al., 2019). Given that many SDT interventions focus on increasing the satisfaction of psychological needs (e.g., Gillison et al., 2019), measuring whether psychological needs satisfaction could reduce procrastination – potentially via an increase in autonomous motivation and a decrease in controlled motivation at different levels of analysis – would be an interesting avenue for future research.

Specific methodological limitations. In this thesis, four decisions were made that have restricted the variance of the scores used for the statistical analyses and may have resulted in false negative effects (i.e., type II errors). First, high school grades – which were initially on a percentage scale – were converted to simpler numerical values based on the 11-point grading scale used at our university. Second, the five regulatory styles according to SDT (i.e., intrinsic, integrated, identified, introjected, and external regulations) were aggregated into dimensional scores representing autonomous and controlled motivation (see Howard et al., 2020). Third, emotional well-being was measured broadly (i.e., positive and negative affect), rather than examining specific emotions that could be considered in terms of both valence and activation (e.g., negatively valenced, low activation affect like boredom vs. negatively valenced, high activation affect like stress; see Posner et al., 2005). Fourth, manifest scores – rather than latent variables – were used in all the statistical analyses. Overall, these decisions reduced the variance of the scores and of the estimated effect sizes (e.g., lower observed effects compared to the true effects corrected for measurement error), which could potentially explain why some main and indirect effects did not reach statistical significance. Future research should try to replicate the findings reported in this thesis while taking into account the four aforementioned methodological limitations.

Conclusion

The overarching goal of my doctoral thesis was to propose three new multilevel studies to better understand whether motivational antecedents and/or achievement and affective outcomes are related to procrastination. The novelty of all three studies mainly resides in the way that the within-person level has been designed. In Article 1, we obtained the academic achievement at three time points during the transition from high school to university. In Article 2, we measured all the variables in up to six courses taken by the participants during a semester. In Article 3, we measured all the variables in up to 12 life domains in which participants were invested. These approaches allowed us to test the cross-level influence of procrastination on the achievement trajectory of students (Article 1) and mediation models of procrastination at the between-person level and at the within-person level across courses (Article 2) and across life domains (Article 3). In conducting those studies, I wanted to gain a better understanding of not only *some* students who procrastinate more than others – sometimes labeled as "procrastinators" – but also *any* student who procrastinates more in some contexts than in others. The findings in this thesis can be summarized in two parts: (a) the outcomes of procrastination and (b) the antecedents of procrastination.

In terms of outcomes, the bad news is that procrastination is generally detrimental for both the between-person and the within-person journey toward success and emotional well-being. That is, *some* university students – those who procrastinate more than their peers – tend to have a worse overall grade trajectory from high school to university and worse semester grades and they tend to experience more negative affect in the academic domain. University students who procrastinate more also tend to experience marginally less self-actual-to-ideal proximity and more negative affect in general across their life domains. In addition, *any* student who procrastinates more in a course is more likely to have a lower course grade and experience less

positive affect and more negative affect in that course. Any student who also procrastinates more in a life domain is more likely to have less self-actual-to-ideal proximity, less goal progress, less positive affect, and more negative affect in that life domain. Taken together, these results paint a rather bleak picture of the negative consequences of procrastination – both when compared to others and when compared to oneself.

In terms of antecedents, the good news is that the dimensions of motivation are related to procrastination. This is good news because motivation – when compared to other variables such as intelligence and personality – is a relatively more malleable target for interventions (Lavrijsen et al., 2022). However, the results also show that autonomous and controlled motivation are not both relevant at all levels of analysis and in all contexts. When *any* university student experiences more autonomous motivation in a course or in a life domain than in others, they seem less likely to procrastinate in that context. By contrast, controlled motivation does not seem quite relevant to influence procrastination within a domain (i.e., across courses), but the relation between controlled motivation and procrastination tends to be positive and significant when one or multiple life domains are involved. Although we certainly need more research to unravel the complex multilevel interconnections between the two dimensions of motivation and procrastination, these new findings are a promising starting point to eventually guide us toward interventions that can reduce procrastination in a course, in a life domain, or in general.

