Motivation-Focused Thinking: Sustaining Goal Striving and Well-Being for Young Adults Navigating a Challenging Life Course Transition

by

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A Thesis submitted to the Faculty of Graduate Studies of

The University of Manitoba

in partial fulfillment of the requirements of the degree of

DOCTOR OF PHILOSOPHY

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Acknowledgments

This thesis would not have been possible without the support of many people. First and foremost, I would like to thank my advisor and mentor, Ray, whose passion for science, dedication to excellence, and extraordinary support contributed greatly to this thesis and my professional development. I am thankful for my committee members Judy, Jason, and Rod. Their insightful questions, feedback, and mentorship made the process rewarding throughout. Thank-you to Steve, who is always willing to take time out of his schedule to help out or engage in a good debate; and Patti, whose friendship and sense of humor made graduate school enjoyable. I would also like to express my appreciation to the Social Sciences and Humanities Research Council of Canada, the Winnipeg Foundation, University of Manitoba's Centre on Aging, and the University of Manitoba for providing financial support during my doctoral program. I am very grateful to my parents. Whether it was stimulating my interest in reading at a very early age, strongly encouraging me to learn the cello in adolescence, or asking to read this thesis, they have always supported my educational pursuits. Finally, thank-you to Naomi, who saw me through.

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Abstract

Developmental transitions are experienced throughout the life-span and necessitate adapting to significant and unpredictable changes (Heckhausen et al., 2010; Perry, 2003). The shift from high school to university in young adulthood serves as an exemplar of how these challenging junctures can undermine motivation and well-being. Recent evidence suggests that most (85%) young adults making this transition feel overwhelmed, half (50%) experience immense anxiety (ACHA, 2012), and more than one quarter (28%) withdraw from their institutions by the end of their first year (Snyder & Dillow, 2013). The present dissertation was designed to counter these developments by conducting a systematic analysis of whether motivation-focused thinking (selective secondary control) sustained young adults' goal striving, goal attainment, and well-being based on propositions stemming from the motivational theory of life-span development (Heckhausen et al., 2010). Study 1 comprised a seven-month field study and showed that motivation-focused selective secondary control striving positively predicted young adults use of behavior-focused selective primary control strategies, which in turn influenced academic performance. Study 2 was based on a seven-month field study and built on Study 1 by demonstrating that increasing selective secondary control striving was related to lower levels of depressive and stress-related physical symptoms for young adults with low high school grades. These effects were mediated by theoretically-derived mechanisms involving selective primary control and discrete emotions. Building on the preceding studies, Study 3 involved a seven-month, pre-post, field design and showed that students with low high school grades and high perceived control who received a motivation-enhancing selective secondary control treatment attained year-end course

grades that were 8% higher than their no-treatment peers (74.85% vs. 66.68%). Consistent with theory, treatment effects were mediated by selective secondary and primary control strategies and emotions. Findings from these studies advance the literature by documenting previously unexplored antecedents, consequences, mediators, moderators, and manipulations (treatment) of selective secondary control for young adults in the midst of a challenging life course transition.

Keywords: motivation-enhancing treatment, goal engagement, secondary and primary control strategies, perceived control, academic performance, well-being

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1. Hamm, J. M., Stewart, T. L., Perry, R. P., Clifton, R. A., Chipperfield, J. G., & Heckhausen, J. (2013). Sustaining primary control striving for achievement goals during challenging developmental transitions: The role of secondary control strategies. *Basic and Applied Social Psychology, 35,* 286-297. doi:10.1080/01973533.2013.785404

2. Hamm, J. M., Perry, R. P., Chipperfield, J. G., Stewart, T. L., & Heckhausen, J. (2015). Motivation-focused thinking: Buffering against stress-related physical symptoms and depressive symptomology. *Psychology & Health, 30,* 1326-1345. doi:10.1080/08870446.2015.1050394

The above publications appear in this dissertation as Chapters 2 and 3, respectively. Copyright permissions have been obtained from the publisher, Taylor and Francis, and all co-authors.

Contributions of Authors

Chapters 2-4 of this dissertation include material that is the result of joint research with Drs. Raymond Perry, Judith Chipperfield, Jutta Heckhausen, Tara Stewart, Rodney Clifton, and Ms. Patti Parker. The extent of the co-authorship for these manuscripts is described below.

For each study described in Chapter 2-4 of this dissertation, I was responsible for idea conception, literature searches, conducting all data analyses, interpreting the results, and writing the first and all subsequent drafts of the manuscript.

For the studies described in Chapters 2-4, Drs. Raymond Perry (Chapters 2-4), Judith Chipperfield (Chapters 2-4), Jutta Heckhausen (Chapters 2-4), Tara Stewart (Chapters 2-3), Rodney Clifton (Chapter 2), and Ms. Patti Parker (Chapter 4) provided advice and assistance in all aspects of the project. This included reviewing the results, aiding in their interpretation, providing suggestions for further analysis, and guiding revisions of the manuscript through detailed feedback.

With the exception of the above qualifications, I hereby certify that this dissertation and the research therein is the product of my own work.

CHAPTER 1

General Introduction

Life course transitions occur in semi-structured intervals throughout the life-span and provide optimal time windows of opportunity to pursue consequential developmental goals (e.g., first job, marriage; Heckhausen, 1997; Heckhausen, Wrosch, & Schulz, 2010). However, these junctures are also imbued with substantial uncertainty and require individuals to strive for transition-relevant and age-sensitive goals while adapting to challenges associated with entering a new environment (e.g., school, work place; Haase, Heckhausen, & Silbereisen, 2012; Perry, 2003). For instance, young adults navigating the landmark shift from high school to university have ample opportunity to pursue a critical developmental goal (i.e., a university education). But their success depends on persistent goal engagement in the face of novel challenges that include frequent failures, unstable social networks, new living arrangements, and critical career choices (Perry, 1991; Perry, Hladkyj, Pekrun & Pelletier, 2001).

Recent evidence points to the difficulties of sustaining motivation and well-being under such conditions. A study of over 28,000 university students revealed that, within the previous year, 45% felt things were hopeless, 50% experienced immense anxiety, and 85% were overwhelmed by their responsibilities (American College Health Association [ACHA], 2012). Moreover, 30% of students reported being so depressed that they had difficulty functioning at least once during the past 12 months (ACHA, 2012). The fact that 11% of respondents were either diagnosed or treated for depression during the last year suggests that university students are approximately 57% more likely to be clinically

depressed than adults in the general American population (ACHA, 2012; Kessler, Chiu, Demler, & Walters, 2005).[1]

The ubiquitous uncertainties inherent in the school-to-university transition may also compromise motivation and goal pursuit in some students before they even leave their high schools: Despite the fact that 72% of high school students graduate, only 50% enroll in post-secondary institutions (see Perry, 2003). Further, many of those who enroll in universities struggle to sustain their goal striving in these novel and increasingly competitive achievement settings. National estimates by the U.S. Department of Education indicate nearly 30% of freshman students in four-year programs withdraw from their institutions within their first year and only 57% graduate after six years (Snyder & Dillow, 2013).

These findings highlight the need for further research on psychological factors that can protect motivation and well-being for young adults negotiating the challenging life course transition to university. Situated within the *motivational theory of life-span development* (MTLD; Heckhausen et al., 2010), selective secondary control (motivation-focused thinking) represents one such factor that may also be amenable to manipulation using treatment interventions. According to Heckhausen et al. (2010), selective secondary control strategies target cognitive and affective resources to sustain motivation and goal striving when individuals face difficult obstacles during goal pursuit. Given that life-course transitions commonly involve setbacks and that continued engagement during these periods predicts consequential health and achievement outcomes (e.g., Haase, Heckhausen, & Köller, 2008; Haynes, Heckhausen, Chipperfield, Perry, Newall, 2009;

[1]This calculation is based on an 11% prevalence among American university students (ACHA, 2012) relative to a 7% prevalence in the American general population (Kessler et al., 2005).

Perry, 2003), selective secondary control may have benefits for young adults making the school-to-university shift. However, this form of motivation-focused thinking has remained largely unexamined in previous studies of young adults in transition.

The present dissertation examined the effects of selective secondary control on university students' goal striving, goal attainment, and well-being in a series of three studies based on Heckhausen et al.'s MTLD theory (2010). Study 1 assessed whether selective secondary control strategies facilitated students' use of (behavior-focused) selective primary control strategies over time. Study 1 also tested whether behavior-focused strategies mediated selective secondary control effects on academic performance. Building on the first study, Study 2 examined the impact of selective secondary control striving on critical indicators of students' psychological (depressive symptoms) and physical well-being (stress-related physical symptoms). Study 2 also simultaneously tested *how* (mechanisms) and *under what conditions* (moderators) selective secondary control influenced these outcomes. Study 3 assessed the achievement effects of a motivation-enhancing treatment intervention designed to enhance selective secondary control striving. Based on the preceding studies, Study 3 examined factors that moderated and mediated treatment effects on two-semester academic performance. See Figure 1 for a summary of the hypothesized models tested in Studies 1-3.

Each study stemmed from the Motivation and Academic Achievement (MAACH) database which contains psychosocial and performance data for over 20 separate cohorts of introductory psychology students (1992 to 2015). Studies were based on MAACH cohorts that contained data on all pertinent variables. See Figure 2 for an overview of the MAACH quasi-experimental treatment design paradigm. A detailed description of each

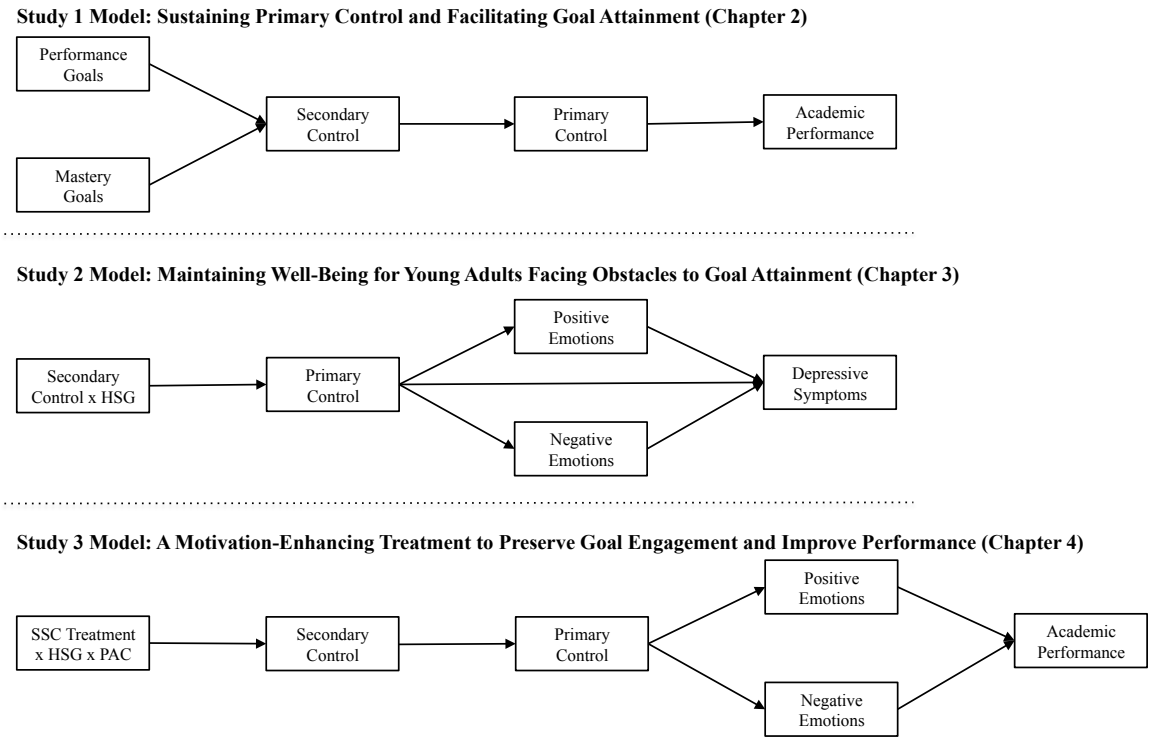

Figure 1. A summary of the models tested in Studies 1-3. HSG = high school grade. SSC treatment = selective secondary control treatment.

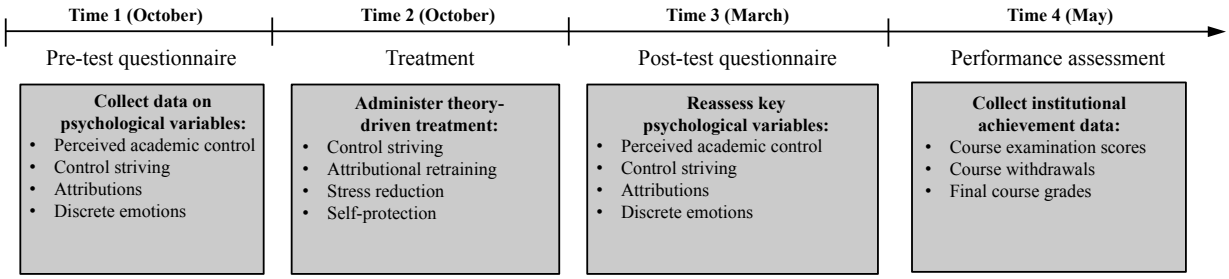

Figure 2. An overview of the Emotion, Motivation, and Control Research (EMCOR) quasi-experimental treatment design paradigm.

study is provided following an overview of the MTLD (see Chapters 2-4).

The Motivational Theory of Life-Span Development

In accordance with other established developmental theories (e.g., Baltes & Baltes, 1990; Brandtstädter, 2006), the MTLD posits that selection and compensation are fundamental regulatory challenges faced by individuals throughout the life course (Heckhausen et al., 2010). Selection mechanisms are processes that regulate goal choice to maximize long-term value and diversity. Because it is not feasible to pursue all available opportunities within a given domain, selection mechanisms are fundamental to establishing which goals to pursue and when to pursue them. Compensation mechanisms represent complementary processes that promote recovery after failing to achieve sought after goals. Compensation is essential considering that failure experiences are ubiquitous, and effectively coping with these setbacks is critical to long-term psychological well-being and goal striving.

Heckhausen and colleagues (Heckhausen et al., 2010; Schulz & Heckhausen, 1996) assert that humans routinely employ primary and secondary control strategies that stem from these overarching regulatory mechanisms. *Selective primary control* involves strategies that target external behavioral resources in order to pursue goals (e.g., attending class, taking notes, or investing time and effort in studying for an exam). *Selective secondary control* involves strategies that target internal cognitive and affective resources in order to sustain volitional goal commitment (e.g., thinking about the pride one will experience after doing well in a difficult course, reflecting on past successes in order to enhance one's perceived control over performance on an upcoming test, or consciously downplaying interpersonal goals when studying for a final exam). *Compensatory primary*

control involves strategies that target unusual external resources to overcome personal limitations (e.g., requesting a friend's help in studying for a test). Finally, *compensatory secondary control* involves strategies that target internal cognitive and affective resources to buffer the potentially negative effects of failed goal pursuit (e.g., downplaying the significance of a failed exam).[2]

Heckhausen et al. (2010) recently refined their conceptual model by elaborating on the function of these four control strategies, categorizing them based on whether they facilitate goal engagement or goal disengagement. Selective primary control, selective secondary control, and compensatory primary control are theorized to act in service of goal engagement (i.e., facilitate active goal pursuit). In contrast, compensatory secondary control is posited to act in service of goal disengagement (i.e., promote relinquishing of obsolete goals).

Although goal engagement may appear the more adaptive of the two motives, Heckhausen et al. (2010) argue that neither goal engagement nor disengagement is adaptive per se. Rather, they propose that a meta level selection process, *optimization*, determines the functionality of engagement versus disengagement. In particular, whether or not goal engagement is strategic is based on three considerations concerning the optimization of a person's long-term primary control potential, which is the fundamental criterion of adaptive development according to MTLD theory (Heckhausen & Schulz, 1995; Heckhausen et al., 2010).

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[2]Note that there are important theoretical distinctions between control *beliefs* and control *strategies*. In brief, strategies concern the *means* through which individuals intend to exercise control, whereas beliefs concern the *perceptions* individuals have about their capacity to exercise control. For instance, a student may believe that increasing the effort she puts into her course-work will increase her grade (control belief), yet she may not intend to come to lectures, take notes, or study (control strategies). Because this dissertation focuses on the largely neglected influence of control striving during the life course transition from school to university, the term *control* will refer to *control strategies* unless otherwise noted. The term *perceived control* will be used when referring to control beliefs.

First, there must be compatibility between the opportunity and the goal, such that the objective is actually attainable. There is little value in investing considerable time and effort in striving for goals beyond one's capacity or not supported by one's environment (e.g., pursuing graduate school with a undergraduate grade point average of 2.0). Second, the long-term gains of pursuing a goal in one domain should outweigh the costs to fundamental, developmental goals in other domains (e.g., pursuing a graduate degree should not preclude marrying or having children). Third, a minimum diversity of goals must be maintained in order to protect control potential over time and across domains (e.g., intensely pursuing career goals while neglecting personal well-being may precipitate health declines that jeopardize one's long-term capacity to influence important outcomes in both domains).

In sum, Heckhausen et al.'s (2010) MTLD consolidates their previous work with the life-span theory of control (Heckhausen & Schulz, 1995), the model of optimization in primary and secondary control (Heckhausen, 1999), and the action-phase model of developmental regulation (Heckhausen, Wrosch, & Fleeson, 2001). By integrating these conceptual models, Heckhausen et al. (2010) have created a comprehensive theory of life-span development that can generate testable hypotheses for individuals' motivated behavior and coping with changing opportunities throughout the life-course and across domains. As described in Chapters 2-4, the present dissertation built on Heckhausen et al. (1995, 2010) by examining previously untested theoretical propositions concerning selective secondary control. Thus, Studies 1-3 advanced the literature by assessing the antecedents, consequences, mediators, moderators, and manipulations (treatment) of selective secondary control for young adults facing a challenging life course transition.

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CHAPTER 2

Study 1: Sustaining Primary Control Striving for Achievement Goals During Challenging Developmental Transitions: The Role of Secondary Control Strategies

Disconcerting university dropout (nearly 30%) and graduation rates (less than 60%) underscore the value of factors that can facilitate persistence and achievement during the challenging school-to-university transition (see Barefoot, 2004; Feldman, 2005; and Tinto, 2010). An encouraging line of research has demonstrated that behavior-focused primary control strategies, such as investing effort in pursuit of valued goals, promotes goal attainment in competitive achievement settings (e.g., Phan, 2011; Haase, Heckhausen, & Köller, 2008). And yet, due to the novel and unpredictable challenges outlined in Chapter 1, developmental transitions have the capacity to undermine the use of adaptive primary control strategies in even the most engaged individuals (Perry, 2003). Thus, cognitive secondary control strategies (motivation-focused thinking) responsible for sustaining primary control striving during developmental shifts may have significant consequences for the realization of coveted goals (e.g., academic achievement, employment), but have been largely neglected in the literature.

Based on Heckhausen, Wrosch, and Schulz (2010), Study 1 examined whether motivation-focused thinking (cognitive secondary control strategies) fostered continued goal pursuit (behavioral primary control strategies) during a difficult transition. Hence, this study was designed to provide an empirical test of a fundamental, but previously unexplored, prediction in the motivational theory of life-span development: that selective secondary control strategies sustain selective primary control striving over time. In accordance with Heckhausen et al. (2010), it was expected that students' use of cognitive

selective secondary control strategies would predict their use of behavioral selective primary control strategies which would in turn predict academic achievement. These predictions were tested longitudinally using a sample of young adults in the midst of the challenging transition from high school to university because theory suggests that selective secondary control is most needed when individuals face obstacles and setbacks (Heckhausen et al., 2010).

Control Striving and Achievement

Given the adaptive value of enacting selective primary control strategies in such domains as aging, health, and physical disability (Chipperfield & Perry, 2006; Chipperfield, Perry, Bailis, Ruthig, & Chuchmach, 2007; Hall, Chipperfield, Heckhausen, & Perry, 2010; Haynes, Heckhausen, Chipperfield, Perry, & Newall, 2009; Wahl, Becker, Burmedi, & Schilling, 2004), the dearth of research examining their effects in competitive achievement settings is surprising. One of the few studies to investigate primary control strategies in such a setting was conducted by Haase et al. (2008). They found that goal engagement, comprising selective primary and selective secondary control strategies, predicted securing an apprenticeship after graduation for females and positive affect in both males and females. Although Haase et al.'s (2008) study suggests the adaptive value of using a combination of selective primary and selective secondary control strategies in achievement settings, it fails to elucidate their distinct but complimentary effects.

