Goals and Control: Exploring Relationships between Two Types of Motivational Constructs and their Effects on University Students' Emotions and Achievement

by

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A Thesis submitted to the Faculty of Graduate Studies of

The University of Manitoba

in partial fulfilment of the requirements of the degree of

DOCTOR OF PHILOSOPHY

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Abstract

Perceived control (Rothbaum, Weisz, & Snyder, 1982) and achievement goals (Dweck & Leggett, 1988) are two widely studied motivational constructs that influence students' emotions and achievement. The central focus of this dissertation was to explore the associations between achievement goals and perceived control in three studies. Each study used a separate cohort of first-year college students taken from the Motivation and Academic Achievement (MAACH) Project (1992-2005, N = 10,053). Study 1 (n = 752) was descriptive and tested the associations between goals, control, and attributions. The results demonstrated that primary control was very clearly defined by the controllability dimension of attributions; however, the other variables were less clear. The purpose of Study 2 (n = 360) was to test for reciprocal relationships between goals and control by using a two-wave four-variable cross-lag panel model. The best predictor of each Time 2 variable was its corresponding Time 1 counterpart. Additionally, the results showed that Time 1 mastery goals positively predicted Time 2 primary and secondary control, but no other relationships emerged. Study 3 (n = 251) extended the relationships between goals and control to predict students' emotions and achievement. The direct and indirect effects implied by the following longitudinal model were tested: goals $\rightarrow$ control $\rightarrow$ emotions $\rightarrow$ achievement (Pekrun, 2006). Mastery goals positively predicted primary and secondary control, whereas performance goals positively predicted primary control only. Primary control was the main mediator between goals and negative emotions. Additionally, primary control had a positive direct effect on achievement, and thus mediated the effects of both mastery and performance goals on this outcome. Secondary control had a negative direct effect on achievement and consequently acted as a negative mediator

between mastery goals and achievement. For mastery goals, anger, anxiety, and boredom functioned as positive mediators with achievement. These emotions also positively mediated the effects of primary control on achievement. Results of the three studies are discussed in terms of contributions to the separate literatures on achievement goals and perceived control and in terms of implications for students in new and challenging achievement settings.

Acknowledgement

I would like to thank Dr. Raymond Perry for taking a risk on me, and allowing me to be part of his research laboratory. My committee members were instrumental and patient throughout the completion of the project: Thanks to Dr. Rod Clifton, Dr. Rob Renaud, and Dr. Dan Bailis. As my external examiner, Dr. Stuart Karabenick provided excellent comments on this work and challenged me to think about my results from a different perspective. I would like to thank my "lab kids," Tara Haynes, Rob Stupnisky, and Nancy Newall, who helped me when I got stuck, listened when I got frustrated, and were my sounding board, not just for this dissertation but for the entirety of my Ph.D. Graduate school in general, and this dissertation specifically, would have been much harder without my family behind me: Thank you for your patience, moral support, and for not asking "when will you be done?". Between the Social Science and Humanities Research Council of Canada (SSHRCC), and my wonderful husband, I completed this project without falling into the starving-student category.

Dedication

This dissertation is dedicated to my Grandma, who always wanted a “doctor” in the family, and to my mom. These two women read every term paper I ever wrote, debated the innocence of Othello with me, and made me into a triple-word-score scrabble player. I’m not quite the doctor my Grandma always hoped for, but she would have been pleased regardless. Mom, I appreciate your willingness to read this one and your help in all things.

Goals and Control: Exploring Relationships between Two Types of Motivational Constructs and their Effects on University Students' Emotions and Achievement

General Introduction

Although many students look back at their years at university as some of the best times of their lives, the actual experience can be complex, difficult, and uncertain. This is especially true in the first year of university when students who have been largely successful in their academic pursuits find themselves in an achievement setting that is drastically different from the one they experienced in high school. The first year of university represents a novel and highly competitive achievement setting. To excel in this setting, students must navigate a gauntlet of new and unexpected hurdles including increased competition, higher standards of competence, pressure to excel, and stressful life decisions (Perry, 1991, 2003). Despite all having met the stringent admissions criteria, only some students truly flourish in their new achievement setting (Perry, Hladkyj, Pekrun, & Pelletier, 2001). Motivational and educational psychologists share a desire to understand why some students flourish while others do not reach their full potential (Pintrich, 2003).