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Appendix A

Instructions and Questionnaires Used in Article 1

Section 1: Background information

Please indicate your sex.

◯ Male ◯ Female

What is your age?

(Note. It includes a drop-down menu with options from 16 to 65+.)

What is your level of academic training?

◯ Freshman (1st year)

◯ Junior (2nd year)

◯ Sophomore (3rd year)

◯ Senior (4th year)

In what program are you mainly enrolled?

How would you describe your semester grade point average from this FALL SEMESTER?

◯ F (0-39)

◯ E (40-49)

◯ D (50-54)

◯ D+ (55-59)

◯ C (60-64)

◯ C+ (65-69)

◯ B (70-74)

◯ B+ (75-79)

◯ A- (80-84)

◯ A (85-89)

◯ A+ (90-100)

Where do you currently live?

◯ With my parents ◯ Apartment ◯ Residence

Do you receive a scholarship to cover your tuition fees?

◯ Full scholarship ◯ Partial scholarship ◯ No scholarship

How much financial support do you receive from your parents for school?

◯ Full support ◯ Partial support ◯ No support

How do you describe yourself in terms of your cultural background?

◯ Aboriginal/Native

◯ Caucasian (White)

◯ African-Canadian (Black)

◯ Hispanic (Latino)

◯ Asian

◯ Arabic

◯ Other (please specify)

Section 2: Personality traits and personal characteristics

Procrastination

Please rate the following items using the scale below.

	Not at all agree (1)	A little agree (2)	Moderately agree (3)	Strongly agree (4)	Totally agree (5)
1. I put things off so long that my well-being or efficiency unnecessarily suffers.	◯	◯	◯	◯	◯
2. If there is something I should do, I get to it before attending to lesser tasks.	◯	◯	◯	◯	◯

3. My life would be better if I did some activities or tasks earlier.	◯	◯	◯	◯	◯
4. When I should be doing one thing, I will do another.	◯	◯	◯	◯	◯
5. At the end of the day, I know I could have spent the time better.	◯	◯	◯	◯	◯
6. I spend my time wisely.	◯	◯	◯	◯	◯
7. I delay tasks beyond what is reasonable.	◯	◯	◯	◯	◯
8. I procrastinate.	◯	◯	◯	◯	◯
9. I do everything when I believe it needs to be done.	◯	◯	◯	◯	◯

(Note. Items 2, 6, and 9 should be reversed-scored.)

Appendix B

Instructions and Questionnaires Used in Article 2

Section 1: Background information

Please indicate your gender.

◯ Male

◯ Female

◯ Other (please specify)

What is your age?

(Note. It includes a drop-down menu with options from 16 to 65+.)

What is your level of academic training?

◯ Freshman (1st year)

◯ Junior (2nd year)

◯ Sophomore (3rd year)

◯ Senior (4th year)

In what program are you mainly enrolled?

Where do you currently live?

◯ With my parents ◯ Apartment ◯ Residence

Do you receive a scholarship to cover your tuition fees?

◯ Full scholarship ◯ Partial scholarship ◯ No scholarship

Do you have to work during the semester?

◯ Yes ◯ No

If yes, how many hours per week?

How do you describe yourself in terms of your cultural background?

◯ Aboriginal/Native

◯ African-Canadian (Black)

◯ Arabic

◯ Asian

◯ Caucasian (White)

◯ Hispanic (Latino)

◯ Other (please specify)

How many course(s) do you have this semester?

(Note. It includes a drop-down menu with options from 1 to 6. The chosen option had an influence on the webpage to which the participant was redirected. For example, if the participant had 1 course, they were redirected to the webpage "Question about your course" and they were asked to complete the questionnaires only once. If the participant had 6 courses, they were redirected to the webpage "Questions about your six courses" and they were asked to complete the same questionnaires in each of their six courses.)

Section 2: Questions about your six courses (if the participant had six courses)

Course-specific information

In this section, you will be asked to evaluate your academic experience separately for each course that you are attending during the semester.