Beyond the control literature, researchers have examined a range of behavioral strategies in relation to achievement goals and academic attainment. This research suggests that achievement goals are positively associated with behavioral strategies that

are commensurate with selective primary control strategies, including deep study strategies, persistence, and effort (Grant & Dweck, 2003; Liem, Lau, & Nie, 2008). Further, in a recent study linking achievement goals and control, Daniels (2009) found that achievement goals predicted students' perceived capacity to enact primary control strategies. Behavioral strategies are also directly implicated in academic attainment. For instance, students who attend class, exert more effort, and employ deep study strategies tend to achieve higher grades (Pekrun, Goetz, Daniels, Stupnisky, & Perry, 2010; Phan, 2011; Rosenbaum, 2001). Thus, a growing body of research suggests that selective primary control striving influences important achievement-related outcomes in competitive attainment settings.

However, sustaining primary control striving can be difficult when faced with the time constraints, competing goals, and initial failure common to developmental transitions. Under such conditions, selective secondary control strategies may play a critical role in buttressing selective primary control striving. Yet, the influence of selective secondary control strategies has gone largely unstudied. Only two studies to date have examined the influence of selective secondary control strategies in competitive achievement settings. Poulin and Heckhausen (2007) explored the effects of selective secondary and selective primary control strategies in youth searching for apprenticeships during a time-urgent period. They found that increased use of selective secondary control strategies reduced the detrimental effect of stressful events (death of a family member or parental divorce) on selective primary control striving (to obtain an apprenticeship). Thus, selective secondary control strategies protected primary control striving for time-limited goals in the midst of negative life events.

More recently, Hamm et al. (2011) conducted the first study to examine selective secondary control's effects for university students. Their longitudinal (seven month) findings showed that students with subpar high school grades who more frequently employed selective secondary control strategies reported a greater perceived capacity to enact selective primary control strategies and achieved higher final grades in a two-semester course. Hence, these two studies begin to provide evidence for the utility of selective secondary control in competitive achievement settings.

However, the specific mechanisms through which selective secondary control influences achievement have not yet been considered. From Heckhausen et al.'s (2010) perspective, selective secondary control has the potential to positively impact achievement outcomes as a function of its capacity to sustain and enhance motivation, goal commitment, and goal striving behaviors. Consequently, further research is needed to examine the effects of selective secondary control in competitive achievement settings and the means through which selective secondary control influences goal attainment.

Selective Secondary Control: Facilitating the Realization of Achievement Goals by Sustaining Selective Primary Control Striving Over Time

Study 1 provided an empirical test of critical, but understudied, linkages in Heckhausen et al.'s (2010) motivational theory of life-span development. In particular, the present study was designed to examine selective secondary control's capacity to promote selective primary control striving for valued achievement goals over time. However, the temporal sequence with which young adults experiencing an important developmental transition employ these strategies was also of interest. Consequently, Study 1 was guided by a conceptual model based on previous theory and research

(Heckhausen et al., 2010; Pekrun, 2006; Schulz & Heckhausen, 1996; see also Daniels, 2009; Hamm et al., 2011).

The model posits that achievement goals influence selective secondary control, which in turn influences selective primary control in a longitudinal sequence (see Figure 1). Because selective secondary control strategies focus on enhancing volitional goal commitment (Heckhausen, 1997; Heckhausen, Wrosch, & Fleeson, 2001), the endorsement of goals should precede the use of selective secondary control; logically, an individual must be committed to pursuing a goal prior to using cognitive strategies to enhance or sustain the goal. Further, the motivational theory of life-span development is firmly rooted in the contention that maintaining and enhancing one's selective primary control potential represents the key criterion for adaptive development (Heckhausen & Schulz, 1995; Heckhausen et al., 2010). The remaining three control strategies (i.e., selective secondary control, compensatory primary control, compensatory secondary control) are functional to the extent that they promote selective primary control. Therefore, selective secondary control's ultimate purpose is to enhance and maintain selective primary control. In keeping with this logic, selective secondary control was expected to predict selective primary control and, consequently, it was situated before selective primary control in the model.[3]

In summary, it was expected that (a) achievement goals would predict the use of cognitive selective secondary control strategies; (b) achievement goals would also predict the use of behavioral selective primary control strategies, but that this relationship would

[3]Although important conceptual distinctions exist between mastery and performance achievement goals, their predicted effects do not differ in this study. It was expected that both mastery and performance goals would (a) positively predict selective secondary control and (b) indirectly influence selective primary control through selective secondary control.

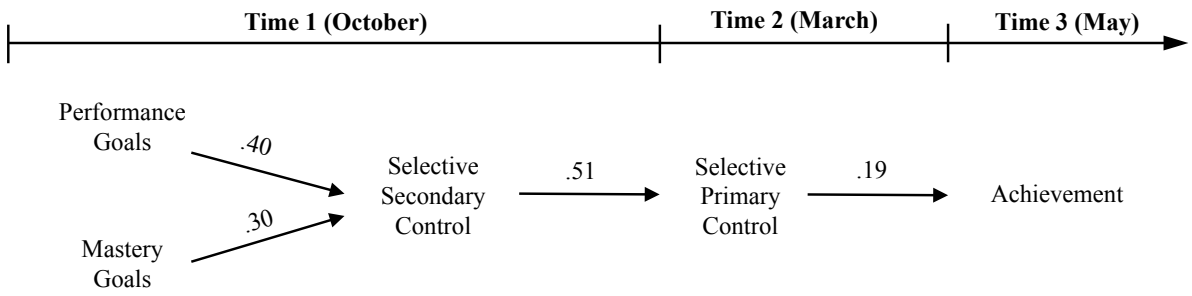

Figure 1. Proposed longitudinal sequence of achievement goals, control strategies, and achievement. Standardized regression weights for the direct effects are reported above each arrow.

be mediated by use of selective secondary control strategies; and (c) that selective primary control would predict academic achievement beyond well-established demographic variables, such as previous performance and gender.

Method

Participants and Procedures

The study sample was drawn from the Emotion, Motivation, and Control Research (EMCOR) database which contains psychosocial data for over two decades of separate cohorts of introductory psychology students (1992 to 2015). The 2007-08 dataset was used for Study 1 because data on all variables of interest were collected for this cohort. Data were collected in three phases during the academic year. At Time 1 (October), participants completed the first questionnaire in groups that varied between 20 and 60. At Time 2 (March), participants returned to complete a second questionnaire similar to the first questionnaire. Time 3 (May) consisted of acquiring consenting participants' final grades for their introductory psychology course after the second semester concluded.

Prior to testing the main hypotheses, two confirmatory factor analyses (CFAs) were conducted to validate the structure of the selective secondary and selective primary control subscales. The CFAs were based on data from a separate sample of students who did not participate in the main study but completed a questionnaire containing the same control subscales at Time 1 (n = 361). The main analyses were conducted using an independent sample of students who participated in the main study and had complete data at all three phases (n = 185). The majority of participants in this sample were enrolled full-time (92%), were 17-18 years old (69%), were native English speakers (75%), and

were female (72%). The sample was restricted to students who indicated that they were in their first year of university because this allowed an examination of the model among young adults striving to achieve consequential goals during a transition known for its negative academic effects.[4]

Measures (see Table 1)

High school grade (Time 1 covariate). Because admission to Canadian universities does not require SATs or ACTs, self-reported high school grade (HSG) was used as a measure of pre-existing aptitude (1 = *50% or less*, 10 = *91-100%*; *M* = 7.94, *SD* = 1.55, range = 2-10). Self-reported HSG was used as a proxy for actual high school achievement based on a strong relation between the two, *r* = .84 (Hall et al., 2007; Perry, Hladkyj, Pekrun, Clifton, & Chipperfield, 2005). Previous research has demonstrated that this self-report measure of HSG is a reliable and substantial predictor of post-secondary achievement, including final course grades, *r* = .40-.54; and grade point averages, *r* = .52-.54 (e.g., Perry, Hladkyj, Pekrun, & Pelletier, 2001; Perry et al., 2005; Perry, Stupnisky, Hall, Chipperfield, & Weiner, 2010).

Gender (Time 1 covariate). Gender was self-reported and coded categorically (1 = *female*, 2 = *male*; 72% female).

Achievement goals (Time 1). The Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich, Smith, Garcia, & McKeachie, 1993) was used to assess students' mastery- and performance-approach goals in accordance with previous research (Daniels et al., 2008; Daniels et al., 2009; Harackiewicz, Barron, Tauer, Carter, & Elliot, 2000). Four items measured performance goals (e.g., "If I can, I want to get better grades

[4]A series of *t*-tests indicated that the samples used in the CFA and main analyses did not differ (all *p*s > .05) on any of the main study variables measured at Time 1 (i.e., performance goals, mastery goals, selective secondary control, and selective primary control).

Table 1

Summary of the Study Variables

Measures	No. of items	Anchors	α	*M*	*SD*	Actual range
High school grade[a]	1	1 = 50% or less 10 = 91-100%	–	7.94	1.55	2-10
Gender[a]	1	1 = female 2 = male	–	1.28	.45	1-2
Performance goals[a]	4	1 = not at all true of me 7 = very true of me	.72	22.89	3.86	12-28
Mastery goals[a]	4	Same	.68	18.06	4.36	7-28
Secondary control[a]	5	1 = strongly disagree 5 = strongly agree	.62	20.39	2.92	10-25
Primary control[b]	4	Same	.77	17.13	2.56	8-20
Final grade[c]	1	Percent	–	77.61	11.55	51.70-98.48

Note. The descriptive statistics for secondary and primary control are based on the sample used in the CFA analyses.

[a]Time 1 measure. [b]Time 2 measure. [c]Time 3 measure.

in this class than most of the other students;" M = 22.89, SD = 3.86, range = 12-28, α = .72) and four measured mastery goals (e.g., "I prefer course material that really challenges me so I can learn new things;" M = 18.06, SD = 4.36, range = 7-28, α = .68). Students rated each item on a seven-point scale (1 = *not at all true of me*, 7 = *very true of me*).

Control strategies. Selective secondary and selective primary control strategies were measured using a variant of the Optimization in Primary and Secondary Control scale (OPS; Heckhausen, Schulz, & Wrosch, 1998). The OPS scale is a flexible instrument and has been tailored to assess task-specific control strategies in a variety of domains, including achievement, interpersonal relationships, health, and aging (Chipperfield & Perry, 2006; Haynes et al., 2009; Poulin & Heckhausen, 2007; Wrosch & Heckhausen, 1999). Because Study 1 focused on control strategies used by young adults in pursuit of academic goals, a modified version of the OPS scale was employed, the Academic-Specific Control Strategies scale (ACS).[5]

Selective secondary control strategies (Time 1). Students rated their agreement with five selective secondary control items (1 = *strongly disagree*, 5 = *strongly agree*; M = 20.39, SD = 2.92, range = 10-25, α = .62; e.g., "I often tell myself that I will be successful in reaching my educational goals").[6]

Selective primary control strategies (Time 2). Students indicated their agreement with four selective primary control items (1 = *strongly disagree*, 5 = *strongly agree*; M = 17.13, SD = 2.56, range = 8-20, α = .77; e.g., "I will work hard to get a good education).

[5]The ACS scale was created by Raymond P. Perry and Judith G. Chipperfield. Correspondence concerning the scale should be addressed to Judith G. Chipperfield at Judith.Chipperfield@ad.umanitoba.ca.
[6]Notably, one secondary control item (SSC2; See Appendix) may be interpreted as either a secondary or primary control strategy since it may suggest cognitive or behavioral persistence. Because this item was interpreted as implying cognitive persistence, it was included in the secondary control scale.

Academic achievement (Time 3). Academic achievement was measured using students' final grades (percentages) in their introductory psychology course (with possible values from 0 to 100%). Consenting students' final grades were collected from instructors after the second semester concluded (M = 77.62, SD = 11.55, range = 51.70-98.48). Visual inspection of the distribution of scores and box and whisker plots revealed a solitary lower bound outlier with a score of 27.35% on the achievement measure (Tabachnik & Fidell, 2007). Consequently, this student was omitted from the analyses due to statistical and conceptual issues. Statistically, extreme outliers have a disproportionate influence on the calculation of the regression line. Conceptually, students with scores this low are unrepresentative of the majority of students striving to adapt to the demands of first-year university.

Results

Confirmatory Factor Analyses

Confirmatory factor analyses (CFAs) were conducted on the selective secondary and selective primary control subscales because the ACS scale has been used only once in previous research (Hamm et al., 2011). These CFAs provided empirical tests of the theoretical structure of the selective secondary and selective primary control items and were computed using the separate Time 1 sample. Model fit was assessed using chi-square (χ^2), the comparison fit index (CFI), and the root mean square error of approximation (RMSEA) based on recommendations by Byrne (2001).

The CFA model for the five selective secondary control items had acceptable fit: χ^2 (5) = 13.28, p = .021; CFI = .96; RMSEA = .07; standardized item loading range = .30-.67 (see the Appendix for item wordings, loadings, and descriptive statistics). The CFA

model for the four selective primary control items also fit the data: χ^2 (2) = 4.11, p = .128; CFI = .99; RMSEA = .05; standardized item loading range = .58-.79 (see the Appendix). These CFA results demonstrate that the items comprising the selective secondary and selective primary control measures form satisfactory psychometric scales that conform to their theoretical underpinnings (Heckhausen et al., 2010). Based on these models, items from the selective secondary and selective primary control subscales were summed to create composite scores for each measure. All subsequent analyses involving selective secondary and selective primary control employ these composite measures.

Rationale for the Main Analyses

The main analyses employed sequential multiple-step regression to examine the effects of predictor variables on the dependent variables in the model (Tabachnick & Fidell, 2007). This procedure allowed for an examination of the direct and indirect effects of the predictor variables on the dependent variables following them in the proposed causal sequence. The multiple regression analyses were conducted in three separate steps. Step 1 examined the effects of the demographic covariates (high school grade, gender) and achievement goals (performance, mastery) on selective secondary control. Step 2 involved predicting selective primary control on the basis of the demographic covariates, achievement goals, and selective secondary control. Step 3 examined the effects of all variables on academic achievement. All correlations and standardized beta weights reported have a reliability of $p < .05$ (two-tailed).

As recommended by Preacher and Hayes (2008), a bootstrap approach was employed to examine the indirect effects of achievement goals on selective primary control (mediated by selective secondary control) and selective secondary control on

achievement (mediated by selective primary control). The bootstrap method used 95% bias corrected confidence intervals (*CI*s). Mediation was confirmed if zero fell outside of the confidence interval based on 20,000 samples of the unstandardized beta weights.

Preliminary Analyses

Correlation and variance inflation factor (VIF) coefficients were used to screen for multicollinearity among predictors prior to conducting the regression analyses. The correlation (all < .60) and VIF (all < 2.0) coefficients indicated that multicollinearity was not an issue (Neter, Kutner, Nachtsheim, & Wasserman, 1996; Tabachnick & Fidell, 2007). Correlation coefficients also allowed for an examination of the unadjusted relationships between the study variables (see Table 2). As expected, high school grades were strongly and positively related to final grades. Selective primary control and performance goals were also positively related to final grades. In accordance with the predictions, performance and mastery goals were positively correlated with selective secondary and selective primary control strategies. Selective secondary control was also strongly and positively related to selective primary control. These relationships provide preliminary support for the model. The regression analyses that follow serve to further explicate these associations in a temporal sequence.

Regression Analyses: Step 1

Selective secondary control was predicted on the basis of demographic covariates and achievement goals in the first step of the regression analyses (see Table 3). The demographic variables were entered first (Step 1.1) and did not reliably predict students' use of secondary control strategies (all βs *ns*).

Students' achievement goals were subsequently entered (Step 1.2). As expected,

Table 2

Zero-Order Correlation Matrix

	HSG	Gender	Performance goals	Mastery goals	Secondary control	Primary control	Final grade
HSG[a]	–						
Gender[a]	-.25**	–					
Performance goals[a]	.19**	-.01	–				
Mastery goals[a]	.03	.04	.11	–			
Secondary control[a]	.04	-.09	.42**	.34**	–		
Primary control[b]	.18*	-.17*	.22**	.29**	.55**	–	
Final grade[c]	.43**	-.12	.16*	.04	.11	.25**	–

Note. HSG = high school grade.

[a]Time 1 measure. [b]Time 2 measure. [c]Time 3 measure.

*$p < .05$, **$p < .01$ (two-tailed tests).

Table 3

Standardized Regression Coefficients and R^2 s for Selective Secondary Control (Time 1)

Predictors	Step 1.1	Step 1.2
Demographic covariates		
High school grade	.02	-.08
Gender	-.08	-.11
Achievement goals		
Performance		.40**
Mastery		.30**
R^2	.01	.27

*$p < .05$, **$p < .01$ (two-tailed tests).

both performance (β = .40) and mastery (β = .30) goals positively predicted selective secondary control. The inclusion of achievement goals increased the variance accounted for in selective secondary control by a substantial margin, $\Delta R^2 = .27$, $\Delta F(2, 180) = 32.97$, $p < .001$. Thus, students' use of selective secondary control strategies was largely related to their endorsement of achievement goals, regardless of whether these goals were performance or mastery oriented. However, performance goals were a stronger predictor of selective secondary control than were mastery goals. The model that included all predictors (i.e., demographic covariates and achievement goals) accounted for a substantial amount of the variance in selective secondary control (27%), $F(4, 180) = 16.95$, $p < .001$.[7]

Regression Analyses: Step 2

The second step in the regression analyses examined predictors of second semester selective primary control (see Table 4). The demographic covariates were entered first (Step 2.1), but they did not reliably predict students' use of selective primary control strategies (βs *ns*).

Achievement goals were entered second (Step 2.2), and both performance (β = .16) and mastery goals (β = .28) proved reliable predictors of selective primary control. The addition of achievement goals resulted in a significant increase in the variance accounted for in selective primary control, $\Delta R^2 = .11$, $\Delta F(2, 180) = 11.88$, $p < .001$. Selective secondary control was entered third (Step 2.3) and strongly predicted selective

[7]Because Step 1 was based on cross-sectional data (all variables were measured at Time 1), two supplementary analyses were conducted to explicate the relationship between achievement goals and selective secondary control (SSC) over time. First, SSC at Time 1 was correlated with its corresponding measure at Time 2 ($r = .61$). Second, a multiple regression analysis demonstrated that Time 2 SSC was reliably predicted by Time 1 measures of performance (β = .34) and mastery (β = .21) goals when controlling for high school grade and gender.

Table 4

Standardized Regression Coefficients and R^2 s for Longitudinal Selective Primary Control (Time 2)

Predictors	Step 2.1	Step 2.2	Step 2.3
Demographic covariates			
High school grade	.15	.10	.14*
Gender	-.13	-.15*	-.10
Achievement goals			
Performance		.16*	-.04
Mastery		.28**	.13
Secondary control			.51**
R^2	.05	.16	.35

*$p < .05$, **$p < .01$ (two-tailed tests).

primary control (β = .51). The inclusion of selective secondary control significantly increased the explained variance in selective primary control, $\Delta R^2 = .19$, $\Delta F(1, 179) = 51.55$, $p < .001$. The final model explained 35% of the variance in selective primary control, $F(5, 179) = 19.04$, $p < .001$.[8]

Bootstrapped tests indicated that selective secondary control significantly mediated the influence of both performance (*CI*s = .07 to .19) and mastery (*CI*s = .05 to .13) goals on selective primary control. As evidenced in Step 2.3, the influence of performance goals was fully mediated by selective secondary control. Mastery goals also became an unreliable predictor with selective secondary control included in the model, and 54% of mastery's total causal effect was mediated by selective secondary control.

Regression Analyses: Step 3

The effects of all predictor variables on students' final grades in introductory psychology were examined in Step 3 (see Table 5). The demographic covariates were entered in Step 3.1. Previous achievement (high school grade) was a strong and positive predictor of final grades (β = .43). Its effect was relatively constant, irrespective of the predictors added in the subsequent steps. Gender did not predict achievement (β *ns*).

Achievement goals were entered in Step 3.2, and neither performance nor mastery goals reliably predicted final grades (all βs *ns*). Selective secondary control was entered in Step 3.3 and also proved an unreliable predictor of final grades. This result was in accord with the model which specified that achievement effects of selective secondary control strategies would be indirect through selective primary control strategies.

[8]A supplemental multiple regression analysis was conducted to test whether Time 1 selective secondary control (SSC) predicted Time 2 selective primary control (SPC) beyond the autoregressive effects of Time 1 SPC. In line with the main analyses, Time 1 SSC (β = .27) reliably predicted Time 2 SPC when controlling for Time 1 SPC, high school grade, gender, and performance and mastery goals.

Table 5

Standardized Regression Coefficients and R^2 s for Final Grade in Introductory Psychology (Time 3)

Predictors	Step 3.1	Step 3.2	Step 3.3	Step 3.4
Demographic covariates				
High school grade	.43**	.42**	.42**	.40**
Gender	-.01	-.01	.00	.01
Achievement goals				
Performance		.07	.04	.05
Mastery		.01	-.01	-.04
Secondary control			.08	-.01
Primary control				.19*
R^2	.19	.19	.20	.22

*$p < .05$, **$p < .01$ (two-tailed tests).

