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Developmental transitions are imbued with ubiquitous uncertainties that undermine goal striving in many otherwise committed individuals. Our seven-month study examined whether cognitive selective secondary control strategies (motivation-focused thinking) facilitate the enactment of achievement goals among young adults experiencing the landmark school to university transition. Sequential regression analyses demonstrated that (a) achievement goals predicted selective secondary control, (b) selective secondary control predicted behavioral selective primary control striving, and (c) selective primary control predicted final course grades. Findings support Heckhausen et al.'s (2010) proposition that selective secondary control bolsters selective primary control striving and enables goal attainment during difficult transitions.

Developmental transitions occur throughout the life-course and are commonly conceived of as periods of opportunity during which individuals may achieve success in novel endeavors. Yet this lay perception clashes with the realities encountered by many individuals in transition. The shift from high school to university serves as an exemplar of how life-course transitions can pose serious challenges to individuals' goal striving and attainment. During this period, 1st-year university students can become overwhelmed by new tasks, pressures to excel, frequent failures, unstable social networks, unfamiliar learning environments, and critical career choices (Perry, 1991, 2003). Hence, it is not surprising that under such circumstances nearly 30% of North American freshmen students withdraw from their institutions, and only 55% of those who remain graduate after five years (Barefoot, 2004; Feldman, 2005; Tinto, 2010).

These worrisome statistics underscore the value of factors that facilitate persistence and achievement during demotivating transitions. An encouraging line of research has demonstrated that primary control strategies (behavioral goal pursuit), such as investing effort in pursuit of valued goals, facilitate goal attainment in competitive achievement settings (e.g., Haase, Heckhausen, & Köller, 2008; Phan, 2011). And yet, due to the aforementioned challenges, developmental transitions have the capacity to undermine the use of adaptive primary control strategies in even the most engaged individuals (Perry, 2003). Thus, cognitive

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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's (2010) *motivational theory of life-span development*, our study examined whether motivation-focused thinking (cognitive secondary control strategies) fostered continued goal pursuit (behavioral primary control strategies) during a difficult transition. Hence, our 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), we 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. We tested these predictions 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).

THE MOTIVATIONAL THEORY OF LIFE-SPAN DEVELOPMENT

Heckhausen et al. (2010) recently proposed the motivational theory of life-span development which 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 previous conceptual models, Heckhausen et al. (2010) 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-span in all domains.

Notably, Heckhausen and colleagues (Heckhausen et al., 2010; Schulz & Heckhausen, 1996) suggested that humans routinely employ control strategies that target both internal and external resources during goal engagement. *Selective primary control* involves strategies that target external behavioral resources 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 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 to enhance one's perceived control over performance on an upcoming exam, or consciously downplaying interpersonal goals when studying for an exam). For the purpose of simplicity, we distinguish these control strategies based on the resources they target. Thus, selective primary control strategies are referred to as *behavioral* and selective secondary control strategies are referred to as *cognitive* hereinafter.

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 studies 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). Not unexpectedly, they found that goal engagement, comprising selective primary and selective secondary control strategies, predicted securing an apprenticeship after graduation for female individuals and positive affect in both male and female individuals. Although Haase et al.'s study suggests the adaptive value of a 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. To our knowledge, only two

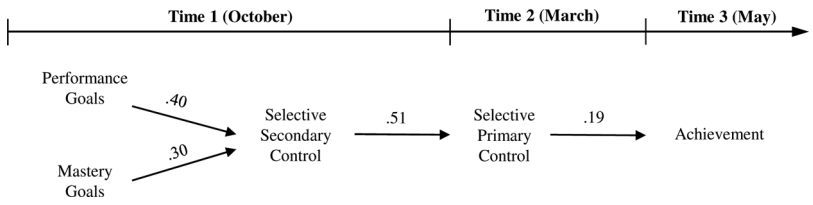

FIGURE 1 Proposed longitudinal sequence of achievement goals, control strategies, and achievement. *Note.* Standardized regression weights for the direct effects are reported above each arrow.