You will be asked the same questions for each course. This section may seem repetitive. Please note that our goal is not to see if you will respond in the same manner across all of your courses. **Our goal is really to understand your specific behavior and feelings in each course.**

Please do your best to provide the information in all of your courses. This is extremely important for the success of our research project.

Thanks!

Course #1

Description of your course #1

Please enter your course code for your course #1 (for example, PSY-1101-B)

Please enter the full name of your professor for your course #1

Part 1: Motivation

Why are you enrolled in this course?

Indicate the extent to which each of the following items presently corresponds to one of the reasons why you are enrolled in this course.

I am enrolled in [course #1] because...

	Not at all for this reason (1)	Very slightly for this reason (2)	Slightly for this reason (3)	Moderately for this reason (4)	Strongly for this reason (5)	Very strongly for this reason (6)	Totally for this reason (7)
1. Because I truly love it.	◯	◯	◯	◯	◯	◯	◯
2. In order not to feel ashamed.	◯	◯	◯	◯	◯	◯	◯
3. It is part of who I am as a person.	◯	◯	◯	◯	◯	◯	◯
4. Somebody is putting pressure on me.	◯	◯	◯	◯	◯	◯	◯
5. I feel that it is important for me.	◯	◯	◯	◯	◯	◯	◯
6. I do it, but it is not motivating.	◯	◯	◯	◯	◯	◯	◯
7. I want to be rewarded.	◯	◯	◯	◯	◯	◯	◯
8. It is intrinsically satisfying.	◯	◯	◯	◯	◯	◯	◯
9. Otherwise, I would feel guilty.	◯	◯	◯	◯	◯	◯	◯
10. It clearly defines me as a person.	◯	◯	◯	◯	◯	◯	◯
11. I feel that others are pushing me to do it.	◯	◯	◯	◯	◯	◯	◯
12. In order to pursue goals that are important to me.	◯	◯	◯	◯	◯	◯	◯

13. I do it, without really knowing why I continue.	◯	◯	◯	◯	◯	◯	◯
14. I do it, but for no reason.	◯	◯	◯	◯	◯	◯	◯
15. It allows me to obtain something in return.	◯	◯	◯	◯	◯	◯	◯

(Note. Items 1 and 8 represent intrinsic regulation. Items 3 and 10 represent integrated regulation. Items 5 and 12 represent identified regulation. Items 2 and 9 represent introjected regulation. Items 4 and 11 represent external regulation.)

Part 2: Procrastination

These questions are concerned with procrastination in your academic tasks for your [course #1]. Procrastination refers to when we delay starting or completing some task even though we are aware that negative consequences will probably follow the delay.

Please think about your procrastination when you are working on academic tasks (for example, studying for an exam or writing a term paper) outside of class.

Please rate the degree to which...

	Not at all agree (1)	A little agree (2)	Moderately agree (3)	Strongly agree (4)	Totally agree (5)
1. …you procrastinate in this course.	◯	◯	◯	◯	◯
2. …you feel that procrastination in this course is a problem for you.	◯	◯	◯	◯	◯
3. …you delay tasks for this course beyond what is reasonable.	◯	◯	◯	◯	◯

Part 3: Affect

This scale consists of a number of words that describe different feelings and emotions that you may have experienced recently in school.

For each item, indicate to what extent you felt this way <u>over the past two weeks in your [course #1]</u>.

	Not at all (1)	Very slightly (2)	Slightly (3)	Moderately (4)	Strongly (5)	Very strongly (6)	Totally (7)
1. Joyful	◯	◯	◯	◯	◯	◯	◯
2. Unhappy	◯	◯	◯	◯	◯	◯	◯
3. Worried/anxious	◯	◯	◯	◯	◯	◯	◯
4. Enjoyment/fun	◯	◯	◯	◯	◯	◯	◯
5. Depressed	◯	◯	◯	◯	◯	◯	◯
6. Pleased	◯	◯	◯	◯	◯	◯	◯

7. Happy	◯	◯	◯	◯	◯	◯	◯
8. Angry/hostile	◯	◯	◯	◯	◯	◯	◯
9. Frustrated	◯	◯	◯	◯	◯	◯	◯

(Note. Items 1, 4, 6, and 7 represent positive affect. Items 2, 3, 5, 8, and 9 represent negative affect.)