As expected, selective primary control strategies contributed significantly to the prediction of final grades (β = .19), and its addition resulted in a significant increase in the variance accounted for in achievement, $\Delta R^2 = .02$, $\Delta F(1, 178) = 5.18$, $p = .024$. This finding is in line with previous research that has suggested the modest, but consistent, effect of selective primary control strategies on academic achievement (Pekrun et al., 2010; Phan, 2011; Rosenbaum, 2001). The final model accounted for 22% of the variance in academic achievement, $F(6, 178) = 8.42$, $p < .001$.

Finally, a bootstrap test revealed that selective secondary control had a significant indirect effect on achievement through its relationship with selective primary control (*CI*s = .08 to .80). Thus, selective secondary control positively influenced students' achievement via its association with selective primary control.

Discussion

The realization of valued goals in competitive achievement settings requires considerable persistence and self-regulation, particularly for young adults in the midst of the landmark transition from high school to university. Consequently, the present study examined the mechanisms through which goals are sustained and acted upon based upon theorized, but previously unexplored, pathways in the motivational theory of life-span development (Heckhausen et al., 2010). Results suggest that cognitive selective secondary control strategies (motivation-focused thinking) are of fundamental importance to student achievement, as these strategies facilitate the long-term enactment of the adaptive behaviors necessary to attain important achievement outcomes.

Selective Secondary Control: Facilitating Primary Control Striving for Achievement Goals

The relationships between achievement goals, selective secondary control, and selective primary control were largely as hypothesized. Achievement goals, whether performance- or mastery-oriented, proved to be reliable predictors of selective secondary control strategies. Interestingly, performance goals were a slightly better predictor of selective secondary control than were mastery goals. Driven by the ultimate intention of outperforming their peers (Dweck & Leggett, 1988; Hulleman, Schrager, Bodmann, & Harackiewicz, 2010), performance-oriented individuals may more frequently employ this form of motivation-focused thinking in an effort to sustain their use of selective primary control strategies which facilitate goal attainment.

This logic is largely in line with Heckhausen and colleagues (e.g., Poulin & Heckhausen, 2007) who argue that secondary control strategies are more likely to be used when an individual's goal pursuit is threatened. Performance goals have been linked to increased levels of anxiety and a fear of failure (Daniels et al., 2009; Elliot & Church, 1997). Hence, to the extent that heightened levels of anxiety and a fear of failure are indicators of perceived threat to one's goal pursuit, the strong link between performance goals and the use of selective secondary control strategies is logical and in accordance with the motivational theory of life-span development. Consequently, the use of cognitive selective secondary control strategies may represent an attempt at maintaining goal commitment when the goal is perceived as under threat which may be particularly relevant for students who strongly endorse performance goals. However, mastery goals' positive relationship with selective secondary control indicates that not only those who

are performance-oriented engage in motivation-focused thinking.

Achievement goals (both performance and mastery) proved to be reliable predictors of selective primary control strategies (behavioral goal pursuit) when selective secondary control was not included in model. Thus, individuals who strongly endorsed achievement goals also tended to frequently employ selective primary control strategies five months later. These results are consonant with previous research suggesting the influence of performance and mastery goals on selective primary control (Daniels, 2009). The respective magnitudes of their effects suggest that mastery goals have a slightly stronger influence on selective primary control strategies than performance goals. However, in line with the predictions, selective secondary control mediated the effects of both performance and mastery goals on selective primary control.

The influence of performance goals on primary control striving was fully mediated by selective secondary control—in fact, the standardized beta weight of performance goals was reduced from .16 to -.04. Mastery goals' effect was also largely mediated by selective secondary control (54%), and its standardized beta weight was reduced from .28 to .13. Thus, students endorsing performance goals profit from continued behavioral selective primary control striving only to the extent that performance goals predict an increased use in cognitive selective secondary control strategies. Similarly, students endorsing mastery goals benefit from an increment in their selective primary control chiefly attributable to mastery's influence on selective secondary control; over half of the effect of mastery goals was due to the mediating influence of selective secondary control. Hence, the behavioral enactment of both types of goals is facilitated by selective secondary control. As a consequence, students with

achievement goals who actively engage in these adaptive cognitive strategies are more inclined to act in ways that enable goal attainment.

As expected, selective secondary control strongly and positively predicted selective primary control over time. The magnitude of the relationship is both considerable and consequential ($\beta = .51$). This relationship indicates that young adults who frequently employed cognitive selective secondary control strategies in October tended to heavily engage in behavioral selective primary control strategies in March. Theoretically, this finding is in accord with Heckhausen et al. (2010), who maintain that selective secondary control's primary function is to enhance selective primary control.

Although selective secondary control's sustaining function was postulated over a decade ago (Schulz & Heckhausen, 1996), the construct has been largely neglected. In fact, of the few studies that have incorporated selective secondary control, the majority have focused on the *combined* effects of selective secondary and selective primary control (e.g., Haase et al., 2008; Wrosch & Schulz, 2008; Wrosch, Schulz, Miller, Lupien, & Dunne, 2007). Thus, the present study is distinct in that it provides evidence for the unique role of selective secondary control in promoting primary control striving over an extended time period. Consequently, this finding also supports a significant, but previously untested, link in the motivational theory of life-span development (Heckhausen et al., 2010).

Finally, selective secondary control's influence on long-term selective primary control is also of practical value for young adults in competitive achievement settings. By actively engaging in this form of motivation-focused thinking, individuals can maintain and even enhance their behavioral goal pursuit during transitions that may otherwise

overwhelm them. The benefits of selective primary control on academic achievement are suggested by its positive effects in the present study and in the broader educational literature (Pekrun et al., 2010; Phan, 2011; Rosenbaum, 2001). Further, in the present study, selective primary control positively influenced achievement beyond the effects of students' previous academic performance. Thus, as a consequence of sustaining longitudinal selective primary control, selective secondary control indirectly influences academic attainment.

A Practical Application

Based on the empirical findings depicted in Figure 1, predicted model values for two hypothetical students may be useful in illustrating the results. Both students achieved relatively good grades in high school, were admitted into university, and are first-year university students enrolled in introductory psychology. The only noteworthy distinction between them is that Student A does not highly value her achievement goals, whereas Student B does. Based on her disregard for achievement goals, the model predicts that Student A will engage in few selective secondary control strategies at the beginning of the term (z = -1.39), which will result in infrequent use of adaptive selective primary control strategies over the course of the year (z = -.88). As a result, Student A is expected to achieve a final grade of 76% (z = -.15). In contrast, the model predicts that Student B's emphasis on her achievement goals will augment her use of first-term selective secondary control strategies (z = 1.39), which will bolster her utilization of second-term selective primary control strategies (z = .88). Thus, Student B is expected to achieve a final grade of 80% (z = .19), a half letter-grade higher than Student A.[9]

[9]Estimated scores were calculated using unstandardized beta weights from the regression models including all relevant predictors for selective secondary control (Step 1.2), selective primary control (Step 2.3), and

Strengths, Limitations, and Future Directions

The present study has several strengths, including the use of an objective achievement measure, a seven-month longitudinal design, and three measurement points involving a combination of psychosocial and performance measures. This research was based on the conceptual framework provided by the motivational theory of life-span development (Heckhausen et al., 2010), which has received much empirical support for its core propositions, but has motivated few studies on the specific role of selective secondary control in promoting primary control striving. Hence, the present study sheds light upon an influential, but largely unstudied, cognitive mechanism that facilitates the enactment and realization of valued goals, selective secondary control.

One limitation of the present study is that, although the proffered model implies three separate steps, data on study measures were only collected twice. Thus, despite the fact that achievement goals were posited to predict selective secondary control, the analysis examining this relationship was based on cross-sectional data. However, the supplemental longitudinal analyses provided in Footnote 8 were in line with those reported in the main analyses and add weight to the findings. Hence, results suggest that performance and mastery goals are robust and reliable predictors of selective secondary control strategies, regardless of whether these strategies are assessed concurrently (Time 1) or over time (Time 2). A second limitation is that the measure of achievement goals employed (MSLQ; Pintrich et al., 1993) does not contain avoidance measures of performance or mastery goals (cf. Elliot & McGregor, 2001). Hence, a topic for future research may be to investigate the relationships in the model when both approach and

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final grade (Step 3.4). The exemplar students were given scores two standard deviations below (Student A) or above (Student B) the mean on mastery and performance goals. Mean scores on high school grade and gender were used in both calculations.

avoidance measures of achievement goals are considered.

Although the present study has begun to unearth evidence supporting the value of using selective secondary control strategies, much about the construct remains unknown. For instance, selective secondary control is postulated to enhance volitional goal commitment by devaluing alternative goals, enhancing perceived control, and anticipating the positive effects of goal attainment (Heckhausen et al., 2010). Future research would do well to examine selective secondary control's influence on these more proximal outcomes. Further, this study focused on the effects of selective secondary control among young adults in a competitive achievement setting. Future research should explore its unique influence in other domains (e.g., health) and among individuals across the life-span (e.g., older adults). Finally, a promising avenue for future research is the development of treatment interventions for students that impart the adaptive value of employing selective secondary control strategies during transitions to competitive achievement settings.

Conclusion

Due to many novel challenges, developmental transitions are commonly experienced as overwhelming, which can result in reduced goal striving and failure to attain consequential goals (Perry, 2003). Based on the motivational theory of life-span development (Heckhausen et al., 2010), the present study examined an influential cognitive mechanism responsible for sustaining behavioral goal engagement. Results indicate that selective secondary control (motivation-focused thinking) functions as a self-regulatory mechanism that enables individuals to persist in their behavioral primary control striving for important goals. Thus, by promoting primary control striving over

time, selective secondary control strategies facilitate academic performance for young adults in the midst of the challenging transition from high school to university.

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Appendix

Standardized parameter estimates, item wordings, and descriptive statistics for selective secondary and selective primary control based on their respective CFAs.

	Parameter estimates				
Item label	SSC	SPC	Item wording	*M*	*SD*
			Selective secondary control		
SSC1	.52		I often tell myself that I will be successful in reaching my educational goals.	4.29	.76
SSC2	.49		Even if it takes a long time, I will not give up my educational goals.	4.23	.92
SSC3	.67		I often remind myself how important it is for my future to have a good education.	4.54	.80
SSC4	.61		I often imagine that I will be happy if I earn good grades in school.	4.35	.85
SSC5	.30		I try hard to keep away from activities that could distract me from my schoolwork.	2.97	1.24
			Selective primary control		
SPC1		.68	I will put time and effort into my education whenever I can.	4.34	.76
SPC2		.69	Even if it uses up my spare time, I will invest all my energy in getting a good education.	3.93	1.04
SPC3		.79	I will work hard to get a good education.	4.50	.70
SPC4		.58	If it gets more difficult to get the education that I want, I will try harder.	4.36	.80

Note. SSC = selective secondary control; SPC = selective primary control.

CHAPTER 3

Study 2: Motivation-Focused Thinking: Buffering Against Stress-Related Physical Symptoms and Depressive Symptomology

Although young adulthood is commonly conceived of as period of health, students navigating the school to university transition may experience physical and psychological health problems similar to or worse than the general population (Grace, 1997; Hussain, Guppy, Robertson, & Temple, 2013). For instance, a recent American Psychological Association report suggests young adults experience stress levels that are among the highest of any age bracket and are the most likely to report their stress has increased over the past five years (American Psychological Association [APA], 2012). Elevated levels of stress are implicated in poor health and are commonly manifest in physical symptoms, such as fatigue, headaches and muscular tension (APA, 2012). Further, a study of 28,000 university students found that 30% reported being so depressed that they had difficulty functioning at least once in the past year (ACHA, 2012). Eleven percent of respondents were either formally diagnosed or treated for depression during the same period, a rate notably higher than the 7% prevalence observed in the general American population (ACHA, 2012; Kessler, Chiu, Demler, & Walters, 2005)

The elevated levels of stress and depression increasingly common in young adulthood underscores the need for further research on psychological factors that may promote well-being during the challenging life course transition from school to university (ACHA, 2012; APA, 2012). Preliminary evidence stemming from the *motivational theory of life-span development* (Heckhausen & Schulz, 1995; Heckhausen, Wrosch, & Schulz, 2010) points to the buffering influence of selective secondary control. Employing

these motivation-focused strategies has been found to facilitate motivation, goal striving, and goal attainment for individuals navigating difficult developmental transitions (Hamm et al., 2013; Poulin & Heckhausen, 2007). However, researchers have yet to adequately explore whether the benefits of this protective form of motivation-focused thinking extend to pertinent health outcomes for young adults.

Consequently, the present study focused on the influence of selective secondary control striving on stress-related physical symptoms and depressive symptomology among young adults negotiating the challenging school-to-university transition. Because selective secondary control is posited to particularly advantage individuals who encounter barriers during goal pursuit (Heckhausen et al., 2010), Study 2 examined whether unprepared university students facing educational obstacles experienced the most pronounced benefits from this form of motivation-focused thinking. However, drawing on theory suggesting that selective secondary control exerts its influence indirectly (Heckhausen et al., 2010), pertinent psychological mechanisms were examined as mediators of selective secondary control's effects. Thus, Study 2 expanded on previous research by using moderated mediation and path analysis to simultaneously test two intertwined theoretical propositions proposed by Heckhausen et al. (2010): that the effects of selective secondary control should be indirect and primarily benefit those facing challenging obstacles.

The Protective Effects of Selective Secondary Control for Young Adults

Past research suggests that simultaneously employing selective primary and selective secondary control strategies (i.e., goal engagement) has important consequences for psychological and physical health. Higher levels of goal engagement are related to

increased positive affect, higher life satisfaction, increased life purpose, fewer depressive symptoms, decreased chronic conditions, better functional status, and reduced diurnal cortisol secretion for adults across the life-span (Haase, Heckhausen, & Köller, 2008; Haase, Heckhausen, & Silbereisen, 2012; Mackay, Charles, Kemp, & Heckhausen, 2011; Wrosch & Schulz, 2008; Wrosch, Schulz, Miller, Lupien, & Dunne, 2007).

Several studies have attempted to tease apart the influence of these two goal engagement strategies by documenting the independent health effects of selective primary and selective secondary control striving. For instance, over a decade of research suggests that employing selective primary control strategies promotes long-term psychological (e.g., increased positive affect) and physical health (e.g., reduced physical symptoms; Chipperfield & Perry, 2006; Chipperfield, Perry, & Menec, 1999; Hall, Chipperfield, Heckhausen, & Perry, 2010; Haynes, Heckhausen, Chipperfield, Perry, & Newall, 2009; Windsor, 2009). Research examining the unique influence of selective secondary control is limited but in line with the broader goal engagement literature: Employing these motivation-focused strategies is related to improved positive affect in older adults coping experiencing macular degeneration (Wahl, Becker, Burmedi, & Schilling, 2004).

Despite this impressive body of evidence, several noteworthy gaps remain in the literature. First, researchers have neglected to explore the effects of selective secondary control on consequential health outcomes for young adults facing the challenging life course transition from high school to university.[10] Considering that theory and research

[10]Note that although the transition from high school to university can be construed as a discrete shift (e.g., high school students become university students on the first day of class), the process of adapting to this major developmental transition may be more accurately depicted as one that occurs over an extended period of time and throughout the first year of university. This is because many first-year students struggle

suggest this form of motivation-focused thinking is of greatest benefit when facing challenging circumstances (Hamm et al., 2013; Heckhausen et al., 2010; Poulin & Heckhausen, 2007), selective secondary control may buffer against the elevated levels of stress and depression increasingly common to young adults in the midst of this transition (ACHA, 2012; APA, 2012).

Although the benefits of this form of motivation-focused thinking are implied in the aforementioned body of evidence relating goal engagement (i.e., simultaneous employment of selective secondary and primary control strategies) to health, the majority of this research was conducted on older adults (e.g., Haase et al., 2012; Mackay et al., 2011; Wrosch & Schulz, 2008; Wrosch et al., 2007). Interestingly, however, both younger and older adults face challenging developmental transitions that have the capacity to undermine motivation and goal striving (see Hamm, Chipperfield, Perry, Heckhausen, & Mackenzie, 2014; Perry, 2003). Consequently, theory suggests that selective secondary control striving should confer health benefits on young and old adults alike given that motivation-focused thinking is posited to be most adaptive when facing difficult obstacles, such as those frequently encountered during developmental transitions (Heckhausen et al., 2010). Hence, empirical evidence is needed to establish whether selective secondary control striving sustains critical health outcomes for young adults in transition in line with the benefits observed for older adults.

A second limitation in the literature is that researchers have yet to adequately explore the theoretical proposition that selective secondary control should especially advantage high-risk individuals prone to initial failure during goal pursuit (Heckhausen et

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to successfully navigate novel, unpredictable, and ongoing challenges during this transition that include new living arrangements, financial responsibilities, critical career choices, novel learning environments, increased pressures to excel, and frequent failures (see Perry, 1991; 2003; Perry et al., 2010).

al., 2010). Thus far, only Poulin and Heckhausen's (2007) study has examined this issue. However, their focus was on the buffering effect of selective secondary control for adolescents experiencing extraordinary, abrupt, and external stressors in their personal lives (i.e., family member death or parental divorce). As described earlier, selective secondary control is theorized to confer the greatest benefit on individuals encountering barriers during goal pursuit (Heckhausen et al., 2010). Although extraordinary, abrupt stressors represent one type of barrier, more stable, everyday obstacles may represent an equally challenging barrier to attaining consequential long-term goals. Thus, it follows that this form of motivation-focused thinking may particularly advantage young adults facing stable educational obstacles during the challenging school-to-university transition.

Perhaps the most common, stable educational obstacle faced by young adults aspiring to earn university degrees and ultimately secure gainful employment is beginning post-secondary education with a low high school grade (HSG). A comprehensive meta-analysis conducted by Richardson, Abraham, and Bond (2012) revealed that HSG is the strongest traditional correlate of university grade point averages (GPAs), predicting post-secondary achievement as well or better than SAT or ACT scores. Moreover, in a job market inundated with college graduates, distinguishing one's self will require more than simply completing a series of degree requirements and may increasingly depend on university GPA. In fact, GPA predicts future education level, occupational status, and income, highlighting the importance of post-secondary achievement in realizing coveted long-term goals (Strenze, 2007).

Thus, poor academic performance in high school can signify a lack of preparation and may exacerbate the already considerable challenges inherent in the school-to-

university transition. As a result, employing selective secondary control strategies as a means of coping with the academic and career impediments posed by poor high school achievement represents an adaptive response to a significant threat to one's goal pursuit.[11] Such a strategic approach may not only sustain motivation and goal striving in young adults with low HSGs who are unprepared for university, it may also protect them from experiencing otherwise elevated levels of stress-related physical symptoms and depression. However, further research is needed to examine this issue.

A final limitation is that, with few exceptions, previous research has largely overlooked intervening mechanisms that explain why selective secondary control is beneficial. Notably, in line with theoretical propositions stemming from Heckhausen et al. (2010), a study by Hamm et al. (2013) demonstrated that this form of motivation-focused thinking is a strong predictor of longitudinal behavior-focused selective primary control striving among young adults. Previous research also suggests that higher levels of selective primary control striving are related to reduced stress and depression (Haynes et al., 2009; Heckhausen et al., 2001; Schilling et al., 2013). Consequently, selective primary control may represent one mechanism for selective secondary control striving to sustain health among young adults.

Interestingly, however, the influence of selective primary control on critical health outcomes, including stress and depression, may be further mediated by emotional well-being. Past studies suggest that selective primary control striving is associated with

[11]Note that in densely populated regions containing a variety of academic institutions, some students with low HSGs may calibrate their level of challenge by choosing to enroll in less demanding universities and programs. However, this is unlikely to be the case for low HSG students in the present sample who were enrolled at the only large, research-intensive university in an expansive Canadian province with a small population and who therefore had limited options for postsecondary education. More broadly, evidence suggests many university students may struggle to calibrate their level of challenge given that national estimates indicate nearly 30% of freshman withdraw from their institutions and only 57% graduate after six years (Snyder & Dillow, 2013).

increased positive and decreased negative affect (e.g., Haase et al., 2012; Haynes et al., 2009; Windsor, 2009). In turn, an extensive literature demonstrates that emotional well-being is strongly related to improved psychological (e.g., depressive symptoms) and physical (e.g., physical symptoms) health outcomes for adults across the life-span (e.g., Chipperfield, Perry, & Weiner, 2003; Ostir, Markides, Black, & Goodwin, 2000; Pekrun et al., 2004; see Lyubomirsky et al., 2005 for a review of 225 studies).

Collectively, this research implies that selective secondary control may indirectly promote health via a sequence of theoretically driven psychological mechanisms involving selective primary control and emotional well-being. However, additional research is required to determine (a) whether motivation-focused thinking indirectly predicts discrete emotions via selective primary control, and (b) whether selective primary control and discrete emotions transmit the protective influence of selective secondary control to stress-related physical symptoms and depression.