In an educational context achievement motivation broadly refers to students' energy and drives to learn and achieve (Pintrich, 2003). Students' beliefs pertaining to achievement goals and perceived control have been at the centre of much of the theoretical and empirical motivational research (Dweck & Leggett, 1988; Elliot, 1999; Heckhausen & Schulz, 1995; Morling & Evered, 2006; Pintrich, 2000; Rothbaum et al., 1982; Rotter, 1966; Skinner, 1996). Generally, achievement goal theory (Dweck &

Leggett, 1988) provides the framework to study the basic constructs of mastery and performance goals. Researchers who focus on achievement goals are interested in understanding how students' beliefs about competence predict their achievement-related outcomes. Mastery goals involve the belief that one is able to develop proficiency and move towards competence according to intrapersonal standards. Performance goals involve beliefs that competence can only be measured according to interpersonal standards (i.e., normative) and that proficiency can only be demonstrated relative to others. Control theories (Rothbaum et al., 1982), in contrast, provide the platform to study primary and secondary control. Researchers who focus on perceived control are interested in understanding how students' beliefs about agency predict their achievement-related outcomes. According to the dual-process model of control (Rothbaum et al., 1982), primary control involves beliefs about bringing the environment in line with the self, whereas secondary control involves beliefs about adjusting the self to match the environment.

Broad beliefs regarding competence and agency have been considered together in research on students' motivation and self-regulation (Elliot & Church, 1997; Heckhausen & Dweck, 1998; Lopez, 1999; Pekrun, 2006; Ratelle, Guay, Vallerand, Larose, & Senécal, 2007; Schunk & Zimmerman, 2006; Shell & Husman, 2001, 2008; Walls & Little, 2005; Weiner, 1985; Weisz & Stipek, 1982). Because most research including both competence and agency has relied on rudimentary operational definitions for the constructs, researchers are still vehemently calling for more research that focuses on integrating motivational constructs (Pintrich, 2003). For example, competence has been measured by items like "how competent do you feel in math," and agency has been

measured by items like "how much control do you have over your achievement". A thorough literature search of the PsycInfo database revealed no study of college students that has explicitly used both of the rich frameworks afforded by achievement goal theory and the dual-process of control.

In short, the impact of students' beliefs regarding achievement goals on their emotions and achievement has not accounted for the impact of their beliefs regarding control and vice versa. By including beliefs related to all four of these constructs (mastery goals, performance goals, primary control, and secondary control), the three studies in this dissertation make a unique contribution to the literatures on achievement goals (Dweck & Leggett, 1988; Elliot, 1999; Pintrich, 2000), perceived control (Heckhausen & Schulz, 1995; Skinner, 1996; Rothbaum et al., 1982), and achievement motivation more broadly. Moreover, the results point to ways in which goals and control jointly contribute to first-year university students' emotions and achievement in a novel and highly competitive achievement setting.

Historical Development of Goals and Control

There is a strong tradition in achievement motivation that the beliefs students bring into their learning environment influence their academic outcomes including emotions and achievement (Atkinson, 1964; Bandura, 1993; Weiner, 1985). Mastery and performance goals (Dweck & Leggett, 1988; Elliot, 1999) and primary and secondary control (Rothbaum et al., 1982) are two such beliefs. They were chosen as the focus of this dissertation because, although they emerged at approximately the same time, little empirical work has considered both sets of constructs together. Recognizing the importance of thoroughly introducing these concepts, a brief historical development of

mastery and performance goals and primary and secondary control is reviewed, and the variables are described within the broader domain of achievement motivation.

Mastery and Performance Goals

Ames (1984), Dweck (1986), Nichols (1984), and others spearheaded the goal theory approach to achievement motivation that states that individuals adopt implicit goals when approaching tasks. Masquerading under many labels such as learning and performance goals (Dweck, 1986) or task and ego involvement (Nichols, 1984), the central constructs are mastery and performance goals, each of which represents a distinct belief about competence. Mastery goals are defined by wanting to increase competence, whereas performance goals are defined by wanting to demonstrate competence relative to others. In this way, students with mastery goals define competence according to internal standards (i.e., intrapersonal), and students with performance goals define competence in relation to others (i.e., normative).