Course #2

Description of your course #2

Please enter your course code for your course #2 (for example, BIO-1140-A)

Please enter the full name of your professor for your course #2.

(Note. The participant completes the same questionnaires as those shown in Parts 1 to 3, but this time, the questionnaires refer to the course #2).

Course #3

Description of your course #3

Please enter your course code for your course #3 (for example, ADM-1100-M)

Please enter the full name of your professor for your course #3.

(Note. The participant completes the same questionnaires as those shown in Parts 1 to 3, but this time, the questionnaires refer to the course #3).

Course #4

Description of your course #4

Please enter your course code for your course #4 (for example, CRM-1301-D)

Please enter the full name of your professor for your course #4.

(Note. The participant completes the same questionnaires as those shown in Parts 1 to 3, but this time, the questionnaires refer to the course #4).

Course #5

Description of your course #5

Please enter your course code for your course #5 (for example, HSS-1101-C)

Please enter the full name of your professor for your course #5.

(Note. The participant completes the same questionnaires as those shown in Parts 1 to 3, but this time, the questionnaires refer to the course #5).

Course #6

Description of your course #6

Please enter your course code for your course #6 (for example, PHI-1103-B)

Please enter the full name of your professor for your course #6.

(Note. The participant completes the same questionnaires as those shown in Parts 1 to 3, but this time, the questionnaires refer to the course #6).

Appendix C

Instructions and Questionnaires Used in Article 3

Section 1: Background information

Please indicate your gender.

◯ Male

◯ Female

◯ You don't have an option that applies to me. I identify as (please specify)

What is your age?

Section 2: Life domains

Information about life domains

In this section, you will be asked to evaluate your personal experience in each life domain in which you are involved.

You will be asked the same questions for each life domain. This section may seem repetitive. Please note that our goal is not to see if you will respond in the same manner across all your life domains. **Our goal is really to understand your specific behaviors and feelings in each life domain.**

Please do your best to provide the information in all the life domains in which you are involved. This is extremely important for the success of our research project.

Thanks!

Please select ALL the domains in which you are involved.

☐ Career (e.g., jobs, employment, earning a living)

☐ Community (e.g., volunteering, political activism)

☐ Education (e.g., school, studying, getting good grades)

☐ Parenting (e.g., interactions with offspring or children)

☐ Family (e.g., interactions with parents and siblings)

☐ Finance (e.g., creating a budget, decisions about money)

☐ Friends (e.g., interactions with close others)

☐ Health (e.g., exercise, diet, avoiding or treating illness)

☐ Leisure (e.g., sports, recreation, hobbies)

☐ Romance (e.g., love, sex, dating, marriage)

☐ Spirituality (e.g., religion, philosophy, the meaning of life)

☐ Self-improvement (e.g., improving oneself in terms of abilities, attitudes, behaviors)

Domain #1: Career

Are you involved in the following life domain: **Career** (e.g., jobs, employment, earning a living)?

◯ Yes

◯ No

(*Note. If the answer is "yes", the participant completes the questionnaires in Parts 1 to 5. If the answer is "no", the participant skips the career domain and goes to the next domain*).

Part 1: Motivation

The items below describe potential reasons why people are involved in [the career domain]. Please rate the extent to which each of these items corresponds to one of the reasons why you are involved in this domain.

I am involved in [**the career domain**] because...