Consequently, Study 2 was designed to expand on previous research and address the aforementioned gaps in the literature by examining whether selective secondary control striving buffered against long-term stress-related physical symptoms and depressive symptomology during the challenging shift from high school to university. Determining whether selective secondary control was most beneficial for young adults facing challenging educational obstacles (i.e., low HSGs) was of particular interest. However, equally important was testing whether selective primary control and discrete emotions provided the mechanisms through which selective secondary control benefited health. Based on Heckhausen et al. (2010) and the preceding logic, it was expected that, for students with low HSGs, (a) selective secondary control would promote selective

primary control, (b) selective primary control would foster positive emotion and suppress negative emotion, and (c) selective primary control, positive emotion, and negative emotion would predict stress-related physical and depressive symptoms (see Figure 1).

A supplemental objective was to examine whether selective secondary control striving facilitated long-term goal attainment for young adults with low HSGs given that these individuals are at increased risk of academic failure (Richardson et al., 2012). Based on past research suggesting these motivation-focused strategies foster goal attainment for individuals facing challenging circumstances (Hamm et al., 2013; Poulin & Heckhausen, 2007), it was expected that selective secondary control would indirectly promote long-term academic performance for students with low HSGs via the hypothesized sequence of psychological mechanisms depicted in Figure 1.

Method

Participants and Procedures

The Study 2 sample was drawn from the Emotion, Motivation, and Control Research (EMCOR) database which contains psychosocial data for over 20 separate cohorts of introductory psychology students at a research-intensive university in Western Canada (1992 to 2015). Analyses were based on the 2007-08 cohort because data were collected on all variables of interest. Three phases were used to collect data on students who were recruited via a departmental participant pool system and participated in exchange for experimental credit. Participants completed a Time 1 (October) questionnaire early in the year and returned five months later to complete a similar Time 2 (March) questionnaire. Time 3 (April) involved acquiring consenting participants' academic performance data from their course instructors after the second semester concluded. The majority of

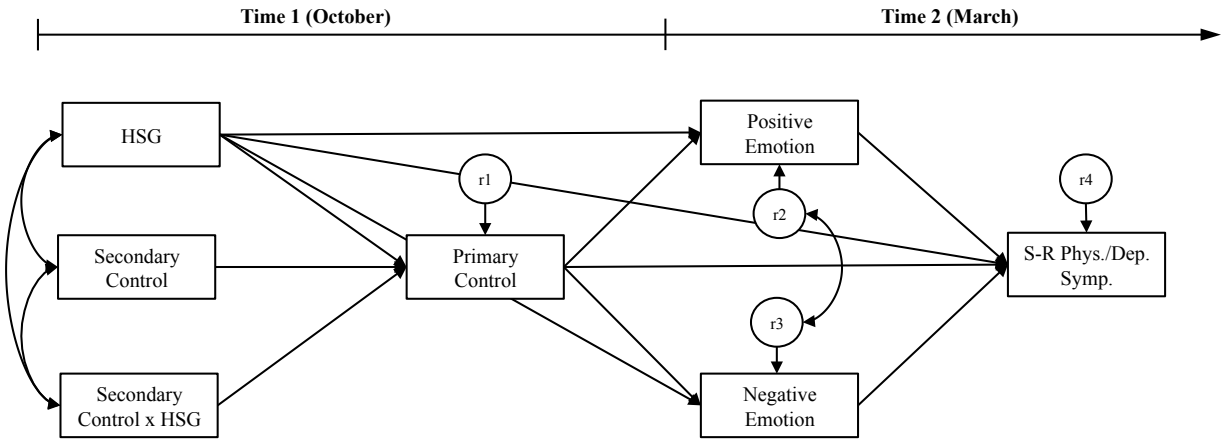

Figure 1. Structural model displaying all specified paths for the hypothesized sequence predicting stress-related physical symptoms (S-R phys. symp.) and depressive symptoms (dep. symp.). All effects were adjusted for age and gender. HSG = high school grade. r = residual.

participants in this sample (n = 239) were 17-20 year old (80%) females (72%) who were native English speakers (77%) enrolled full-time (91%) in their first year of university (69%).

Covariates

Age (Time 1). Participants reported their age using a 10-point scale (1 = *17-18*, 10 = *older than 45*). Because approximately half the students indicated they were between the ages of 17 and 18 and since the first year of university represents a challenging developmental transition for young adults (Perry, 1991, 2003), age was dichotomized into two pertinent categories (1 = *17-18*, 2 = *19 and older*). See Table 1 for a summary of the study variables.

Gender (Time 1). Gender was self-reported and coded categorically (1 = *female*, 2 = *male*).

Main Study Variables

High school grade (HSG; Time 1). HSG was self-reported and used as a proxy for actual performance in high school based on the strong relationship between the two, r = .84 (Perry, Hladkyj, Pekrun, Clifton, & Chipperfield, 2005; 1 = *50% or less*, 10 = *91-100%*). Previous research demonstrates this self-report measure of HSG is a strong and reliable predictor of achievement in university, including course grades, r = .40-.54; and overall grade point averages, r = .51-.54 (e.g., Hamm, Perry, Clifton, Chipperfield, & Boese, 2014; Perry et al., 2005; Perry, Hladkyj, Pekrun, & Pelletier, 2001; Perry, Stupnisky, Hall, Chipperfield, & Weiner, 2010).

Selective secondary control strategies (Time 1). Five items from the Academic-Specific Control Strategies (ASCS) scale were used to measure participants' selective

Table 1

Summary of the Study Variables and Zero-Order Correlation Matrix

	M	*SD*	Actual range	α	1	2	3	4	5	6	7	8	9	10
1. Age[a]	1.53	0.50	1-2	–	–									
2. Gender[a]	1.28	0.45	1-2	–	.17**	–								
3. High school grade[a]	7.84	1.59	4-10	–	-.21**	-.18**	–							
4. Secondary control[a]	20.53	2.69	13-25	.55	-.05	-.06	-.02	–						
5. Primary control[a]	17.35	2.31	11-20	.75	-.06	-.14*	.16**	.61**	–					
6. Positive emotion[b]	19.49	6.17	3-30	.84	-.01	.01	.13*	.21**	.32**	–				
7. Negative emotion[b]	13.61	7.94	5-39	.85	.05	.07	-.12	-.09	-.24**	-.44**	–			
8. Stress-related physical symptoms[b]	8.62	3.16	3-15	.63	-.17**	-.18**	.04	-.01	-.07	-.22**	.17**	–		
9. Depressive symptoms[b]	34.49	11.79	14-68	.88	-.06	-.07	.05	-.14*	-.27**	-.32**	.39**	.41**	–	
10. Academic performance[c]	70.48	15.86	28-98	–	.01	-.09	.41**	.07	.21**	.33**	-.32**	.00	-.14*	–

[a]Time 1 measure. [b]Time 2 measure. [c]Time 3 measure.

*$p \leq .05$, **$p \leq .01$ (two-tailed).

secondary control striving (Hamm et al., 2013; 1 = *strongly disagree*, 5 = *strongly agree*; e.g., "I often remind myself how important it is for my future to have a good education").

Selective primary control strategies (Time 1). Four items from the ASCS scale were used to measure participants' selective primary control striving (e.g., "I will put time and effort into my education whenever I can").

Positive emotion (Time 2). Participants reported their happiness, pride, and hope after reading the following stem: "Rate the extent to which each of the following emotions describe how you feel about your performance in your introductory psychology course so far this year." Ratings were provided on a 10-point scale (1 = *not at all*, 10 = *very much so*).

Negative emotion (Time 2). Participants reported their guilt, regret, helplessness, shame, and anger after reading the same stem as that described for the positive emotions. Ratings were provided on the same 10-point scale.

Depressive symptoms (Time 2). Participants reported the extent to which they experienced 14 depressive symptoms from Goldberg's Depression Inventory (Goldberg, 1993; 1 = *not at all*, 6 = *very much*; e.g., "I have lost interest in aspects of life that used to be important to me").

Stress-related physical symptoms (Time 2). Based on the Cohen-Hoberman Inventory of Physical Symptoms (Cohen & Hoberman, 1983), three physical symptoms commonly implicated in stress were assessed: headaches, muscle tension, and fatigue (APA, 2012). Participants rated the frequency each symptom was experienced in the past two months (1 = *not at all*, 5 = *5 or more times a month*).

Academic performance (Time 3). Consenting students' academic performance

was measured using their Time 3 test grades (percentages) from an introductory psychology course. Data were collected from course instructors after the second semester concluded.

Results

Rationale for Analyses

Study 2 was designed to examine selective secondary control's indirect effects on long-term health for students with low HSGs via the hypothesized sequence of psychological mechanisms (see Figure 1 for the specified models). Consequently, a path analytic approach involving AMOS (maximum-likelihood method) was employed to calculate the omnibus effects of predictor variables and assess model fit using chi-square (χ^2), the comparison fit index (CFI), and the root mean square error of approximation (RMSEA) based on recommendations by Byrne (2010). Hayes's (2013) PROCESS macro for SPSS was subsequently employed to conduct tests of moderated mediation by probing Secondary Control x HSG interaction effects. This approach allowed an examination of whether secondary control indirectly benefited students with low HSGs (i.e., whether secondary control had conditional indirect effects).

Secondary control's conditional indirect effects were examined at low (-1 *SD*) and high (+1 *SD*) levels of HSG. Significance of the directional hypotheses concerning the conditional indirect effects were tested using a bootstrap approach that employed 90% bias corrected confidence intervals (Hayes, 2013; Preacher & Hayes, 2008). Mediation was confirmed if zero fell outside the confidence interval (*CI*) based on 5000 samples of the unstandardized beta weights. Indirect effects of the omnibus predictors were tested using the same approach. Note the residuals between positive and negative emotions

were correlated to account for interrelationships between these constructs in accordance with previous research (e.g., Daniels et al., 2009). All effects were adjusted for participant age and gender in order to control for the influence of these demographic factors on the outcome measures.

Preliminary Analyses

Zero-order correlations. Correlation coefficients revealed a number of logically consistent associations between the study variables (see Table 1). For instance, depressive symptoms exhibited a moderate and positive relationship with stress-related physical symptoms. Further, positive and negative emotion were related to each other and all dependent variables in expected directions. Students who frequently employed secondary control strategies reported higher levels of primary control and positive emotion, but fewer depressive symptoms. Although secondary control was not significantly related to negative emotion or stress-related physical symptoms, this was consistent with the model which specified that secondary control's effects would be moderated by students' HSGs (i.e., primarily benefit those with low HSGs). In addition to its strong relationship with secondary control, primary control was related to positive emotion, negative emotion, depressive symptoms, and academic performance in expected directions. Finally, HSG was the strongest correlate of performance, with positive emotion, negative emotion, and depressive symptoms also significantly correlated.

Simple effects of secondary control on health. Prior to conducting the main analyses, simple Secondary Control x HSG regression models were assessed to determine whether secondary control influenced the health outcomes for students with low HSGs in the absence of the mediators. The Secondary Control x HSG interactions were significant

for both depressive (β = .17, p = .009) and stress-related physical (β = .17, p = .009) symptoms despite controlling for age and gender. More interestingly, simple slope analyses suggested that secondary control predicted fewer depressive symptoms for those with low (β = -.33, p = .001) but not high (β = .01, p = .873) HSGs. Similarly, secondary control predicted fewer stress-related physical symptoms for those with low (β = -.20, p = .031) but not high (β = .14, p = .120) HSGs. Thus, these analyses provide preliminary support for the hypotheses and suggest that secondary control sustains health for students facing challenging educational obstacles. The following path analyses serve to further explicate the model by examining theorized mechanisms that may account for secondary control's effects.

Main Analyses

Model fit summary. Separate structural models predicting depressive symptoms and stress-related physical symptoms were specified and tested (see Figure 1). Results from these two path models indicated that the models fit the data well: depressive symptoms model, χ^2 (6) = 6.79, p = .340; CFI = .997; RMSEA = .024; stress-related physical symptoms model, χ^2 (6) = 9.37, p = .154; CFI = .986; RMSEA = .049. However, the individual path estimates in each model provided direct tests of the hypotheses and were therefore of greatest interest. Path estimates are detailed separately for each model below.

Depressive symptoms model. The individual path estimates were consistent with the proposed model (see Figure 2). Note that the variables involved in the hypothesized interaction (secondary control, HSG) were mean centered to facilitate interpretation of their omnibus effects (Cohen, Cohen, West, & Aiken, 2003). As expected, the

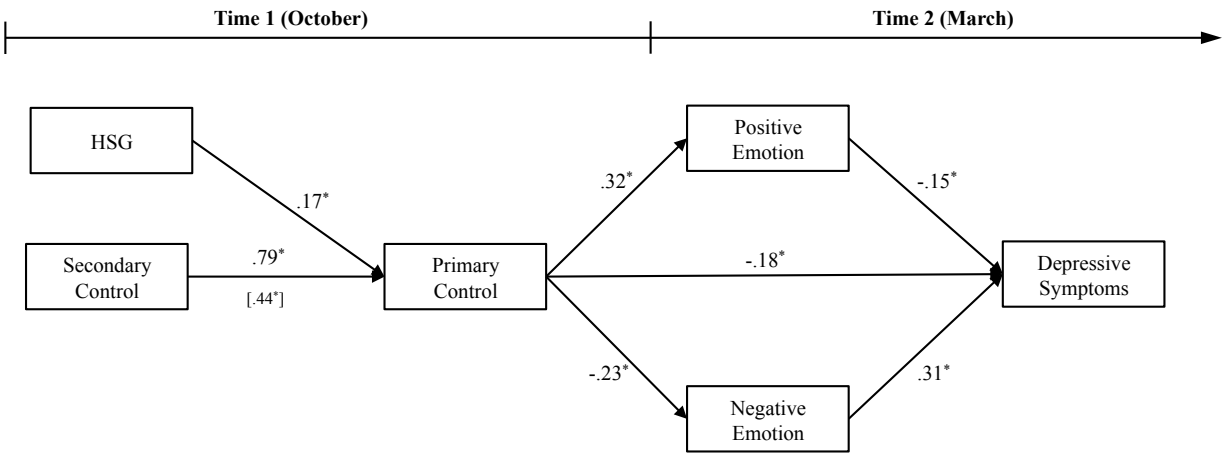

Figure 2. Conditional indirect effects of secondary control on depressive symptoms. Standardized regression weights are reported for all effects. To facilitate interpretation, the omnibus effects of secondary control and the Secondary Control x High School Grade (HSG) interaction term are not shown. Rather, the paths from secondary control to primary control are presented separately for low (-1 *SD*) and high (+1 *SD*) HSG: Low HSG is reported above the arrow, and high HSG is reported below the arrow [in brackets]. All effects control for age and gender. Residuals and non-significant paths are not shown. $^{*}p \leq .05$ (two-tailed).

Secondary Control x HSG interaction was a significant predictor of primary control (β = -.17, $p < .001$). Simple-slope analyses revealed that the positive influence of secondary control on primary control was nearly twice as strong when HSG was low (β = .79, $p < .001$) as when HSG was high (β = .44, $p < .001$; see Figure 3).[12]

In line with predictions, primary control predicted positive (β = .32, $p < .001$) and negative emotion (β = -.23, $p < .001$). Because secondary control predicted primary control, which in turn predicted the emotions, the conditional indirect effects of secondary control on the emotions via primary control were tested. As expected, when HSG was low, secondary control had a strong indirect influence on positive (β = .25, *CI*s = .2333 to .7195) and negative (β = -.18, *CI*s = -.9044 to -.2842) emotion via primary control. When HSG was high, secondary control's influence on positive (β = .14, *CI*s = .1293 to .4464) and negative (β = -.10, *CI*s = -.5568 to -.1607) emotion remained significant but was notably reduced.

Consistent with the hypotheses, primary control (β = -.18, $p = .003$), positive emotion (β = -.15, $p = .027$), and negative emotion (β = .31, $p < .001$) predicted depressive symptoms. As expected, tests of mediation demonstrated that primary control also indirectly predicted depressive symptoms via its influence on positive (β = -.05, *CI*s = -.4845 to -.0471) and negative (β = -.07, *CI*s = -.6152 to -.1781) emotion.[13]

Stress-related physical symptoms model. Note that the only distinction between

[12]Secondary ($r_{T1\text{-}T2} = .61$) and primary ($r_{T1\text{-}T2} = .63$) control were also assessed at Time 2, and both measures exhibited moderate stability over time. Assessing primary control at Time 2 also enabled an examination of whether secondary control's effects were reliable when accounting for autoregressive effects. Simple-slope analyses indicated secondary control remained a significant predictor of Time 2 primary control at low and high HSG despite accounting for variability in the Time 1 measure.

[13]Because data on Time 2 measures were also collected at Time 1 (i.e., positive and negative emotion, depressive symptoms, stress-related physical symptoms), supplemental ordinary least square regression (OLS) analyses were conducted to determine whether significant paths in the depressive and stress-related physical symptoms model were reliable when accounting for autoregressive effects. All effects remained significant when accounting for variability in the Time 1 measures.

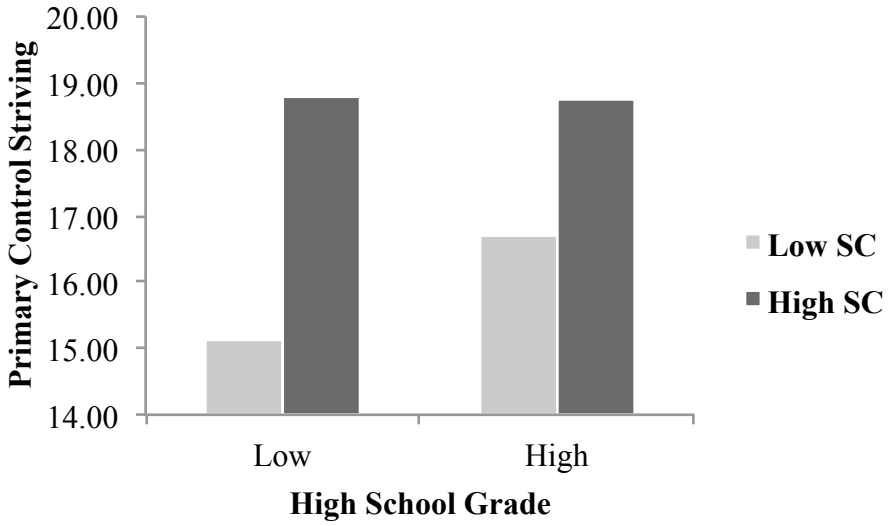

Figure 3. Conditional effects of secondary control (SC) on primary control striving at low (-1 *SD*) and high (+1 *SD*) levels of high school grade.

the depressive symptoms and stress-related physical symptoms models is that they predict different outcomes (i.e., the same model was employed to predict both outcomes; see Figure 1). As a consequence, all path estimates in the present model are identical to those reported above with the exception of those relating to stress-related physical symptoms. Thus, only path estimates involving the prediction of stress-related physical symptoms are reported below.

Individual path estimates revealed that positive emotion (β = -.16, p = .025) predicted stress-related physical symptoms. Negative (β = .11, p = .099) emotion was a marginally significant predictor of these symptoms. Although primary control did not directly predict stress-related physical symptoms, tests of mediation demonstrated that primary control indirectly predicted this health outcome via its influence on positive (β = -.05, *CI*s = -.1371 to -.0157) and negative emotion (β = -.03, *CI*s = -.0833 to -.0015).

Supplemental Analyses: Secondary Control and Goal Attainment

Supplemental analyses explored whether secondary control had indirect effects on Time 3 academic performance for students with low HSGs via the hypothesized sequence of psychological mechanisms. Once again, with the exception of path estimates relating to performance, all effects are identical to those reported above. Thus, only path estimates involving the prediction of student performance are reported below.[14]

Results from the academic performance path analysis suggested the model fit the data well: χ^2 (6) = 7.532, p = .274; CFI = .995; RMSEA = .033. More interesting, individual path estimates revealed that positive (β = .18, p = .004) and negative (β = -.18,

[14]As part of the supplemental analyses, a simple Secondary Control x HSG moderation model was assessed to determine whether secondary control promoted performance for students with low HSGs in the absence of the mediators. Consistent with the preliminary results reported earlier, these simple slope analyses revealed that secondary control predicted increased performance for those with low (β = .24, p = .007) but not high (β = -.06, p = .427) HSGs despite controlling for age and gender.

p = .003) emotion predicted Time 3 academic performance. Unsurprisingly, HSG (β = .37, p < .001) was also a strong predictor of student performance. Although primary control did not directly predict performance, tests of mediation demonstrated that primary control indirectly predicted this outcome via its influence on positive (β = .06, *CI*s = .1557 to .7738) and negative (β = .04, *CI*s = .1195 to .5284) emotion. Thus, consistent with the main analyses, the supplemental analyses suggested secondary control indirectly influenced goal attainment for those with low HSGs via the hypothesized sequence of psychological mechanisms.[15]

Discussion

Although health is commonly believed to flourish in young adulthood, it may suffer among those navigating the challenging developmental transition from high school to university. Young adults report elevated levels of stress and are at increased risk of depression relative to those in the general population (APA, 2012; ACHA, 2012; Kessler et al., 2005). The deleterious effects of this transition may be even more pronounced for those who are unprepared and face the additional obstacle of having to overcome a history of poor academic performance. Supporting this rationale, standardized predicted values (Z_{PRED}) based on the preliminary analyses are provided in parentheses below and highlight the plight of students with low HSGs (-1 *SD*) who *infrequently* employed selective secondary control strategies (-1 *SD*): These individuals experienced the most stress-related physical symptoms (Z_{PRED} = .22), the most depressive symptoms (Z_{PRED} = .28), and the lowest academic performance (Z_{PRED} = -.66).