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.

Most recently, Hamm et al. (2011) conducted the only study to examine selective secondary control's effects for university students. Their longitudinal (7-month) findings showed that among students with subpar high school grades, those more frequently using 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 provide preliminary 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

Our study provides an empirical test of critical, but understudied, linkages in Heckhausen et al.'s (2010) motivational theory of life-span development. We were primarily concerned with examining selective secondary control's capacity to promote selective primary control striving for valued achievement goals over time. However, we were also interested in the temporal sequence with which young adults experiencing an important developmental transition employ these strategies. Consequently, our study was guided by a conceptual model that was based on previous theory and research (Heckhausen et al., 2010; Pekrun, 2006; Schulz & Heckhausen, 1996; see also Daniels, 2009; Hamm et al., 2011).

Our conceptual 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 et al., 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.[1]

In summary, we expected that (a) achievement goals would predict the use of cognitive selective secondary control strategies; (b) achievement goals would also

[1]Although important conceptual distinctions exist between mastery and performance achievement goals, their predicted effects did not differ in our study. We 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.

predict the use of behavioral selective primary control strategies, but that this relationship would 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 achievement and gender.

METHOD

Participants and Procedures

The study sample was drawn from the Manitoba Motivation and Academic Achievement database which contains psychosocial data for two decades of separate cohorts of introductory psychology students (1992–2012). Each cohort includes data 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.

We used the 2007–08 data set for the following analyses because data on all variables of interest were collected for this cohort. Prior to testing our main hypotheses, we conducted two confirmatory factor analyses (CFAs) 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 ($n = 361$). We subsequently conducted our main analyses using an independent sample of students who participated in the main study and had full data at all three phases ($n = 185$). The majority of participants in this sample were enrolled full time (92%), were 17 to 18 years old (69%), were native English speakers (75%), and were female (72%). This sample was restricted to students who indicated that they were in their first year of university, which allowed us to examine the model among young adults striving to achieve consequential goals during a transition known for its negative academic effects.[2]

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 was used as a measure of preexisting aptitude (1 = *50% or less*, 10 = *91–100%*; $M = 7.94$, $SD = 1.55$, range = 2–10). Self-reported high school grade 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 high school grade is a reliable and substantial predictor of postsecondary achievement, including final course grades ($r = .40$–$.54$) and grade point averages ($r = .52$–$.54$; e.g., Perry et al., 2005; Perry, Hladkyj, Pekrun, & Pelletier, 2001; Perry, Stupnisky, Hall, Chipperfield, & Weiner, 2010).

Gender (Time 1 Covariate)

Gender was self-reported and treated as a dummy-coded variable (1 = *female*, 2 = *male*; 72% female).

Achievement Goals (Time 1)

The Motivated Strategies for Learning Questionnaire (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 in this class than most of the other students"; $M = 22.89$, $SD = 3.86$, range = 12–28, $\alpha = .72$) 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, $\alpha = .68$). Students rated each item on a 7-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 (Heckhausen, Schulz, & Wrosch, 1998). The Optimization in Primary and Secondary Control 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 our study focused on control strategies used by young adults in pursuit of academic goals, we used a modified version of the Optimization in Primary and Secondary Control scale, the Academic-Specific Control Strategies scale.[3]

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

[3]The Academic-Specific Control Strategies 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.

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	0.45	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	%	–	77.62	11.55	51.70–98.48

Note. The descriptive statistics for secondary and primary control are based on the sample used in the confirmatory factor analyses.
[a]Time 1 measure. [b]Time 2 measure. [c]Time 3 measure.

Selective secondary control strategies (Time 1). Students rated their agreement with five selective secondary control items (1 = *strongly disagree*, 5 = *strongly strongly agree*; $M = 20.39$, $SD = 2.92$, range = 10–25, $\alpha = .62$; e.g., "I often tell myself that I will be successful in reaching my educational goals").[4]

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

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.