	Not at all for this reason (1)	Very slightly for this reason (2)	Slightly for this reason (3)	Moderately for this reason (4)	Strongly for this reason (5)	Very strongly for this reason (6)	Totally for this reason (7)
1. Because I truly love it.	◯	◯	◯	◯	◯	◯	◯
2. In order not to feel ashamed.	◯	◯	◯	◯	◯	◯	◯
3. It is part of who I am as a person.	◯	◯	◯	◯	◯	◯	◯
4. Somebody is putting pressure on me.	◯	◯	◯	◯	◯	◯	◯
5. I feel that it is important for me.	◯	◯	◯	◯	◯	◯	◯

6. I do it, but it is not motivating.	◯	◯	◯	◯	◯	◯	◯
7. I want to be rewarded.	◯	◯	◯	◯	◯	◯	◯
8. It is intrinsically satisfying.	◯	◯	◯	◯	◯	◯	◯
9. Otherwise, I would feel guilty.	◯	◯	◯	◯	◯	◯	◯
10. It clearly defines me as a person.	◯	◯	◯	◯	◯	◯	◯
11. I feel that others are pushing me to do it.	◯	◯	◯	◯	◯	◯	◯
12. In order to pursue goals that are important to me.	◯	◯	◯	◯	◯	◯	◯
13. I do it, without really knowing why I continue.	◯	◯	◯	◯	◯	◯	◯
14. I do it, but for no reason.	◯	◯	◯	◯	◯	◯	◯
15. It allows me to obtain something in return.	◯	◯	◯	◯	◯	◯	◯

(Note. Items 1 and 8 represent intrinsic regulation. Items 3 and 10 represent integrated regulation. Items 5 and 12 represent identified regulation. Items 2 and 9 represent introjected regulation. Items 4 and 11 represent external regulation.)

Part 2: Procrastination

Procrastination refers to when we delay starting or completing some task or activity even though we are aware that negative consequences will probably follow the delay.

Please think about [**the career domain**] and rate the degree to which...

	Not at all agree (1)	A little agree (2)	Moderately agree (3)	Strongly agree (4)	Totally agree (5)
1. …you procrastinate.	◯	◯	◯	◯	◯
2. …you feel that procrastination is a problem for you.	◯	◯	◯	◯	◯
3. …you delay tasks beyond what is reasonable.	◯	◯	◯	◯	◯

Part 3: Affect

This scale consists of a number of words that describe different feelings and emotions that you may have experienced recently during your involvement in [the career domain].

For each item, indicate to what extent you felt this way over **the past two weeks** during your involvement in [**the career domain**].

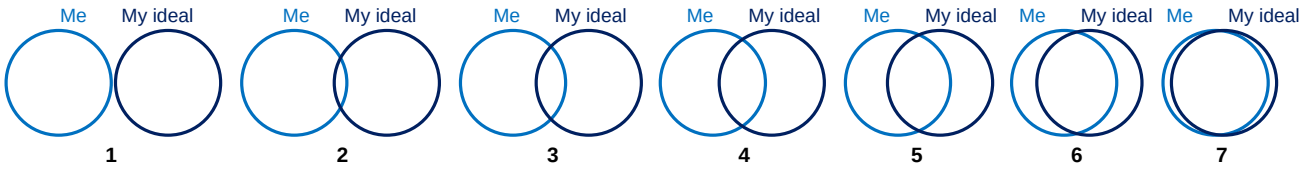
	Not at all (1)	Very slightly (2)	Slightly (3)	Moderately (4)	Strongly (5)	Very strongly (6)	Totally (7)
1. Joyful	◯	◯	◯	◯	◯	◯	◯
2. Unhappy	◯	◯	◯	◯	◯	◯	◯
3. Worried/anxious	◯	◯	◯	◯	◯	◯	◯
4. Enjoyment/fun	◯	◯	◯	◯	◯	◯	◯
5. Depressed	◯	◯	◯	◯	◯	◯	◯
6. Pleased	◯	◯	◯	◯	◯	◯	◯
7. Happy	◯	◯	◯	◯	◯	◯	◯
8. Angry/hostile	◯	◯	◯	◯	◯	◯	◯
9. Frustrated	◯	◯	◯	◯	◯	◯	◯

(Note. Items 1, 4, 6, and 7 represent positive affect. Items 2, 3, 5, 8, and 9 represent negative affect.)

Part 4: Self-Actual-to-Ideal Proximity

The following item represents the extent to which you currently feel close to your personal ideal.