In contrast, their peers with low HSGs (-1 *SD*) who *frequently* employed selective

[15]Data on students' first test scores (September) were also collected, and supplemental OLS regression analyses indicated that both positive and negative emotion remained reliable predictors of Time 3 test performance (April) when accounting for autoregressive effects (i.e., students' initial test scores).

secondary control strategies (+1 *SD*) experienced considerably lower levels of stress-related physical (Z_{PRED} = -.15) and depressive (Z_{PRED} = -.31) symptoms, and performed notably better on their Time 3 test (Z_{PRED} = -.21). Moreover, these predicted values for students with low HSGs and high secondary control were largely in line with their not-at-risk peers who entered university with high HSGs. Thus, the present results indicate that students with low HSGs may be especially vulnerable to the harmful effects of the school-to-university transition. Encouragingly, however, findings also suggest that motivation-focused thinking may protect against these detriments for at-risk individuals with low HSGs.

Selective Secondary Control's Conditional Indirect Effects on Health and Performance

The present results and preceding discussion indicate the value of selective secondary control for young adults facing a major personal barrier to goal attainment: entering university with a low HSG. As hypothesized, and consistent with the motivational theory of life-span development (Heckhausen et al., 2010), these findings suggest that selective secondary control is most needed (and most beneficial) when individuals face significant challenges during goal pursuit. However, the present study was equally concerned with elucidating the mechanisms through which selective secondary control exerted its influence. In particular, it was expected that the advantages of secondary control would be indirect through primary control and previously unexamined measures of emotion.

In accordance with the hypotheses, simple slope analyses demonstrated that selective secondary control was nearly twice as strong a predictor of selective primary

control when HSG was low (β = .79) than when HSG was high (β = .44). Further, primarily for students with low HSGs, selective secondary control indirectly predicted five-month measures of positive and negative emotion via selective primary control. Particularly noteworthy is a comparison of the magnitudes of selective secondary control's indirect effects for students with low versus high HSGs. For students with low HSGs, a 1 *SD* increase in selective secondary control corresponded to a .25 *SD* increase in positive emotion and a .18 *SD* decrease in negative emotion through selective primary control. In contrast, for students with high HSGs, a 1 *SD* increase in selective secondary control corresponded to notably smaller changes in positive (.14 *SD*) and negative (.10 *SD*) emotion through selective primary control.

The latter half of the models suggests there may be long-term implications to selective secondary control's influence on selective primary control and emotion, as these mediators provided mechanisms through which motivation-focused thinking sustained health. Among students with low HSGs, selective secondary control was related to reduced depressive symptoms via the following paths: selective primary control (β = -.14), selective primary control-positive emotion (β = -.04) and selective primary control-negative emotion (β = -.05). Thus, a 1 *SD* increase in selective secondary control corresponded to approximately a .25 *SD* decrease in depressive symptoms assessed five months later via the proposed mediators in the hypothesized causal sequence.[16]

This pattern was replicated for stress-related physical symptoms. When HSG was low, selective secondary control predicted fewer of these symptoms through the selective primary control-positive emotion (β = -.04) and selective primary control-negative

[16]Calculations of the magnitudes of selective secondary control's indirect effects on the health/performance outcomes are based on only significant individual paths.

emotion (β = -.02) paths. Thus, the depression model accounted for a sizable 70% of selective secondary control's effect on depressive symptoms given that the preliminary analyses indicated the influence of these motivation-focused strategies was β = -.33 in the absence of the mediators. The stress-related physical symptom model also accounted for 30% of selective secondary control's effect on these symptoms when considering the preliminary analyses demonstrated the influence of selective secondary control was β = -.20 in the absence of the mediators.

The supplementary analyses indicate that selective secondary control's conditional indirect effects during a challenging developmental transition are not limited to the health domain. For students with low HSGs, selective secondary control strategies indirectly promoted sixth-month academic performance through the selective primary control-positive emotion (β = .05) and selective primary control-negative emotion (β = .03) paths. Highlighting low HSG as a significant impediment to post-secondary achievement, Study 2 is in line with the broader empirical literature in documenting HSG's strong relationship with university course grades (*r* = .40-.54; Perry et al., 2001, 2010). Encouragingly, however, findings suggest that this barrier may be partly overcome by employing selective secondary control strategies.

Collectively, these results indicate that, particularly for young adults facing a major educational obstacle, selective secondary control indirectly promotes health and performance through increased selective primary control striving and emotional well-being. Thus, the present study represents the first simultaneous test of two interconnected theoretical propositions proposed by Heckhausen et al. (2010) that have previously been explored only in isolation (Hamm et al., 2013; Poulin & Heckhausen, 2007): that the

benefits of selective secondary control should be indirect and primarily advantage those encountering barriers during goal pursuit. Moreover, the study expands on previous theory and research by demonstrating that selective secondary control exerts its influence, in part, by positively impacting discrete emotions among young adults. Hence, selective secondary control may help young adults in transition overcome challenging obstacles by indirectly increasing positive emotion and reducing negative emotion via selective primary control. Finally, Study 2 focused on selective secondary control's effects on critical physical and psychological health outcomes for young adults that have been neglected in past studies of the construct, namely stress-related physical symptoms and depressive symptomology.

The present results also have implications for university students navigating the challenging transition from high school to university. As documented earlier, young adults enrolled in post-secondary education must cope with psychological and physical health problems that are equivalent to, or potentially even more severe than, the general population (ACHA, 2012; Adlaf, Gliksman, Demers, & Newton-Taylor, 2001; Grace, 1997; Hussain et al., 2013). This study suggests that, for students facing the added challenge of entering university with a low HSG, selective secondary control striving may act as a buffer that reduces the risk of experiencing elevated stress-related physical symptoms and depression. Given the strong relationship between depression and suicide and the elevated risk of suicide in young adulthood (Galaif, Sussman, Newcomb, & Locke, 2007; Westefeld et al., 2005), employing selective secondary control strategies may have critical long-term consequences for university students facing challenging obstacles.

Strengths, Limitations, and Future Directions

The present study is supported by the use of two critical measures of health for young adults, a six-month design, and three measurement points involving a combination of psychological, physical, and performance measures. Further, this research was based on the motivational theory of life-span development (Heckhausen et al., 2010), which has amassed impressive empirical support for its core tenets, but has inspired few studies on the potential health benefits of selective secondary control striving for young adults. Hence, the present study supplements the existing literature by using path analysis and moderated mediation to document not only the long-term health consequences of selective secondary control, but also to provide insight into which individuals are most advantaged by these motivation-focused strategies and the mechanisms through which these benefits are realized.

Study 2 has several limitations. First, although the models predicting depressive and stress-related physical symptoms imply four separate steps, data on these measures were collected at only two time points. Hence, the secondary control-primary control and emotion-psychological/physical symptom paths were based on cross-sectional data from Time 1 and Time 2, respectively. However, the supplemental autoregressive analyses reported in Footnotes 12, 13, and 15 substantiate the main results and indicate that all significant paths in the hypothesized model remain reliable when accounting for pre-existing differences in the dependent variables. Second, the HSG measure was self-reported and may therefore not perfectly reflect actual high school achievement. However, previous research indicates this self-reported measure of HSG is strongly related to actual HSGs, $r = .84$ (Perry et al., 2005). Further, to the extent that the barriers

to university achievement associated with low HSGs are due to beliefs about personal aptitude, self-reported HSG may better reflect the type of everyday obstacle that was intended to be assessed than would actual HSG. Third, although the outcome measures were relatively broad indicators of stress-related physical and depressive symptoms, the emotion measures were limited to the course-specific indicators available in the present cohort. However, the results may have been stronger if broader indicators of emotion were used since such measures would better match the broad outcome measures.

Although this study sheds further light on selective secondary control, many questions about the construct remain. For instance, are there circumstances under which engaging in selective secondary control strategies are actually maladaptive? Results observed for students with high HSGs in the preliminary analyses imply that such conditions may exist: For those with high HSGs, selective secondary control was actually related to marginally higher reports of stress-related physical symptoms ($\beta = .14$, $p = .120$). Given that selective secondary control is posited to primarily benefit those facing challenging circumstances (Heckhausen et al., 2010), it may be that employing these strategies when facing few obstacles is not only unnecessary, but harmful. Supporting this rationale, recent research points to one instance under which selective secondary control can be detrimental: Among very old adults, there are negative health consequences to engaging in selective secondary control strategies when corresponding selective primary control strategies are not employed (Hamm, Chipperfield et al., 2014). Thus, future research would do well to further explore this issue.

An additional avenue for future research involves examining alternative mechanisms that may transmit selective secondary control's effects. In particular,

Heckhausen et al. (2010) theorize that these strategies should also enhance motivational commitment to important goals. Consequently, there would be theoretical and practical value to investigating whether selective secondary control enhances the value of chosen goals (e.g., physical fitness) and diminishes the value of competing goals (e.g., leisure time), particularly among those who face challenging obstacles (e.g., individuals who are overweight). Finally, the present results have implications for the development of treatment interventions. Preliminary evidence suggests that a treatment designed to promote the use of motivation-focused selective secondary control strategies may enhance long-term emotional well-being and academic performance among young adults facing challenging circumstances (Chipperfield et al., 2013). However, further research is needed to replicate and extend these findings to determine whether the treatment impacts critical measures of psychological and physical health.

Conclusion

Although the transition from high school to university is commonly conceived of as a period of opportunity, this shift is imbued with uncertainty and unpredictability which can undermine health (Adlaf et al., 2001; Hussain et al., 2013; Perry, 2003). The present study builds on previous research by exploring whether selective secondary control striving facilitates health and performance among young adults facing major educational obstacles. Results suggest that, for students with low HSGs, selective secondary control indirectly reduces long-term stress-related physical and depressive symptoms (and promotes academic performance) through selective primary control and previously unexamined measures of discrete emotions. Thus, by employing these motivation-focused strategies, young adults facing difficult obstacles may be able to

enhance their goal striving and emotional well-being, and thereby sustain their psychological and physical health.

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CHAPTER 4

Study 3: A Motivation-Enhancing Treatment for Young Adults Navigating Life Course Transitions: Sustaining Goal Engagement and Improving Performance[17]

As described in Chapter 1, developmental transitions are imbued with substantial uncertainty and present unique challenges that can undermine motivation and goal engagement at critical junctures in the life course. Theory-driven treatments to increase control striving may be effective in countering transition-related challenges, but research has yet to systematically examine their efficacy during these stressful junctures. Past studies have consistently shown that control striving under such conditions facilitates adaptation for individuals who experience significant challenges across the life-span (e.g., Chipperfield & Perry, 2006; Chipperfield, Perry, Bailis, Ruthig, & Chuchmach, 2007; Haase et al., 2008, 2012; see Chipperfield, Hamm, Perry, & Ruthig, in press and Heckhausen et al., 2010 for reviews). Thus, (selective secondary) control strategies that sustain volitional goal commitment may be especially critical for young adults faced with the time constraints, competing goals, and initial failure inherent to the shift from school to university.

Recent evidence shows that employing these selective secondary control strategies promotes motivation, goal engagement, and goal attainment for young adults in the midst of difficult life course transitions (Hamm et al., 2013; Hamm, Perry, Chipperfield, Heckhausen, & Stewart, 2015; Poulin & Heckhausen, 2007). Consequently, Study 3 extended previous research using a seven-month, pre-post, randomized field study to assess the efficacy of a novel and theory-driven (selective secondary) control striving treatment to improve performance for young adults facing obstacles during the

[17]This chapter was submitted for publication in February 2016.

challenging transition to university (Heckhausen et al., 2010). Changes in theoretically-derived process variables (selective secondary and primary control strategies) were expected to account for treatment effects on goal attainment and were examined as mediators of the treatment-performance linkage.[18]

The Effects of Control Striving for Young Adults in Transition

Past research points to the benefits of striving for control in multiple domains and throughout the life-span: Increased control striving is related to the attainment of career goals, increased positive affect, higher job and life satisfaction, increased life purpose, less depressive symptoms, fewer physical health conditions, and better functional status for adults facing challenge across the life-span (Chipperfield, Perry, & Menec, 1999; Chipperfield & Perry, 2006; Haase et al., 2008, 2012; Hall, Chipperfield, Heckhausen, & Perry, 2010; Haynes, Heckhausen, Chipperfield, Perry, & Newall, 2009; Wrosch, Schulz, & Heckhausen, 2002). Most relevant to the present study, evidence shows that selective secondary control striving facilitates motivation and adaptation for young adults navigating difficult life course transitions. For instance, a 10-month field study by Poulin and Heckhausen (2007) found that selective secondary control striving was positively related to selective primary control striving, perceived control, and positive affect (and inversely related to negative affect) for adolescents seeking apprenticeships during the school-to-work transition. The effects of these motivation-enhancing strategies were

[18]The present literature review focuses on control striving from the perspective of the MTLD and therefore does not address motivation treatments that: involve motivation theories other than Heckhausen et al.'s (2010); are not control strategy based, for example, attributional retraining (e.g., Perry & Hamm, in press), value enhancement (e.g., Hulleman & Harackiewicz, 2009; Harackiewicz, Rozek, Hulleman, & Hyde, 2012), intention implementation (e.g., Duckworth, Grant, Loew, Oettingen, & Gollwitzer, 2011), goal setting (e.g., Morisano, Hirsh, Peterson, Pihl, & Shore, 2010), or social belonging (e.g., Walton & Cohen, 2011); do not concern motivation or performance (e.g., psychotherapy); or, focus on very young or old populations (e.g., Chapin & Dyck, 1976; Gitlin et al., 2006). Reviews of the broader motivation treatment literature are provided elsewhere (see Elliot, Dweck, & Yeager, in press; Hulleman & Baron, in press; Karabanick & Urdan, 2014).

strongest for students experiencing stressful circumstances (death of a family member or parental divorce).

Other longitudinal field studies spanning two-academic semesters (Hamm et al., 2013, 2015) replicated and extended these findings by showing that increased selective secondary control striving during the shift from high school to university predicts increased selective primary control striving over time. These motivation-enhancing strategies also predicted (a) more happiness, pride, hope; (b) less guilt, regret, helplessness, shame, and anger; (c) reduced depressive and stress-related physical symptoms; and (d) higher academic performance on class tests and final course grades assessed over a seven-month period. Consistent with MTLD theory (Heckhausen et al., 2010), the effects of selective secondary control were mediated by selective primary control striving and were most pronounced for students facing significant challenges (those with a history of poor academic performance).

This research indicates there are advantages for young adults who engage in selective secondary control striving during life course transitions, particularly for those who encounter additional obstacles to goal attainment. Although treatments designed to promote these motivation-enhancing strategies may be a viable means of facilitating adaptation for young adults in transition, a systematic evaluation of control striving treatments is lacking.

A Control Striving Treatment to Sustain Motivation During Life Course Transitions

Study 3 advanced the literature by assessing the efficacy of a theory-driven (selective secondary) control striving treatment to promote student performance during the school-to-university shift. The present analytic approach enabled an examination of

how (mediators) and under what conditions (moderators) the treatment influenced achievement. Concerning moderation, previous intervention research in competitive achievement settings shows that motivation treatments are typically most effective for those experiencing challenge (e.g., Perry, Chipperfield, Hladkyj, Pekrun, & Hamm, 2014; Perry & Hamm, in press). This suggests transition-related risk factors may affect (moderate) control striving treatment effects. In line with theory and evidence regarding which individuals benefit from selective secondary control, treatments that promote motivation-enhancing strategies should primarily advantage those facing challenging but manageable obstacles (Heckhausen et al., 2010; Poulin & Heckhausen, 2007). For young adults aspiring to complete a post-secondary education, few obstacles to goal attainment are more problematic than entering university with a low high school grade (HSG).

Those who begin university with low HSGs are commonly recognized as being at high risk of failure (see Mathiasen, 1984; Mouw & Khanna, 1993; and Robbins et al., 2004). A comprehensive meta-analysis conducted by Richardson, Abraham, and Bond (2012) revealed that HSG is the strongest traditional correlate of university grade point averages (GPAs, $r = .40$), predicting post-secondary achievement as well or better than SAT ($r = .29$) or ACT scores ($r = .40$). HSG has an equally strong influence on the likelihood that young adults achieve a critical developmental goal, graduating university. A field study of 1500 university students showed that each one-unit increase in incoming HSGs (0.0 = *F* to 4.0 = *A*) more than doubled the odds of five-year graduation (OR = 2.76; Johnson, 2008). It is noteworthy that the size of this effect was equivalent to that of first term university GPAs on graduation (OR = 2.77). Thus, unprepared young adults who enter university with low HSGs are at increased risk of failing to achieve

consequential short-term (e.g., passing a class test) and long-term goals (e.g., graduating university) and may benefit from selective secondary control (SSC) treatments.

However, not all low HSG students are likely to benefit from control striving treatments. Low HSG students differ in critical psychological variables that can preserve motivational resources and may impact treatment uptake during challenging life course transitions (see Perry et al., 2014). Perceived control represents one such variable and refers to beliefs people hold about their capacity to predict or influence important events in their lives (Perry, 1991, 2003). Previous research points to the protective influence of perceived control for young adults navigating stressful transitions to low control environments (Perry, Hall, & Ruthig, 2005).

Longitudinal field studies of school-to-university transitions show that perceived academic control (PAC) sustains intrinsic motivation (*r*s = .18 to .19; Perry et al., 2001; Hamm, Perry, Clifton, Chipperfield, & Boese, 2014); enhances positive emotions such as pride and hope (*r*s = .24 to .43; Hall, Perry, Ruthig, Hladkyj, & Chipperfield, 2006; Pekrun et al., 2004); and diminishes negative emotions including helplessness and shame (*r*s = -.34 to -.47; Pekrun et al., 2004; Ruthig, Haynes, Perry, & Chipperfield, 2007). PAC also facilitates performance on year-end final course grades (*r*s = .21 to .27) and cumulative GPAs assessed over one (*r*s = .20 to .31), two (*r* = .19), and three academic years (*r* = .19; Hall et al., 2006; Perry et al., 2001; Perry, Hladkyj, Pekrun, & Chipperfield, 2005; Ruthig et al., 2007; Stupnisky et al., 2007; Stupnisky, Renaud, Daniels, Haynes, & Perry, 2008). Highlighting its influence in competitive achievement settings, separate meta-analyses by Robbins et al. (2004) and Richardson et al. (2012) found that perceived control was the strongest psychosocial predictor of university GPA

(*r*s = .31 to .59).

Consequently, PAC may moderate which low HSG individuals benefit from control striving treatments. As described earlier, the life course transition from school to university is fraught with novel challenges that have the capacity to overwhelm even young adults who are motivated and prepared (Perry, 2003). Low HSG students who also have low PAC may be most susceptible to the detrimental effects of this difficult transition and may therefore be unable to benefit from motivation treatments (see Perry & Penner, 1990). This logic is consistent with Heckhausen et al.'s (2010) congruence principle, which posits that compatibility between an opportunity and a goal is essential to achieving the objective. Thus, young adults with low HSGs and low PAC may experience goal-opportunity incongruence due to pursuing overly challenging goals in a competitive and unsupportive environment. Specifically, incongruence may arise when low HSG-low PAC students begin the transition period unprepared (lack work habits, skills, content knowledge) and believe their capacity to influence academic performance is limited.

Young adults with low HSGs and high PAC also face a significant obstacle to goal attainment in entering university unprepared, but believe in their abilities to influence future academic performances. Hence, low HSG-high PAC individuals may have untapped potential due to their substantial personal control that is likely to be threatened by a lack of educational preparation in high school. These students may be receptive to (selective secondary) control striving treatments designed to sustain volitional goal commitment when facing obstacles and setbacks. Thus, SSC treatments may be able to assist low HSG-high PAC students by providing a timely boost to

motivational resources and thereby maintain elevated levels of goal engagement to overcome (a) challenges inherent in the transition to university that are compounded by (b) the obstacles posed by deficits in skill, knowledge, and work habits.