[4]Notably, one secondary control item (SSC2; see the Appendix) may be interpreted as either a secondary or primary control strategy because it may suggest cognitive or behavioral persistence. Because we interpreted the item as implying cognitive persistence, we included it in the secondary control scale.

RESULTS

Confirmatory Factor Analyses

CFAs were conducted on the selective secondary and selective primary control subscales because the Academic-Specific Control Strategies 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, 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: $\chi^2(5) = 13.28$, $p = .021$, 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: $\chi^2(2) = 4.11$, $p = .128$, 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.

Main Analyses

Rationale for Analyses

The main analyses employed sequential multiple-step regression to examine the effects of the predictor variables on the dependent variables in our 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). Our bootstrap method used 95% bias corrected confidence intervals (CIs). Mediation was confirmed if zero fell outside of the CI based on 20,000 samples of the unstandardized beta weights.

Preliminary Analyses

Correlation and variance inflation factor coefficients were used to screen for multicollinearity among predictors prior to conducting the regression analyses. The correlation (all $< .60$) and variance inflation factor (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. Notably, 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. In addition to the aforementioned associations, selective secondary control was 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, both performance ($\beta = .40$) and mastery ($\beta = .30$) 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

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.

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.

variance in selective secondary control (27%), $F(4, 180) = 16.95$, $p < .001$.[5]

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 ($\beta = .16$) and mastery goals ($\beta = .28$) proved reliable predictors of selective primary control. Further, 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 primary control ($\beta = .51$). 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, $F(5, 179) = 19.04$, $p < .001$.[6]

Bootstrapped tests indicated that selective secondary control significantly mediated the influence of both performance (*CIs* = .07 to .19) and mastery (*CIs* = .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.

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.

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. As expected, previous achievement (high school grade) was a strong and positive predictor of final grades ($\beta = .43$). 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 our model which specified that achievement effects of

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.

[5]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 over time. First, selective secondary control at Time 1 was correlated with its corresponding measure at Time 2 ($r = .61$). Second, a multiple regression analysis demonstrated that Time 2 selective secondary control was reliably predicted by Time 1 measures of performance ($\beta = .34$) and mastery ($\beta = .21$) goals when controlling for high school grade and gender.

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

selective secondary control strategies would be indirect through selective primary control strategies.

As expected, selective primary control strategies contributed significantly to the prediction of final grades ($\beta = .19$), 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 ($CIs = .08$ to $.80$). Thus, although selective secondary control's direct effect was not significant ($\beta = -.01$), it 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 on theorized, but previously unexplored, pathways in the motivational theory of life-span development (Heckhausen et al., 2010). Notably, our 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. Of interest, 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 that facilitate goal attainment.

This logic is largely in line with Heckhausen and colleagues (e.g., Poulin & Heckhausen, 2007), who have argued 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 5 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; more than 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, our study is distinct in that it provides evidence for the unique role of selective secondary control in promoting primary control striving over an extended 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 noteworthy, as suggested by selective primary control's 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 achievement. Thus, as a consequence of selective secondary control 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 our 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.[7]

Strengths, Limitations, and Future Directions

The present study has several strengths, including the use of an objective achievement measure, a 7-month longitudinal design, and three measurement points involving a combination of psychosocial and performance measures. Our 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 psychosocial steps, data on these measures were collected only 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 3 were in line with those reported in the main analyses and add weight to the findings. Hence, our results suggest that performance and mastery goals are robust and reliable predictors of selective secondary control strategies, regardless of whether these

[7]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 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.

strategies are assessed concurrently (Time 1) or longitudinally (Time 2). A second limitation is that our measure of achievement goals (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 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, our 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., elderly 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. In sum, we hope our study inspires further research on this promising, but understudied, construct in the motivational theory of life-span development.

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, cognitive selective secondary control strategies facilitate academic achievement among 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 CONFIRMATORY FACTOR ANALYSES

	Parameter Estimates				
Item Label	*SSC*	*SPC*	*Item Wording*	*M*	*SD*
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
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 sec ondary control; SPC = selective primary control.