Once a goal is adopted predictable patterns of cognition-affect-behaviour follow, especially in the face of a challenge like that found in a competitive achievement setting (Dweck & Leggett, 1988; Moller & Elliot, 2006). Decades of empirical research have demonstrated that mastery and performance goals have different effects on academic outcomes like emotions and achievement. Students with mastery goals consistently demonstrate adaptive patterns of cognition, affect, and behaviour including attributing success and failure to effort, perceiving difficult tasks as a challenge (Dweck & Leggett, 1988), using effective learning strategies (Ames & Archer, 1988; Meece, Blumenfeld, & Hoyle, 1988), and experiencing sustained interest and positive affect (Pintrich, 2000; Senko & Harackiewicz, 2005). Students with performance goals generally demonstrate

less adaptive patterns of cognition, affect, and behaviour including attributing success to uncontrollable factors (Seifert, 1995), perceiving difficult tasks as failure situations (Dweck & Leggett, 1988), using shallow cognitive strategies (Ames & Archer, 1988; Pintrich, 2000) and experiencing negative affect (Pintrich, 2000).

Over the last 20 years, researchers have used several variations of mastery and performance goals. Researchers refer to the original division of mastery and performance goals as the dichotomous perspective (Dweck & Leggett, 1988). However, this dichotomy was unable to explain why at times mastery and performance goals resulted in similar levels of objective achievement despite different patterns of cognitive and emotional engagement (Elliot, 1999; Moller & Elliot, 2006). In pursuing this discord, the original variables have been adjusted in several ways.

In the trichotomous goals perspective, performance goals were divided into approach and avoidance components, and mastery remained a singular construct (Elliot & Church, 1997). Shortly thereafter, mastery goals were also bifurcated into approach and avoidance dimensions resulting in a complete 2 (mastery, performance) x 2 (approach, avoidance) perspective (Elliot, 1999). The appetitive, or approach component of both goals seems to be associated with relatively adaptive outcomes. Finally, the multiple-goals perspective suggests that endorsing mastery and performance goals together can be more adaptive in terms of cognitions, emotions, and achievement than endorsing either goal exclusively (Pintrich, 2000).

Some researchers considered these theoretical revisions “necessary and illuminating” (Harackiewicz, Barron, Pintrich, Elliot, & Thrash, 2002, p. 638), whereas others deemed the revisions unwarranted (Midgley, Kaplan, & Middleton, 2001). Even

though debate continues on the exact structure of mastery and performance goals (see Elliot & Murayama, 2008; Grant & Dweck, 2003), researchers generally agree on two things: First, mastery and performance goals are the building-blocks of this powerful theory, and second, avoidance-valenced goals are likely maladaptive.

Despite these advances some researchers continue to focus on the approach dimensions of mastery and performance goals without the avoidance dimensions (Daniels et al., 2008; Daniels et al., in press; Harackiewicz, Barron, Tauer, Carter, & Elliot, 2000; Linnenbrink, 2005; Shell & Husman, 2008). Two reasons contributed to the decision to focus on the approach dimensions in this dissertation. First, the database used in this thesis contained well-established measures of the approach dimensions of mastery and performance but not the avoidance dimensions. Second, it has been shown that when Introductory Psychology students are given the opportunity to generate their own goals less than 4% of goals can be classified as avoidance-based, thus implying that approach-valenced goals are by far the most dominant goal type for this group (Okun, Fairholme, Karoly, Ruehlman, & Newton, 2006).