According to theory and research (Heckhausen et al., 2010; Hamm et al., 2013), the effects of SSC treatments on goal attainment should be indirect (mediated) through several influential psychological process variables. Logically, a treatment designed to enhance selective secondary control should promote the employment of these motivation-enhancing strategies. Further, the MTLD contends that selective secondary control ultimately serves to promote selective primary control striving (Heckhausen et al., 2010). Recent evidence supports this proposition and shows that selective primary control mediates the influence of selective secondary control on academic performance in a two-semester course (Hamm et al., 2013). Thus, the effect of SSC treatments on performance may be accounted for (mediated) by a sequence of mechanisms comprising selective secondary and selective primary control striving.

The present two-semester, pre-post, randomized field study assessed the efficacy of a novel theory-driven SSC treatment in assisting young adults during the school-to-university transition. For low HSG-high PAC students, the SSC treatment (vs. no-treatment) was expected to promote post-treatment selective secondary control and year-end academic performance. The SSC treatment-performance linkage was expected to be mediated by psychological process variables consistent with Heckhausen et al.'s MTLD (2010). It was predicted that, for low HSG-high PAC students, (a) the SSC treatment (vs. no-treatment) would directly promote selective secondary control, (b) increases in this form of motivation-enhancing thinking would facilitate selective primary control striving,

and (c) increases in selective primary control would predict higher year-end academic performance (see Figure 1).

A supplemental objective was to examine whether discrete emotions further mediated SSC treatment effects on performance. Previous research shows selective primary control striving promotes emotional well-being (Hamm et al., 2015; Haynes et al., 2009), which in turn predicts academic performance (Pekrun et al., 2004; Pekrun, Elliot & Maier, 2009). Thus, it was expected positive (pride, hope) and negative (helplessness, shame) discrete emotions to mediate the selective primary control-academic performance path tested in the main analysis.

Method

Participants and Procedures

The sample was drawn from the Emotion, Motivation, and Control Research (EMCOR) database which contains psychosocial and achievement data for over 20 separate cohorts of young adults enrolled in a research-intensive university in Western Canada (1992 to 2015). The 2012-13 dataset was used for the analyses because it contained data on all variables of interest. Young adults were recruited from multiple sections of an introductory psychology course and participated in a quasi-experimental, randomized treatment field study in exchange for partial course credit. Data were collected at four time points over a seven-month period during the academic year.

At Time 1 (October), participants selected laboratory-based study sessions that were randomly assigned to experimental treatment conditions (Shadish, Cook, & Campbell, 2002). Participants began the first laboratory study session by completing an online questionnaire in groups that varied between 20 and 45. Time 2 occurred

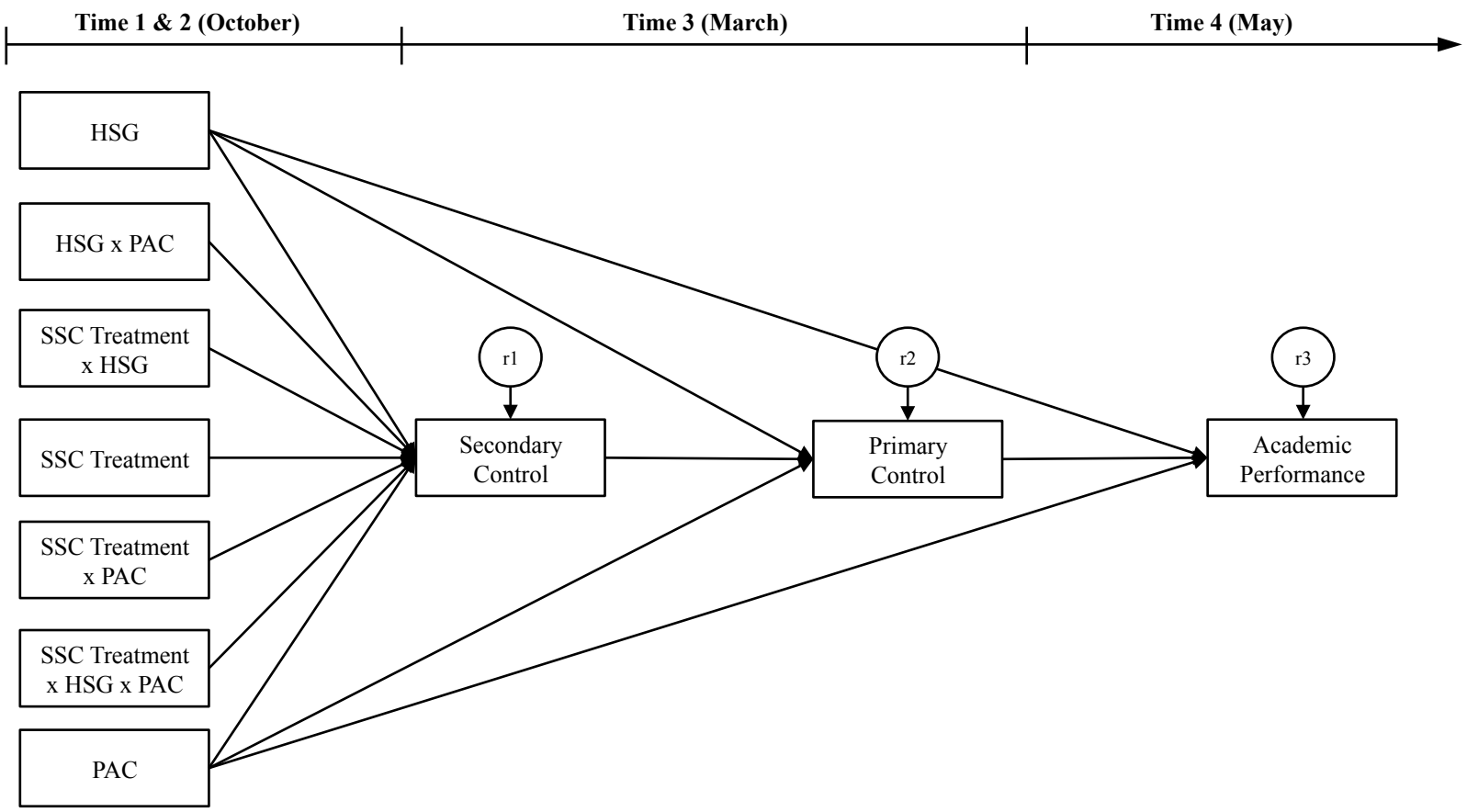

Figure 1. Structural model displaying all specified paths in the hypothesized sequence. All effects were adjusted for age and gender. HSG = high school grade. PAC = perceived academic control. r = residual.

immediately following the Time 1 questionnaire: As described below, participants in the experimental sessions received the SSC treatment whereas those in the control sessions completed a filler task. At Time 3 (March), participants returned to the laboratory to complete a second online questionnaire similar to the first questionnaire. Time 4 (May) consisted of acquiring participants' final course grades from their introductory psychology course after the second semester concluded. Participants in this sample (n = 316) were native English speakers in their first year of university, the majority of whom were 17-18 year old (89%) females (68%).

Main Study Variables

High school grade (HSG; Time 1). Self-reported HSG was used as a proxy for actual high school performance based on a strong relation between the two, r = .84 (Perry, Hladkyj, et al., 2005; 1 = *50% or less*, 10 = *91-100%*; M = 8.10, SD = 1.50, range = 2-10). Previous research has demonstrated that this self-report measure of HSG is a reliable and substantial predictor of post-secondary achievement, including final course grades, r = .40-.54; and grade point averages, r = .51-.54 (e.g., Hamm et al., 2014; Perry, Hladkyj, et al., 2001, 2005; Perry, Stupnisky, Hall, Chipperfield, & Weiner, 2010). Canadian universities use HSGs as the primary admission criterion rather than standardized entrance examinations (e.g., SATs, ACTs). Meta-analyses by Richardson et al. (2012) and Robbins et al. (2004) revealed that HSGs are the strongest traditional correlate of university GPAs (rs = .40 to .41) and predict university performance as well or better than SAT (r = .29 to .37) or ACT scores (r = .37 to .40). See Table 1 for a summary of the main study variables.

Perceived academic control (Time 1). Perry et al.'s (2001) eight-item Perceived

Table 1

Summary of the Main Study Variables and Zero-Order Correlation Matrix

	M	*SD*	Actual range	α	1	2	3	4	5	6	7
1. Age[a]	1.11	0.32	1-2	–	–						
2. Gender[a]	1.32	0.47	1-2	–	.03	–					
3. HSG[a]	8.10	1.50	2-10	–	-.16*	-.11*	–				
4. PAC[a]	4.11	0.59	1.75-5.00	.80	.08	.05	.09	–			
5. Secondary control[b]	4.14	0.57	2.50-5.00	.68	-.05	-.09	.12*	.17*	–		
6. Primary control[b]	3.98	0.67	1.75-5.00	.81	-.02	-.11	.29*	.10	.61*	–	
7. Academic performance[c]	72.01	12.79	10.11-94.65	–	-.06	-.04	.48*	.22*	.31*	.33*	–

Note. HSG = high school grade. PAC = perceived academic control.

[a]Time 1 measure. [b]Time 3 measure. [c]Time 4 measure.

*$p \leq .05$ (two-tailed tests).

Academic Control (PAC) scale assessed domain-specific perceived control (e.g., "I have a great deal of control over my academic performance in my Introductory Psychology course"). Participants rated their agreement on a five-point scale (1 = *strongly disagree*, 5 = *strongly agree*; $M = 4.11$, $SD = 0.59$, range = 1.75-5.00, $\alpha = .80$). PAC was reassessed using the same scale at Time 3 ($M = 4.14$, $SD = 0.56$, range = 2.63-5.00, $\alpha = .79$, test-retest $r = .59$).

Previous research indicates the PAC scale has suitable psychometric properties ($\alpha = .75$ to .81; five-month test-retest reliability $r = .53$ to .66; Hall et al., 2006; Pekrun, Goetz, Daniels, Stupnisky, & Perry, 2010; Perry, Hladkyj, et al., 2001, 2005; Ruthig, Haynes, Stupnisky, & Perry, 2009; Stupnisky et al., 2008). Past studies have also established the PAC scale is a reliable predictor of post-secondary achievement, including final course grades, $r = .27$-.29; and year-end grade point averages, $r = .19$-.31 (Perry, Hladkyj, et al., 2001, 2005; Ruthig et al., 2007; Stupnisky et al., 2007).

Selective secondary control treatment (SSC treatment; Time 2). The SSC treatment was administered early during the transition period (October) and immediately following the Time 1 questionnaire. The treatment was provided by trained research assistants in a laboratory setting equipped with computers for each participant (session group sizes ranged from 20-45). Treatment administration occurred during one-hour sessions and consisted of three stages. First, the *activation* stage encouraged students to reflect on the causes of their past academic performances so as to heighten the relevance of the content presented in the induction stage (see Perry et al., 2014). Activation was accomplished by having participants rate the influence of various causes to their academic performance presented via a secure survey website, as well as by administering

the treatment only after students had received performance feedback on their first introductory psychology test.

Second, the *induction* stage required participants to view a narrated video presentation that focused on the grade-enhancing impact of frequently employing selective secondary control strategies. Based on Heckhausen et al. (1995, 2010), the narrated presentation suggested that (a) students who set academic goals tend to achieve higher grades, (b) maintaining motivation for academic goals is challenging, and (c) students who actively focus on sustaining their goal commitment by consistently employing selective secondary control strategies are more likely to achieve their long-term academic goals. Selective secondary control strategies were introduced using the acronym *APP* to provide students with a simple mnemonic to facilitate retention of the treatment message. APP/selective secondary control strategies presented in the treatment involved *anticipation* (e.g., reminding oneself how good it will feel to succeed), *prioritization* (e.g., reminding oneself how important a university education is to one's future career), and *persistence* (e.g., reminding oneself of others who have succeeded in the face of obstacles and initial setbacks).

Third, the *consolidation* stage used a writing activity that was designed to facilitate deep processing of the treatment content based on previous research (see Haynes, Perry, Stupnisky, & Daniels, 2009 and Perry et al., 2014). Participants were instructed to (a) set an academic goal, (b) write about the positive emotions they anticipated experiencing after achieving the goal (anticipation), (c) write about why their academic goals were a priority (prioritization), and (d) write about a personal model of persistence (persistence).

Students in the no-treatment sessions completed the same activation task described above. However, during the critical induction and consolidation stages, those in the no-treatment sessions completed "filler" tasks. In the induction stage, participants viewed a narrated presentation summarizing supplemental information from their introductory psychology course textbook. Presentation content focused on how artists throughout history have employed perceptual principles to recreate, reinterpret, and question reality. The consolidation phase involved participants summarizing the presentation and writing about how they could apply the main points of the presentation in their own lives. The treatment variable was dummy-coded (0 = *no-treatment* [n = 205], 1 = *SSC treatment* [n = 111]).

Selective secondary control strategies (Time 3). Four items from the domain-specific Academic-Specific Control Strategies scale measured selective secondary control at Time 3 (ASCS; Hamm et al., 2013; e.g., "I often tell myself that I will be successful in reaching my educational goals"). Participants rated their agreement on a five-point scale (1 = *strongly disagree*, 5 = *strongly agree*; M = 4.14, SD = 0.57, range = 2.50-5.00, α = .68). Selective secondary control was assessed using the same scale at Time 1 (M = 4.23, SD = 0.58, range = 1.25-5.00, α = .63, test-retest r = .45).

Confirmatory factor analyses conducted by Hamm et al. (2013) indicate that the items comprising the selective secondary and selective primary control measures form satisfactory psychometric scales that conform to their theoretical underpinnings. Research assessing the five-month test-retest reliability of the selective secondary control subscale has demonstrated acceptable stability over time, r = .61 (Hamm et al., 2015).

Selective primary control strategies (Time 3). Four domain-specific selective

primary control items from the ASCS scale measured selective primary control at Time 3 (e.g., "I will work hard to get a good education). Participants rated their agreement on a five-point scale (1 = *strongly disagree*, 5 = *strongly agree*; *M* = 3.98, *SD* = 0.67, range = 1.75-5.00, α = .81). Selective primary control was assessed using the same scale at Time 1 (*M* = 4.00, *SD* = 0.72, range = 1.00-5.00, α = .82, test-retest *r* = .57). Hamm et al. (2015) also examined the five-month test-retest reliability of the selective primary control subscale and found acceptable stability over time, *r* = .63.

Academic performance (Time 4). Academic performance was measured using students' final grades (percentages) in their introductory psychology course (with possible values from 0 to 100%; *M* = 73.68, *SD* = 13.26, range = 7.16-96.18). The measure was adjusted for (omitted) scores on a pre-treatment class test and therefore represented a cumulative measure of post-treatment performance. Grades were collected from course instructors at the end of the academic year.

Covariates

Age (Time 1). Participants indicated their age using a 10-point scale (1 = *17-18*, 10 = *older than 45*; *M* = 1.11, *SD* = 0.32, range = 1-2).

Gender (Time 1). Gender was self-reported and coded categorically (1 = *female*, 2 = *male*; 68% female).

Emotion Measures for the Supplemental Analysis

Positive emotion (Time 3). Participants reported their pride and hope after reading the following stem: "Please indicate the extent to which each of the following emotions describe how you feel about your performance in your introductory psychology course to date." Time 3 ratings were provided on a 10-point scale (1 = *not at all*, 10 =

very much so; *M* = 6.48, *SD* = 1.87, range = 1.50-10.00, pride-hope *r* = .66). Positive emotions were assessed using the same items at Time 1 (*M* = 5.86, *SD* = 1.87, range = 1.00-10.00, pride-hope *r* = .47, test-retest *r* = .45)

Negative emotion (Time 3). Participants reported their helplessness and shame after reading the same stem as that described for the positive emotions. Time 3 ratings were provided on a 10-point scale (1 = *not at all*, 10 = *very much so*; *M* = 3.24, *SD* = 1.96, range = 1.00-9.00, helplessness-shame *r* = .54). Negative emotions were assessed using the same items at Time 3 (*M* = 3.57, *SD* = 2.14, range = 1.00-10.00, helplessness-shame *r* = .46, test-retest *r* = .34).

Results

A Treatment x HSG x PAC design tested the hypotheses. Simple slope regression analyses assessed whether the SSC treatment influenced post-treatment selective secondary control and two-semester academic performance for low HSG-high PAC students in transition. A path analytic and moderated mediation approach examined whether SSC treatment effects on performance (for low HSG-high PAC students) were mediated by a hypothesized sequence of psychological mechanisms based on Heckhausen et al. (1995, 2010; see Figure 1). Details concerning the path analytic approach are provided in describing the results. Consistent with previous treatment intervention studies in competitive achievement settings (e.g., Hamm et al., 2014; Haynes Stewart et al., 2011), age and gender were controlled in all analyses to account for the extraneous influence of these demographic factors on motivation and performance outcomes (see Richardson et al., 2012).

Standardized regression weights are reported for all effects with the exception of

the treatment effects. Because the treatment variable is dichotomous, it has been left in its original metric (0 = *no-treatment*, 1 = *SSC treatment*) to enable valid interpretation (Hayes, 2013). Hence, SSC treatment effects are partially standardized and represent the mean difference between the no-treatment and SSC conditions on the dependent measures reported in standard deviation units (e.g., the standard deviation difference between the treatment conditions in academic performance). Note that a partially standardized beta weight is conceptually analogous to Cohen's *d*. Thus, the partially standardized effect of SSC treatment (β = .62) on academic performance reported below indicates that low HSG-high PAC students who received treatment outperformed their no-treatment peers by .62 of a standard deviation (74.85% vs. 66.68%).

Zero-order Correlations

Correlation coefficients allowed for an examination of unadjusted relationships between the main study variables (see Table 1). HSG (*r* = .48), PAC (*r* = .22), secondary control (*r* = .31), and primary control (*r* = .33) were related to academic performance in theoretically consistent directions. HSG was correlated with primary (*r* = .29) and secondary (*r* = .12) control, whereas PAC was correlated with secondary control (*r* = .17). As expected, secondary and primary control were strongly and positively related to each other (*r* = .61).

Simple Treatment Effects

Treatment x HSG x PAC regression models were assessed to examine whether the SSC treatment (vs. no-treatment) influenced post-treatment psychological (Time 3 secondary control) and performance (Time 4 final grades) outcomes consistent with theory (Heckhausen et al., 2010). Three-way interactions were observed for secondary

control [β = -.20, p < .001, CIs = -0.305 to -0.087] and performance [β = -.09, p = .023, CIs = -0.173 to -0.013]. Interactions were probed by testing simple-simple treatment effects (slopes) at low (-1 SD) and high (+1 SD) levels of HSG and PAC using the lavaan package for R (Cohen, Cohen, West, & Aiken, 2003; Hayes, 2013; Rosseel, 2012). Thus, SSC treatment effects were tested at four pertinent combinations of the moderators: low HSG-low PAC, low HSG-high PAC, high HSG-low PAC, and high HSG-high PAC.

Simple-simple slope regression analyses showed that low HSG-high PAC students in the SSC treatment condition reported higher secondary control than their peers in the no-treatment condition five-months post-treatment [partially standardized β = .73, p = .003, CIs = 0.257 to 1.211]. Tests of simple-simple slopes also indicated that low HSG-high PAC individuals who received SSC treatment achieved year-end course grades that were 8% higher (74.85% vs. 66.68%) than their no-treatment peers [partially standardized β = .62, p = .002, CIs = 0.226 to 1.007; see Figure 2). Effects were consistent when controlling for baseline levels of each outcome measure (i.e., when accounting for autoregressive effects of T1 secondary control and initial test performance). No treatment effects were observed for students with the other three combinations of HSG and PAC (p range = .082 to 758).[19]

Supplemental analyses also probed Treatment x HSG x PAC interactions

[19]To test Heckhausen et al.'s (2010) proposition that SSC should promote perceived control, a supplemental Treatment x HSG x PAC regression analysis was conducted with Time 2 PAC as the outcome measure when controlling for age and gender. The three-way interaction was significant [β = -.12, p = .009, CIs = -0.207 to -0.030], and simple-simple slope analyses indicated that the SSC treatment (vs. no-treatment) increased Time 2 PAC for individuals with low HSGs and high Time 1 PAC [partially standardized β = .49, p = .014, CIs = 0.097 to 0.873]. The SSC treatment also increased Time 2 PAC for those with high HSGs and low Time 1 PAC [partially standardized β = .64, p = .002, CIs = 0.234 to 1.040]. No treatment effects were observed for students with the remaining two combinations of HSG and PAC. Results were consistent when employing a traditional subgropus analysis: The SSC treatment (vs. no-treatment) only increased Time 2 PAC for students with low HSGs and high initial PAC [t(238) = 2.31, p = .022, Ms = 4.66 vs. 4.38, M_{diff} = 0.28, d = 0.61] and for students with high HSGs and low initial PAC [t(238) = 1.98, p = .048, Ms = 4.13 vs. 3.87, M_{diff} = 0.25, d = 0.54].