Please think of your behaviors and accomplishments in [**the career domain**]. Based on the figure below, select the answer that best represents how close you feel to your personal ideal in this domain right now.



	1	2	3	4	5	6	7
How close do you feel to your personal ideal?	◯	◯	◯	◯	◯	◯	◯

Part 5: Goal Progress

Please refer to the goals that you have been pursuing in [the career domain].

In [**the career domain**]...

	Not at all (1)	Very slightly (2)	Slightly (3)	Moderately (4)	Strongly (5)	Very strongly (6)	Totally (7)
1. …you have progressed on your goals.	◯	◯	◯	◯	◯	◯	◯

2. …you have made progress toward the realization of your goals.	◯	◯	◯	◯	◯	◯	◯
3. …you have advanced toward your goals.	◯	◯	◯	◯	◯	◯	◯

Domain #2: Community

Are you involved in the following life domain: **Community** (e.g., volunteering, political activism)?

◯ Yes

◯ No

(*Note. If the answer is "yes", the participant completes the same questionnaires as those shown in Parts 1 to 5, but this time, the questionnaires refer to the community domain. If the answer is "no", the participant skips the community domain and goes to the next domain*).

Domain #3: Education

Are you involved in the following life domain: **Education** (e.g., school, studying, getting good grades)?

◯ Yes

◯ No

(*Note. If the answer is "yes", the participant completes the same questionnaires as those shown in Parts 1 to 5, but this time, the questionnaires refer to the education domain. If the answer is "no", the participant skips the education domain and goes to the next domain*).

Domain #4: Parenting

Are you involved in the following life domain: **Parenting** (e.g., interactions with offspring or children)?

◯ Yes

◯ No

(*Note. If the answer is "yes", the participant completes the same questionnaires as those shown in Parts 1 to 5, but this time, the questionnaires refer to the parenting domain. If the answer is "no", the participant skips the parenting domain and goes to the next domain*).

Domain #5: Family

Are you involved in the following life domain: **Family** (e.g., interactions with parents and siblings)?

◯ Yes

◯ No

(*Note. If the answer is "yes", the participant completes the same questionnaires as those shown in Parts 1 to 5, but this time, the questionnaires refer to the family domain. If the answer is "no", the participant skips the family domain and goes to the next domain*).

Domain #6: Finance

Are you involved in the following life domain: **Finance** (e.g., creating a budget, decisions about money)?

◯ Yes

◯ No

(*Note. If the answer is "yes", the participant completes the same questionnaires as those shown in Parts 1 to 5, but this time, the questionnaires refer to the finance domain. If the answer is "no", the participant skips the finance domain and goes to the next domain*).

Domain #7: Friends

Are you involved in the following life domain: **Friends** (e.g., interactions with close others)?

◯ Yes

◯ No

(*Note. If the answer is "yes", the participant completes the same questionnaires as those shown in Parts 1 to 5, but this time, the questionnaires refer to the friends domain. If the answer is "no", the participant skips the friends domain and goes to the next domain*).

Domain #8: Health

Are you involved in the following life domain: **Health** (e.g., exercise, diet, avoiding or treating illness)?

◯ Yes

◯ No

(*Note. If the answer is "yes", the participant completes the same questionnaires as those shown in Parts 1 to 5, but this time, the questionnaires refer to the health domain. If the answer is "no", the participant skips the health domain and goes to the next domain*).

Domain #9: Leisure

Are you involved in the following life domain: **Leisure** (e.g., sports, recreation, hobbies)?

◯ Yes

◯ No

(*Note. If the answer is "yes", the participant completes the same questionnaires as those shown in Parts 1 to 5, but this time, the questionnaires refer to the leisure domain. If the answer is "no", the participant skips the leisure domain and goes to the next domain*).

Domain #10: Romance

Are you involved in the following life domain: **Romance** (e.g., love, sex, dating, marriage)?

◯ Yes

◯ No

(*Note. If the answer is "yes", the participant completes the same questionnaires as those shown in Parts 1 to 5, but this time, the questionnaires refer to the romance domain. If the answer is "no", the participant skips the romance domain and goes to the next domain*).