Primary and Secondary Control

Whereas mastery and performance goals were essentially born out of the academic domain, from its inception perceived control spanned many areas of human motivation. Originally, uncontrollability theorists believed that any behaviour not associated with directly manipulating the environment to suit personal needs was indicative of relinquished control resulting in helplessness (Hiroto & Seligman, 1975; Seligman, 1980). Rothbaum et al. (1982) believed that this association led to an overestimation of instances of helplessness and argued instead “because control is so

valued, the quest for it is rarely abandoned" (p.7). As such, while uncontrollability theorists viewed inward behaviours such as passivity, withdrawal, compliance, and conformity as evidence of relinquished control, Rothbaum et al. suggested that in certain instances these behaviours and beliefs could still be considered control enhancing. Their assertion rested on the notion of a dual-process of perceived control.

Shifting from the original conceptualization of perceived control as a single construct defined as perceived contingency between an agent's action and subsequent outcome, Rothbaum and colleagues (1982) suggested that people use two types of control: primary and secondary. Primary control is aptly named because it closely resembles the original formulation of perceived control that refers to acting on the environment. Secondary control, in contrast, suggests that people adjust psychologically to match the environment. Rothbaum and colleagues acknowledge a "rough analogy" (p. 8) between the primary and secondary control distinction and the notions of assimilation and accommodation in Piaget's developmental theory.

Rothbaum et al. (1982) suggested that there are at least four types of secondary control: predictive, illusory, vicarious, and interpretive. They posited that each type of secondary control serves to help the individual fit into a challenging environment such as that experienced during the first year of university. Predictive secondary control involves attributing failure to severely limited ability in order to avoid potential disappointment. Attributions to luck as a personal quality much like ability demonstrate illusory secondary control. Vicarious secondary control involves cognitively aligning the self with powerful others in order to share in their power. Finally, students use interpretive secondary control to derive meaning and understanding from the situation in order to

accept it. As can be seen in this definition, interpretive secondary control is conceptualized as an independent type of secondary control; however, it can also be fostered through the other types of secondary control to the extent that they help the individual find meaning in or come to an understanding about a situation. Rothbaum et al. also stated that primary control can have predictive, illusory, vicarious, and interpretive dimensions. These dimensions have not been considered to the same extent as the separate types of secondary control and hence are not discussed here.

Although the four types of secondary control are conceptually distinct, it has proven difficult to distinguish empirically between the types. To deal with this problem researchers have either created composite measures reflecting a "real world" indication of secondary control (Hall, Perry, Ruthig, Hladkyj, & Chipperfield, 2006) or focused on one type of secondary control (Bailis, Chipperfield, & Perry, 2005; Daniels, Clifton, Mandzuk, Perry, & Hall, 2006; Hall, 2008; Hall, Chipperfield, Perry, Ruthig, & Goetz, 2006, Wrosch, Heckhausen, & Lachman, 2006). Secondary interpretive control has been shown to be most adaptive in competitive achievement settings and hence is focused on throughout this dissertation.

Recently a dialogue has begun on the structure and function of secondary control (Morling & Evered, 2006; Morling & Evered, 2007; Skinner, 2007). Morling and Evered (2006) argued that the purpose of secondary control was to fit with the environment, whereas Skinner (2007) contended that the purpose of secondary control was to re-establish primary control. Skinner (2007) concluded by suggesting that secondary be freed from its "secondary" position and renamed accommodation. Although Morling and Evered (2007) were not completely opposed to this suggestion, they felt more evidence

was required before any changes were made. Both the fit-focused versus control-focused debate and the labeling issue deserve further empirical attention; however, neither is the focus of this dissertation. Therefore, the original notion of secondary control as a "fit" focused construct is retained, and the original "secondary control" label is used throughout the dissertation to refer to interpretive secondary control.

Research Questions and Significance

In this dissertation, there are three studies. In Study 1, attributions (Weiner, 1985) were used as a common denominator, or common feature, between goals and control. By correlating goals and control with different attributions it was possible to determine how goals and control related to attributions and how these attributional underpinnings provided a foundation for relationships between goals and control. The results of Study 1 showed that primary control was the only one of the four variables to correlate positively with all controllable attributions and negatively with all uncontrollable attributions. This result foreshadows the benefits of primary control that emerge across all three studies.