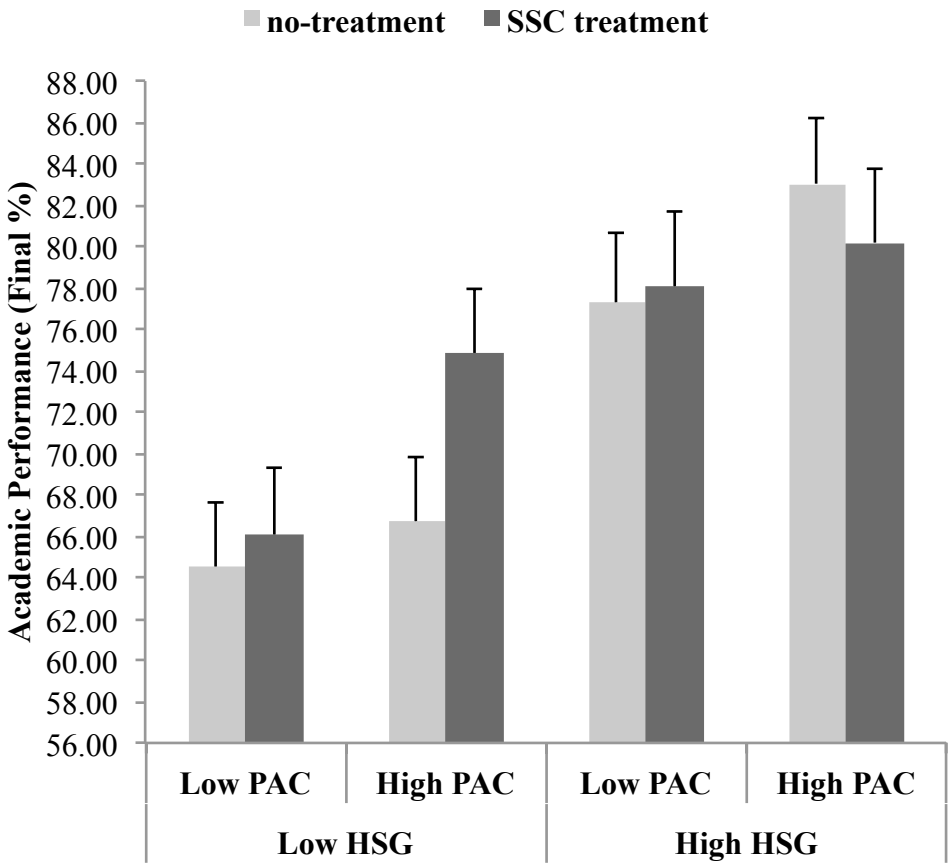

Figure 2. The Treatment x High School Grade (HSG) x Perceived Academic Control (PAC) interaction on seven-month academic performance. The effects of the SSC treatment (vs. no-treatment) are presented at low (-1 *SD*) and high (+1 *SD*) levels of HSG and PAC. Error bars represent 1 standard error.

employing a traditional approach that tested simple-simple SSC treatment effects within subgroups of students characterized by low (below median) or high (above median) HSGs and PAC. Results of these simple-simple effect *t*-tests were consistent with those reported above. Only low HSG-high PAC individuals who received the SSC treatment reported higher post-treatment secondary control [$t(239) = 3.16$, $p = .002$, $Ms = 4.48$ vs. 4.02, $M_{diff} = 0.46$, $d = 0.84$] and achieved higher final grades [$t(306) = 2.03$, $p = .044$, $Ms = 76.53$ vs. 70.94, $M_{diff} = 5.60$, $d = 0.48$] than their no-treatment peers (see Table 2 for group means and standard deviations).

Main Path Analysis

The main path analyses tested whether SSC treatment effects on two-semester performance were mediated by psychological process variables based on Heckhausen et al. (1995, 2010; see Figure 1). A path analytic approach involving the lavaan package for R (maximum-likelihood method; Rosseel, 2012) was used to calculate the omnibus effects of predictor variables and assess model fit. Model fit was assessed using chi-square (χ^2), the comparison fit index (CFI), and the root mean square error of approximation (RMSEA) based on recommendations by Byrne (2010). Results of these tests indicated that the model fit the data well: χ^2 (11) = 17.83, $p = .086$; CFI = .974; RMSEA = .044.

Individual path estimates (regression weights) revealed a pattern of results consistent with the proposed model (see Table 3). Note that the variables involved in the hypothesized interactions (SSC treatment, HSG, PAC) were mean centered to facilitate interpretation of their omnibus effects (Cohen et al., 2003). HSG [$\beta = .18$, $p = .007$, CIs = 0.050 to 0.308], PAC [$\beta = .19$, $p = .005$, CIs = 0.056 to 0.314] and the

Table 2

Means and Standard Deviations by SSC Treatment Condition, High School Grade, and Perceived Academic Control

	Low HSG				High HSG			
	Low PAC		High PAC		Low PAC		High PAC	
Outcome	No-SSC	SSC	No-SSC	SSC	No-SSC	SSC	No-SSC	SSC
Secondary control[a]								
M (*SD*)	4.01 (0.48)	3.92 (0.58)	4.02 (0.61)	4.45 (0.42)	4.08 (0.60)	4.22 (0.52)	4.39 (0.54)	4.18 (0.61)
Adj. M (SE)	3.99 (0.08)	3.94 (0.11)	4.02 (0.09)	4.48 (0.11)	4.07 (0.08)	4.21 (0.13)	4.39 (0.09)	4.18 (0.13)
n	48	25	35	26	43	19	35	18
Academic performance[a]								
M (*SD*)	65.35 (14.61)	66.37 (12.92)	70.86 (10.80)	76.09 (9.73)	78.92 (11.51)	79.49 (9.23)	82.18 (8.77)	81.68 (9.77)
Adj. M (SE)	65.19 (1.40)	66.42 (1.94)	70.94 (1.68)	76.53 (2.20)	78.80 (1.70)	79.24 (2.34)	82.21 (1.82)	81.66 (2.54)
n	69	36	48	29	47	25	41	21

Note. Adj. M = covariate adjusted mean. HSG = high school grade. PAC = perceived academic control. No-SSC = no-treatment condition. SSC = SSC treatment condition.

[a]Time 3 measure. [b]Time 4 measure.

Table 3

Summary of Individual Path Estimates (Regression Weights)

	Outcome variables		
Predictor variables	Secondary control	Primary control	Academic performance
SSC Treatment x HSG x PAC[a]			
SSC at low HSG-low PAC	-.08	–	–
SSC at low HSG-high PAC	.73*	–	–
SSC at high HSG-low PAC	.38	–	–
SSC at high HSG-high PAC	-.44	–	–
HSG	.18*	.25*	.38*
PAC	.19*	.00	.15*
Secondary control		.59*	–
Primary control			.25*

Note. The simple effects of the SSC treatment are presented at each of the four combinations of HSG (low, high) and PAC (low, high). Only path estimates specified in the structural model are shown (see Figure 1). Paths not specified are indicated by a dash (–). HSG = high school grade. PAC = perceived academic control.

[a]Standardized regression weights are reported for all variables with the exception of the SSC treatment. Because the treatment variable is dichotomous, it has been left in its original metric (0 = no-treatment, 1 = SSC treatment) to enable valid interpretation (see Hayes, 2013).

*$p < .05$ (two-tailed tests).

Treatment x HSG x PAC interaction [β = -.20, p < .001, CIs = -0.305 to -0.087] were significant predictors of secondary control. The significant three-way interaction was probed using lavaan (Rosseel, 2012) to examine SSC treatment effects at low (-1 SD) and high (+1 SD) levels of HSG and PAC. Consistent with the hypotheses, simple-simple slope analyses showed that students with low HSGs and high PAC who received the SSC treatment reported higher secondary control than their no-treatment peers [partially standardized β = .73, p = .003, CIs = 0.257 to 1.211]. Effects were consistent when controlling for baseline (T1) secondary control. No treatment effects were observed for those with the remaining three combinations of HSG and PAC (p range = .082 to .742).

Supporting the proposed model, secondary control was a strong predictor of primary control (β = .59, p < .001, CIs = 0.492 to 0.691). HSG also predicted primary control (β = .25, p < .001, CIs = 0.145 to 0.349). Results were consistent when accounting for autoregressive effects (i.e., adjusting for T1 primary control). Because the SSC treatment predicted secondary control (for low HSG-high PAC students only), which in turn predicted primary control, conditional indirect effects of the SSC treatment on primary control were examined. Conditional indirect treatment effects were tested at low (-1 SD) and high (+1 SD) levels of HSG and PAC and tested for significance using a bootstrap approach that employed 95% bias corrected confidence intervals (Hayes, 2013; Preacher & Hayes, 2008). Mediation was confirmed if zero fell outside the confidence interval (CI) based on 5,000 samples of the unstandardized beta weights. The indirect effects of omnibus predictors were tested using the same bootstrap approach. As expected, the SSC treatment promoted primary control through secondary control (partially standardized β = .42, CIs = 0.111 to 0.468) for only those with low HSGs and

high PAC. See Table 4 for a summary of indirect effects.

Consistent with the model, higher HSGs (β = .38, $p < .001$, CIs = 0.272 to 0.482), PAC (β = .15, $p = .002$, CIs = 0.053 to 0.243), and primary control (β = .25, $p < .001$, CIs = 0.130 to 0.372) were related to increased final grades. Secondary control also indirectly promoted academic performance via primary control (β = .15, CIs = 1.466 to 6.075). All effects except the PAC-performance path remained significant when controlling for initial test performance. See Figure 3 for a summary of the SSC treatment's indirect effects on two-semester academic performance via the proposed sequence of psychological mechanisms.

Supplemental Emotions Path Analysis

A supplemental path analysis assessed whether emotions further mediated SSC treatment effects based on recent evidence suggesting that the influence of control striving on performance may be partially accounted for by emotional well-being (Hamm et al., 2015). The structural model for the supplemental analysis was specified in accordance with the model depicted in Figure 1. The only distinction was that the supplemental analysis included positive (pride, hope) and negative (helplessness, shame) emotions as mediators of primary control's effects on academic performance. Age and gender were controlled in the analyses.

Results from the supplemental path analysis indicated the model had acceptable fit: χ^2 (23) = 44.59, $p = .004$; CFI = .948; RMSEA = .055. Note that path estimates in the supplemental model relating to the prediction of secondary control and primary control are identical to those in the main analysis. Thus, only path estimates involving the prediction of the emotions and academic performance are reported below.

Table 4

Tests of Indirect Effects

Predictor variable	Mediating variable(s)	Outcome variable	Standardized indirect effect[a]	95% bias-corrected *CI*s (lower, upper)[b]
SSC Treatment x HSG x PAC[a]				
SSC at low HSG, low PAC	Secondary control	Primary control	-.03	-.246, .148
SSC at low HSG, high PAC	Secondary control	Primary control	.42*	.111, .468
SSC at high HSG, low PAC	Secondary control	Primary control	.24	-.030, .360
SSC at high HSG, high PAC	Secondary control	Primary control	-.26	-.393, .017
Secondary control	Primary control	Academic performance	.15*	1.466, 6.075

Note. The simple indirect effects of the SSC treatment are presented at each of the four combinations of HSG (low, high) and PAC (low, high). HSG = high school grade. PAC = perceived academic control.

[a]Standardized indirect effects are reported for all variables with the exception of the SSC treatment. Because the treatment variable is dichotomous, it has been left in its original metric (0 = no-treatment, 1 = SSC treatment) to enable valid interpretation (see Hayes, 2013).

[b]Confidence intervals are based on 5,000 samples of the unstandardized beta weights.

*$p < .05$ based on unstandardized bias-corrected *CI*s (two-tailed tests).

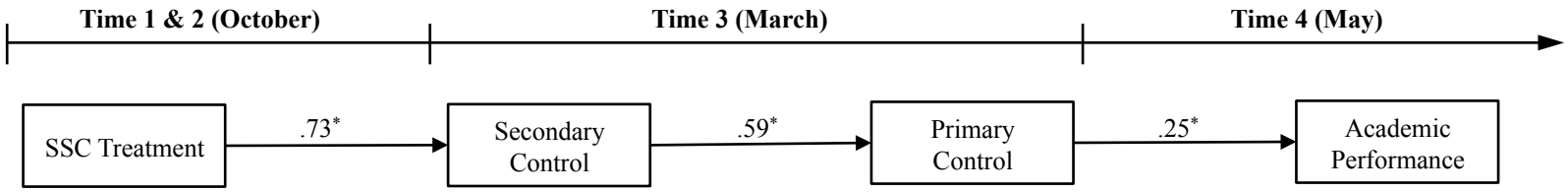

Figure 3. Indirect effects of the SSC treatment (vs. no-treatment) on academic performance for young adults with low high school grades (HSGs) and high perceived academic control (PAC) via the proposed sequence of psychological mechanisms. All effects control for age and gender.

Consistent with the proposed model, primary control predicted both positive (β = .41, $p < .001$, CIs = 0.285 to 0.533) and negative emotion (β = -.23, $p < .001$, CIs = -0.361 to -0.106). Effects were consistent when controlling for baseline (T1) positive and negative emotion. In turn, increases in positive emotion (β = .23, $p < .001$, CIs = 0.103 to 0.358) were related to higher final grades, whereas increases in negative emotion (β = -.20, $p = .002$, CIs = -0.328 to -0.075) were related to lower final grades. Primary control also indirectly promoted academic performance via positive (β = .09, *CI*s = 0.739 to 3.642) and negative emotion (β = .05, *CI*s = 0.247 to 2.177). All effects remained consistent when controlling for initial test performance. See Figure 4 for a summary of the SSC treatment's indirect effects on academic performance via the control strategies and emotions.

Discussion

Life course transitions are infused with changes and challenges that have the capacity to undermine motivation and goal engagement (Perry, 2003). These challenges may be considerable for those facing additional obstacles to goal attainment (Hamm et al., 2015). Motivation-enhancing treatments to promote control striving may assist some of these vulnerable individuals who have psychosocial characteristics that make them especially amenable to treatment. Consequently, the present seven-month, quasi-experimental, randomized field study examined whether young adults with untappedpotential (low HSG-high PAC) who were transitioning to university benefited from a novel treatment to sustain control striving. In so doing, Study 3 simultaneously examined whether SSC treatment effects were mediated by psychological mechanisms consistent with Heckhausen et al.'s (2010) MTLD.

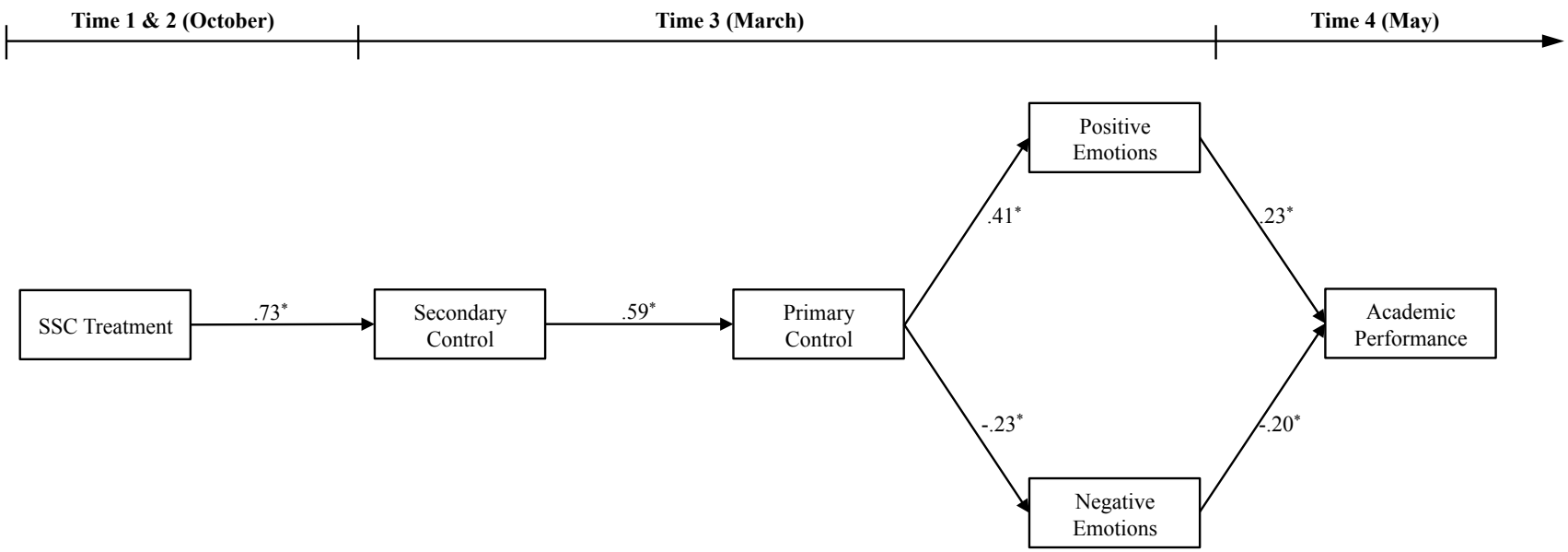

Figure 4. Supplemental analysis showing indirect effects of the SSC treatment on academic performance for young adults with low high school grades (HSGs) and high perceived academic control (PAC) via the control strategies and emotions. All effects control for age and gender.

Results were consistent with the hypotheses and suggested that, for only young adults with low HSGs and high PAC, (a) the SSC treatment (vs. no-treatment) promoted selective secondary control, (b) increases in this form of motivation-enhancing thinking facilitated selective primary control striving, (c) which in turn predicted higher year-end academic performance. Results of the supplemental path analysis extend the main findings and contribute to a broader understanding of motivational processes accounting for the influence of control striving treatments on performance. These findings build on evidence linking selective primary control to emotional well-being (Hamm et al., 2015; Haynes et al., 2009) by showing that positive (pride, hope) and negative (helplessness, shame) discrete emotions mediated the selective primary control-academic performance path examined in the main analysis. Thus, in line with Heckhausen et al.'s (2010) theoretical propositions, the treatment directly increased the use of cognitive control strategies and indirectly promoted adaptive emotions, which in turn facilitated two-semester performance. These findings advance the literature by showing that control striving treatments influence performance for some young adults with untapped potential (low HSG-high PAC) and by demonstrating that the treatment-performance linkage is mediated by psychological mechanisms consistent with Heckhausen et al.'s MTLD (1995, 2010).

Standardized predicted values (Z_{PRED}) from the preliminary analyses point to the SSC treatment's capacity to tap the potential of young adults with low HSGs and high PAC. Those who did not receive treatment reported modest levels of post-treatment selective secondary control (Z_{PRED} = -.28) and PAC (Z_{PRED} = .30), which may have contributed to their poor long-term performance (Z_{PRED} = -.53). These five- to seven-

month psychological and performance outcomes are in contrast to those experienced by their peers who received SSC treatment: Young adults with low HSGs and high PAC in the treatment condition reported the highest post-treatment selective secondary control (Z_{PRED} = .45), the highest PAC (Z_{PRED} = .79), and achieved average final grades (Z_{PRED} = .09). Thus, low HSG-high PAC students in the treatment condition were able to sustain their motivation-enhancing thinking (selective secondary control) and adaptive beliefs about their academic capabilities (PAC) over a five-month period to a greater degree than even high HSG-high PAC students who were least at risk (respective Z_{PRED} = .01 and .59). Although low HSG-high PAC students did not achieve the highest final grades, their performance was significantly higher than their no-treatment peers and comparable to those with high HSGs and low PAC (Z_{PRED} = .27).[20]

The magnitudes of these SSC treatment effects for low HSG-high PAC students were moderate in size based on Cohen's (1988) conventions and noteworthy considering the seven-month field design (note that a partially standardized β is conceptually analogous to Cohen's *d*). For instance, the partially standardized treatment effect (β = .62) on year-end course grades indicates low HSG-high PAC students in the SSC treatment condition outperformed their no-treatment peers by .62 of a standard deviation. This 8% boost (74.85% vs. 66.68%) for those receiving the SSC treatment is consequential given that it translates into a full letter grade difference in an eight-month course (C+ vs. B). SSC treatment effects on selective secondary control (partially standardized β = .73) and PAC (partially standardized β = .49) assessed five-months

[20]Predicted values were consistent with the supposition that low HSG-low PAC students may be most susceptible to the detrimental effects of difficult transitions and possibly cannot be assisted by motivation treatments: Irrespective of treatment condition, these young adults experienced the lowest selective secondary control (Z_{PRED} = -.33, -.42), the lowest PAC (Z_{PRED} = -.74, -.67), and achieved the lowest final grades (Z_{PRED} = -.69, -.58).

post-treatment were consistent with the performance effect and moderate in size.