Domain #11: Spirituality

Are you involved in the following life domain: **Spirituality** (e.g., religion, philosophy, the meaning of life)?

◯ Yes

◯ No

(*Note. If the answer is "yes", the participant completes the same questionnaires as those shown in Parts 1 to 5, but this time, the questionnaires refer to the spirituality domain. If the answer is "no", the participant skips the spirituality domain and goes to the next domain*).

Domain #12: Self-improvement

Are you involved in the following life domain: **Self-improvement** (e.g., improving oneself in terms of abilities, attitudes, behaviors)?

◯ Yes

◯ No

(*Note. If the answer is "yes", the participant completes the same questionnaires as those shown in Parts 1 to 5, but this time, the questionnaires refer to the self-improvement domain. If the answer is "no", the participant skips the self-improvement domain and goes to the end of the survey*).

Section 3: Last question of the survey

Did you answer the questions in this survey honestly?

◯ Yes

◯ No

Appendix D

Research Ethics Board (REB) – Approval for Study 1

File Number: H06-14-23 Date (mm/dd/yyyy): 07/31/2014

Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

University of Ottawa
Office of Research Ethics and Integrity

Ethics Approval Notice

Health Sciences and Science REB

Principal Investigator / Supervisor / Co-investigator(s) / Student(s)

First Name	Last Name	Affiliation	Role
Patrick	Gaudreau	Social Sciences / Psychology	Principal Investigator
Kristina	Kljajic	Social Sciences / Psychology	Project Coordinator

File Number: H06-14-23

Type of Project: Professor

Title: How do you manage your time in each of your courses?

Approval Date (mm/dd/yyyy)	Expiry Date (mm/dd/yyyy)	Approval Type
07/31/2014	07/30/2015	Ia

(Ia: Approval, Ib: Approval for initial stage only)

Special Conditions / Comments:
N/A

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Appendix E

Research Ethics Board (REB) – Approval for Study 2

30/09/2019

Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

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CERTIFICAT D'APPROBATION ÉTHIQUE | CERTIFICATE OF ETHICS APPROVAL

Numéro du dossier / Ethics File Number	H-08-19-4692
Titre du projet / Project Title	A survey on your academic experience in each of your courses
Type de projet / Project Type	Thèse de doctorat / Doctoral thesis
Statut du projet / Project Status	Approuvé / Approved
Date d'approbation (jj/mm/aaaa) / Approval Date (dd/mm/yyyy)	30/09/2019
Date d'expiration (jj/mm/aaaa) / Expiry Date (dd/mm/yyyy)	29/09/2020

Équipe de recherche / Research Team

Chercheur / Researcher	Affiliation	Role
Kristina KLJAJIC	École de psychologie / School of Psychology	Chercheur Principal / Principal Investigator
Patrick GAUDREAU	École de psychologie / School of Psychology	Superviseur / Supervisor

Conditions spéciales ou commentaires / Special conditions or comments

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Appendix F

Research Ethics Board (REB) – Approval for Study 3

31/01/2020

Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

University of Ottawa
Office of Research Ethics and Integrity

CERTIFICAT D'APPROBATION ÉTHIQUE | CERTIFICATE OF ETHICS APPROVAL

Numéro du dossier / Ethics File Number	H-12-19-5035
Titre du projet / Project Title	A survey on your personal experience across life domains
Type de projet / Project Type	Thèse de doctorat / Doctoral thesis
Statut du projet / Project Status	Approuvé / Approved
Date d'approbation (jj/mm/aaaa) / Approval Date (dd/mm/yyyy)	31/01/2020
Date d'expiration (jj/mm/aaaa) / Expiry Date (dd/mm/yyyy)	30/01/2021

Équipe de recherche / Research Team

Chercheur / Researcher	Affiliation	Rôle
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Patrick GAUDREAU	École de psychologie / School of Psychology	Superviseur / Supervisor

Conditions spéciales ou commentaires / Special conditions or comments

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