Considering that the SSC treatment was administered in a single one hour session, it is notable that the magnitude of the treatment's effect on performance (partially standardized $\beta = .62$ converted into Pearson's $r = .28$) compares favorably to costly and time-intensive first-year experience ($r = .02$), academic skill ($r = .28$), and self-management ($r = .16$) interventions increasingly provided to young adults transitioning to university (see meta-analysis by Robbins, Oh, Le, & Button, 2009). At a surface level, the capacity of a one-time control striving treatment to produce meaningful effects on a performance measure assessed seven-months post-treatment may appear surprising. However, these results are consistent with recent research showing that brief treatments that target influential psychological processes can produce notable long-term performance gains for individuals facing obstacles to goal attainment (see Cohen, Garcia, Purdie-Vaughns, Apfel, & Brzustoski, 2009; Paunesku et al., in press; Walton, 2014; Yeager et al., 2014). Increasing evidence suggests that selective secondary control may represent one such influential factor to the extent that it facilitates adaptation by sustaining motivation, goal engagement, and well-being for young adults navigating challenging life course transitions (Hamm et al., 2013, 2015; Poulin & Heckhausen, 2007). Thus, Study 3 results provide further evidence for the benefits of this form of motivation-enhancing thinking in young adulthood and suggest that these strategies are amenable to manipulation via a theoretically-based treatment intervention.

Strengths, Limitations, and Future Directions

One strength of Study 3 was its reliance on the strong theoretical framework provided by Heckhausen et al.'s (1995, 2010) MTLD, which has received consistent

empirical support for its core tenets over the past 20 years. This study is also supported by a seven-month, pre-post, randomized treatment design in which a combination of psychological and performance outcomes were assessed at three separate time points during the year (October, March, May). Such designs make causal inference more viable than research that examines cross-sectional relationships or fails to manipulate the independent variables. Finally, the statistical approach employed (path analysis and moderated mediation) enabled a simultaneously examination of how (control strategies, emotions) and for whom (those with untapped potential) an SSC treatment facilitated two-semester performance for young adults in transition.

One limitation of the present study is that, although the model implies four separate steps (see Figure 1), data were collected in three phases. Thus, the relationship between selective secondary control and selective primary control was based on cross-sectional data. However, an autoregressive analysis substantiated the main findings and demonstrated that this relationship remained reliable when accounting for pre-existing differences in selective primary control. A second limitation concerns the self-reported measure of HSG, which may not correspond perfectly to actual high school performance. However, previous research demonstrates this measure is strongly related to actual HSGs, r = .84 (Perry, Hladkyj, et al., 2005). Further, the present results (HSG-performance r = .48) are in line with past studies indicating that this self-report measure of HSG is a reliable and substantial predictor of post-secondary performance, including final course grades, r = .40-.54; and grade point averages, r = .51-.54 (e.g., Hamm, Perry, et al., 2014; Perry, Hladkyj, et al., 2001, 2005; Perry et al., 2010).

Considering that this study represents one of the first empirical examinations of

control striving treatment efficacy, there are many productive avenues for future research. For instance, further research is needed to examine other influential mechanisms that may transmit control striving treatment effects, such as motivational commitment to important goals as suggested by Heckhausen et al. (2010). SSC treatments may also increase the value of chosen goals (e.g., losing weight) and decrease the value of competing goals (e.g., leisure time), particularly among individuals who face challenging obstacles to goal attainment (e.g., those who are overweight).

This example points to the potential value of examining the influence of control striving treatments in alternate domains, such as health (cf. Gitlin et al., 2006; Gitlin, Hauck, Winter, Dennis, & Schultz, 2006). Given that recent evidence suggests selective secondary control sustains psychological and physical health (reduced depressive and stress-related physical symptoms) during stressful life course transitions (Hamm et al., 2015), the benefits of SSC treatments may extend beyond those related to young adults' educational and career goals. Finally, considering control striving treatments can be delivered online and are therefore scalable, there may be significant practical benefits to mass administering such treatments to young adults navigating challenging life course transitions. This underscores the need for future studies to explore whether control striving treatments sustain motivation and promote goal attainment when administered en masse as part of large-scale programs designed to facilitate adaptation for young adults in transition (cf. Robbins et al., 2009).

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CHAPTER 5

General Discussion

Whether one is a five-year old entering kindergarten or an 85-year old entering a personal care home, adjusting to change throughout the lifespan is often difficult. There may be few periods that necessitate adapting to more significant and unpredictable changes than life course transitions (Heckhausen & Schulz, 1995; Perry, 2003). These transitions occur in semi-structured intervals across the life-span and include (among others) entry into kindergarten, a new school, university, or career; marriage, child birth, relocation, retirement, loss of independent functioning, and personal care home admission (Heckhausen, 1999; Heckhausen, Wrosch, & Schulz, 2010; Perry, 2003).

The shift from high school to university provides an exemplar of the difficulties of sustaining goal engagement and well-being during these challenging junctures. Young adults navigating this transition must contend with increased pressures to excel, frequent failures, unstable social networks, new living arrangements, and critical career choices (Perry, 1991; Perry, Hladkyj, Pekrun, & Pelletier, 2001). Many struggle to adapt to this new and competitive achievement environment, as evidenced by elevated levels of stress and depression reported at this juncture in the life-span (American College Health Association [ACHA]; 2012; American Psychological Association [APA], 2012). Difficulty adjusting to the significant changes and challenges experienced during this period may also compromise goal striving considering that nearly 30% of young adults drop out of university within their first year and only 57% of students complete four year degrees within six years (Snyder & Dillow, 2013).

The present dissertation examined the influence of a largely overlooked

motivation factor that may facilitate goal striving and well-being during stressful life course transitions: selective secondary control. Three studies systematically assessed the precursors, consequences, mediators, and moderators of this form of motivation-focused thinking during the school to university shift. Study 1 explored the antecedents of selective secondary control striving and its influence on behavior-focused selective primary control and seven-month academic achievement. Study 2 built on Study 1 by examining the impact of selective secondary control striving on consequential indicators of well-being for university students (depressive symptoms, stress-related physical symptoms). Study 2 also simultaneously tested *how* (mechanisms) and *for whom* (moderators) selective secondary control benefits young adults. Study 3 extended Studies 1 and 2 by assessing the longitudinal effects of a theory-based treatment intervention designed to enhance selective secondary control striving and improve performance. Building on the preceding studies, Study 3 examined factors that moderated and mediated treatment effects on two-semester academic performance.

Achievement Goals as Precursors to Selective Secondary Control

Study 1 is among the first to explore the antecedents of selective secondary control. Findings showed that both performance and mastery achievement goals predicted students use of selective secondary control strategies. These results are consistent with theory and logic. Selective secondary control is intended to enhance volitional goal commitment (Heckhausen, 1997; Heckhausen, Wrosch, & Fleeson, 2001), which implies that the adoption of a goal should precede the use of these motivation-focused strategies. In essence, an individual must be committed to pursuing a goal prior to using cognitive strategies to enhance or sustain the goal.

Results of Study 1 pointed to the strong influence of performance goals on selective secondary control ($\beta = .40$). Performance-oriented individuals have been shown to be concerned with normative social comparisons and tend to be driven by outperforming their peers (Dweck & Leggett, 1988; Hulleman, Schrager, Bodmann, & Harackiewicz, 2010). Thus, these students may employ motivation-focused strategies to sustain (behavior-focused) selective primary control striving and thereby improve future academic performance. This logic is consistent with Heckhausen and colleagues (e.g., Poulin & Heckhausen, 2007) who posit that selective secondary control strategies are commonly employed when an individual's goal pursuit is threatened. Performance goals are related to increased levels of anxiety and a fear of failure (Daniels et al., 2009; Elliot & Church, 1997). To the extent that heightened anxiety and a fear of failure are indicators of perceived threat to one's goal pursuit, the strong link between performance goals and the use of selective secondary control strategies is logical and in accordance with Heckhausen et al. (2010). Selective secondary control strategies may provide a means of maintaining goal commitment when the goal is threatened, which may be particularly relevant for students who strongly endorse performance goals. However, mastery goals were also a positive predictor of selective secondary control, suggesting that not only performance-oriented students engage in this form of motivation-focused thinking (cf. Daniels et al., 2014).

Selective Secondary Control Facilitates Adaptation During a Challenging Life Course Transition

Despite its potential benefits for young adults negotiating significant life course transitions, past studies have largely overlooked the role of selective secondary control in

sustaining motivation and well-being. The present dissertation addressed this omission by examining whether motivation-focused thinking facilitates adaptation during the landmark shift from school to university. A central form of adjustment that selective secondary control should promote during this juncture is selective primary control (behavior-focused goal striving). Heckhausen et al. (1995, 2010) contend that enhancing selective primary control potential is fundamental to adaptive development (Heckhausen & Schulz, 1995; Heckhausen et al., 2010). Although the ultimate purpose of selective secondary control is to enhance selective primary control, previous research had yet to directly test this core theoretical proposition. Studies 1-3 extend preliminary research in this field (cf. Poulin & Heckhausen, 2007) and advance the literature by providing consistent evidence showing that selective secondary control promotes selective primary control over periods of up to five months (*r*s = .55-.61). This relationship remained reliable in each study when accounting for baseline levels of selective primary control (i.e., when autoregressive effects were controlled).

Consistent with past studies showing the adaptive value of striving for control at other challenging junctures in the life course (e.g., when faced with increasing health problems in late life; Chipperfield & Perry, 2006; Chipperfield, Perry, & Menec, 1999; Chipperfield, Perry, Bailis, Ruthig, & Chuchmach, 2007), the present findings indicate that selective secondary control has positive implications for goal attainment and well-being during the landmark transition to university. Increasing selective secondary control striving was related to improved academic performance (test scores and final grades; Studies 1-3), emotional adaptation (more happiness, pride, hope; and less guilt, regret, helplessness, shame, anger; Studies 2-3), and psychological and physical well-being (less

depressive and stress-related physical symptoms; Study 2). This pattern of findings suggests there are significant advantages to engaging in selective secondary control striving during challenging life course transitions. Results also extend past research by demonstrating that selective secondary control influenced a breadth of consequential outcomes in young adulthood assessed over periods of up to seven months. These include objectively assessed performance indicators and critical measures of well-being (stress, depression) shown to be susceptible during these junctures (ACHA, 2012; APA 2012).

Mediated and Moderated Effects of Selective Secondary Control

Results of these studies provide novel insights into how (mediating factors) and under what conditions (moderating factors) selective secondary control exerts its influence. Studies 1-3 revealed a stable pattern in which selective primary control mediated the influence of selective secondary control on two-semester academic performance (indirect effect β range = .08-.15). Thus, this form of motivation-focused thinking facilitated achievement performance for young adults in transition by sustaining behavior-focused goal striving over time. These findings contribute to MTLD theory (Heckhausen et al., 1995, 2010) and provide initial evidence for the indirect role of selective secondary control in promoting long-term goal attainment.

Studies 2 and 3 built on Study 1 by showing that the influence of selective secondary control on well-being and goal attainment was further mediated by both positive (e.g., pride, hope) and negative (e.g., helplessness, shame) discrete emotions. These results extend existing research exploring relationships between control striving and emotion measures (e.g., Haase, Heckhausen, & Köller, 2008; Haase, Heckhausen, & Silbereisen, 2012; Haynes, Heckhausen, Chipperfield, Perry, & Newall, 2009;

Heckhausen et al., 2001; Wahl, Becker, Burmedi, & Schilling, 2004; Windsor, 2009). The majority of these studies focused on control striving in relation to general positive and negative affect while neglecting commonly experienced discrete emotions that are more complex in nature (see Pekrun & Perry, 2014). Consequently, the present findings advance the literature by showing that increased selective secondary control striving is related to more pride and hope and less helplessness and shame. Consistent with MTLD theory, results of both Studies 2 and 3 suggest the relationship between selective secondary control and the emotions is indirect via selective primary control. Findings also showed that discrete emotions mediated selective secondary and selective primary control effects on well-being and performance.

Studies 2 and 3 revealed that the effects of selective secondary control were moderated by influential factors in competitive achievement settings. According to Heckhausen et al. (2010), selective secondary control should especially advantage high-risk individuals prone to initial failure during goal pursuit, such as those entering university with low high school grades (HSGs; see Richardson, Abraham, & Bond, 2012). Consistent with this premise, results of Studies 2-3 showed that HSG moderated the effects of selective secondary control and a treatment designed to increase the use of these motivation-focused strategies. For young adults with low HSGs (Study 2), increases in selective secondary control were related to higher levels of selective primary control ($\beta = .79$) and academic performance ($\beta = .24$), and lower levels of stress-related physical ($\beta = -.20$) and depressive symptoms ($\beta = -.33$). Selective secondary control had no effects for those with high HSGs, with the exception of its influence on selective primary control. However, the magnitude of selective secondary control's effect on these

behavior-focused strategies was nearly twice as large for low HSG (β = .79) relative to high HSG students (β = .44). These findings extend limited research concerning which individuals are most advantaged by selective secondary control (cf. Poulin & Heckhausen, 2007) and show the benefits of these motivation-focused strategies are greatest for those facing common obstacles to goal attainment during already challenging life course transitions.

Manipulating Selective Secondary Control Using a Theory-Based Treatment Intervention

Study 3 employed a seven-month, pre-post, randomized field design to examine whether a theory-based treatment was effective in manipulating students' use of selective secondary control strategies. In line with Study 2 and MTLD theory (Heckhausen et al., 2010), treatment efficacy depended on influential determinants of academic performance in competitive achievement settings: HSGs and perceived academic control (PAC; see Richardson et al., 2012 and Robbins et al., 2004). Treatment effects were observed for young adults who began the transition period with substantial personal control (high PAC) but who faced significant obstacles due to insufficient academic preparation and poor work habits (low HSGs).

Low HSG-high PAC students who received selective secondary control (SSC) treatment (vs. no-treatment) reported higher subsequent levels of selective secondary control and PAC, and achieved higher grades (8% boost) in an eight-month introductory course. Treatment effects on each of these outcomes were moderate according to Cohen's (1988) conventions and meaningful when translated into letter grade differences: Those who received the SSC treatment outperformed their no-treatment peers by a full letter

grade (C+ vs. B; 8% difference) by the end of the academic year. These effect sizes are noteworthy considering the seven-month, quasi-experimental design employed and comparable to those reported for other theory-based motivation treatments administered to young adults in competitive achievement settings (e.g., attributional retraining; see Perry, Chipperfield, Hladkyj, Pekrun, & Hamm, 2014 and Perry & Hamm, in press).

Consonant with Studies 1 and 2, treatment effects on final grades were mediated by a theory-driven sequence of psychological mechanisms comprising control strategies and emotions. Study 3 showed that, for only young adults with low HSGs and high PAC, (a) the SSC treatment (vs. no-treatment) promoted selective secondary control, (b) increases in this form of motivation-enhancing thinking facilitated selective primary control striving, (c) these behavior-focused strategies enhanced positive emotion and diminished negative emotion, (d) which in turn predicted year-end academic performance. These findings advance the literature by systematically delineating the influence of SSC treatment effects on performance via psychological mechanisms consistent with Heckhausen et al.'s MTLD (1995, 2010) for some young adults with untapped potential (low HSG-high PAC).

In sum, Study 3 was based on best-evidence practices integral to the scientific method and provides strong initial support for the efficacy of SSC treatments to facilitate adaptation for young adults navigating a stressful transition. The treatment was based on the empirically-supported framework provided by Heckhausen et al.'s MTLD (1995, 2010). Laboratory-based study sessions provided a measure of experimental control over treatment administration, and participants were randomly assigned to conditions to ensure unbiased estimates of treatment effects (Shadish, Cook, & Campbell, 2002). SSC

treatment efficacy was supported by evidence showing the intervention influenced pertinent psychological and performance outcomes. Specifically, SSC treatment effects were observed for theoretically-consistent psychological process variables (selective secondary control) and objective, gold-standard performance outcomes (final grades). Further, SSC treatment effects on performance were shown to be mediated by a cascade of cognitive (increased control striving) and affective (emotional adaptation) changes implied by theory.

Strengths, Limitations, and Future Directions

The present dissertation has several strengths. Studies 1-3 were based on the strong conceptual framework provided by Heckhausen et al.'s (1995, 2010) MTLD, which has received consistent empirical support for its fundamental principles over the past two decades. Each study was also supported by seven-month field designs that assessed a combination of self-reported psychological measures and objective performance outcomes at three separate time points during the year (October, March, May). Study 3 was further supported by a pre-post, randomized, treatment design that assessed the effects of a novel and theory-driven SSC intervention. Such designs make causal inference more viable than research that examines cross-sectional relationships or fails to manipulate the independent variables. Finally, Studies 2 and 3 employed a statistical approach (path analysis and moderated mediation) that enabled a simultaneously assessment of how (mediators) and under what conditions (moderators) selective secondary control (and an SSC treatment) facilitated year-end performance for young adults in the midst of a significant life course transition.

Several limitations to the present research should be noted. Studies 1-3 were

based on conceptual models that implied four separate steps, but data were collected in only three phases. Consequently, relationships between achievement goals and selective secondary control (Study 1), emotions and depressive and stress-related symptoms (Study 2), and selective secondary control and selective primary control (Study 3) were based on cross-sectional data. However, supplemental analyses assessed these relationships over time and/or controlled for autoregressive effects and found that results were consistent with those reported in the main analyses. A second limitation common to these studies is their use of self-reported HSGs, which may not correspond perfectly to actual high school performance. However, previous research supports the validity of this self-report measure and demonstrates it is strongly related to objectively assessed HSGs, r = .84 (Perry, Hladkyj, et al., 2005). Further, results from Studies 1-3 (HSG-performance respective rs = .43, .41, .50) are in line with past research showing that this measure of HSG is a reliable and substantial predictor of post-secondary performance, including final course grades, r = .40-.54; and grade point averages, r = .51-.54 (e.g., Hamm, Perry, et al., 2014; Perry, Hladkyj, et al., 2001, 2005; Perry et al., 2010).

The present dissertation represents the first systematic examination of the selective secondary control construct, and many productive avenues for future research remain. One area in need of further exploration concerns how these motivation-focused strategies, and control striving more generally (the means to exercise control), relate to perceptions of control (beliefs about capacity to exercise control; see Chipperfield, Hamm, Perry, & Ruthig, in press and Perry, Hall, & Ruthig, 2005). Study 3 provides some preliminary evidence consistent with Heckhausen et al. (2010), who suggest increasing selective secondary control striving should enhance perceived control.

However, a detailed analysis is needed to disentangle how these distinct but closely related psychological constructs influence one another.

Further research is also needed to explore whether selective secondary control striving is associated with negative consequences under certain conditions. Findings in Studies 2 and 3 suggest there may be (minor) detriments for young adults who employ these motivation-focused strategies when facing few obstacles to goal attainment. Study 2 showed that selective secondary control was related to marginally higher reports of stress-related physical symptoms for students with high HSGs ($\beta = .14$, $p = .120$). Study 3 revealed a similar trend in that high HSG-high PAC students who received an SSC treatment (vs. no-treatment) reported marginally lower levels of selective secondary control (partially standardized $\beta = -.44$, $p = .082$). High HSG-high PAC students in the treatment condition also tended to achieve slightly, though not significantly, lower final grades than their no-treatment peers (partially standardized $\beta = -.22$, $p = .270$).

These trends are consistent with recent evidence showing that selective secondary control striving has negative implications for older adults in some circumstances. Employing these motivation-focused strategies in the absence of behavior-focused selective primary control strategies is related to lower levels of physical activity and cardiorespiratory health for very old adults (Hamm, Chipperfield, Perry, Heckhausen, & Mackenzie, 2014). Results of the present dissertation point to a possibility that there may also be detriments to selective secondary control in young adulthood, but additional studies are needed to carefully examine this issue.

Another area for future research involves examining selective secondary control in other domains and during different periods in the life course. Studies 1-3 point to the

value of employing these motivation-focused strategies when navigating a challenging life course transition in early adulthood. Such transitions occur throughout the life-span, implying that there may be other junctures in adulthood when increasing selective secondary control striving may be beneficial (e.g., relocating to a new city, starting a new career, having one's first child, etc.). These strategies may be particularly valuable in later life when functional losses begin to occur and motivation to remain active and independent can be severely challenged (Centers for Disease Control and Prevention, 2013). Thus, if SSC motivation treatments could be successfully adapted and administered to older adults prior to the onset of debilitating functional restrictions, there may be considerable benefits for maintaining independence and health in late life (see Sarkisian, Prohaska, Davis, & Weiner, 2007).

Conclusion

The present dissertation advances the literature by documenting antecedents, consequences, mediators, moderators, and manipulations (treatment) of selective secondary control in a series of studies that focused on young adults facing a challenging life course transition. Findings showed that endorsing mastery and performance goals promoted selective secondary control and that employing these motivation focused strategies facilitated well-being (e.g., depressive symptoms) and goal attainment (e.g., final grades). Consistent with MTLD theory (Heckhausen et al. 2010), selective secondary control effects were mediated by selective primary control and discrete emotions and moderated by transition-related risk factors (HSGs, PAC). Finally, results suggest theory-based interventions can increase selective secondary control striving and improve long-term academic performance for some young adults with untapped potential.

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