Study 2 moved beyond a descriptive analysis of goals and control and tested whether both types of goals related to both types of control and whether the relationships were reciprocal (Elliot, 1999; Pekrun, 2006). On the one hand, the control-value theory of emotions purports that goals should predict control (Pekrun, 1992, 2006). On the other hand, achievement-goal theory argues that control should predict goals (Elliot, 1999; Elliot & Church, 1997). A third option would be for reciprocal effects to occur, that is, control predicts goals and goals predict control. Improving on previous research that tested only unidirectional hypotheses (e.g., Lopez, 1999), Study 2 used a cross-lag panel model to test for different and/or reciprocal relationships between goals and control. The

results supported the theoretical position forwarded by the control-value theory of emotions (Pekrun, 2006), suggesting that in novel and highly competitive achievement settings college students' mastery goals influence their primary and secondary control beliefs but not the other way around. It was important to establish the predictive ordering between these constructs so that they could be situated appropriately in a model that included important academic outcomes as was done in Study 3.

The results of studies 1 and 2 established at the zero-order level and in a cross-lag panel model that mastery and performance goals related differently to primary and secondary control. Building on these results in Study 3, goals and control were placed in the broader educational context that includes students' emotions and achievement. A longitudinal model specified according to the control-value theory of emotions (Pekrun, 2006) was used to test how mastery and performance goals and primary and secondary control directly and indirectly predict students' emotions and achievement. More specifically, four mediational relationships were examined: Sequence 1 goals→control→emotions; Sequence 2 goals→control→achievement; Sequence 3 goals→emotions→achievement; and Sequence 4 control→emotions→achievement[1]. The results showed that primary control or secondary control but not both mediated the effects of mastery and performance goals on some emotions. Also, mastery and performance goals had no direct effects on achievement, but the relationships were positively mediated by primary control. The effect of mastery goals on achievement was also negatively mediated by secondary control and positively mediated by anger, anxiety, and boredom. In contrast, the effects of primary and secondary control on achievement were mainly direct and not mediated by emotions. Overall, primary control held the most

adaptive role in the model characterized by direct and indirect effects that reduced negative emotions and enhanced achievement.

Data for the three studies were taken from the Motivation and Academic Achievement Project (MAACH; $N \approx 10{,}000$), which is a pre-existing cross-sectional and longitudinal program of research involving 13 separate one-year studies (1992-2005). The database includes classic and well-established instruments assessing goals, control, attributions, and emotions as well as institutional records concerning high school grades, faculty of registration, course grades, etc. Moreover, within the large database it is possible to isolate first-year students who were experiencing the complexities of a new and competitive achievement setting at the time of data collection. Thus, although the sample for each study was independent from the others, they were similar on a number of demographic variables and their involvement in a stressful educational transition.

As alluded to above, new achievement settings are an ideal venue for studying students' beliefs about goals and control because they represent an appreciable shift from a familiar to novel learning environment. Moreover, the increased competition and pressure to excel at university may prompt significant reconsideration of previous beliefs about goals and control (see Perry, Stupnisky, Daniels, & Haynes, 2008). Situations such as moving to a new city, starting a new job, joining a new sports team, being in a new relationship, or becoming a parent for the first time all represent new achievement settings that seem to be associated with the reassessment of beliefs based on the new conditions. In short, new achievement settings produce challenging conditions for students and represent a critical juncture at which the beliefs that give rise to and sustain

achievement striving should be examined: Two such beliefs are those related to goals and control.

As can be seen from the development of the above research questions, the overarching purpose of this dissertation was to explore relationships between two sets of beliefs integral to understanding students' academic outcomes: achievement goals and perceived control. Goals and control represent two of the most common constructs belonging to the larger nomological network of ideas related to competence, agency, and motivation (Payne, Youngcourt, & Beaubien, 2007). Within this purview, an additional purpose was to test the direct and indirect effects of goals and control on students' emotions and achievement in a competitive achievement setting.

To facilitate the readability of this dissertation, each study is presented as an independent and complete piece (i.e., literature review, method and results, discussion). Throughout the literature reviews the empirical evidence pertains primarily to college students and not elementary or high school students. This restriction was imposed because individual and/or situational differences between university students and elementary or high school students may influence their beliefs about goals and control. For example, research suggests that goal beliefs are fairly stable within an achievement setting but can change in response to shifts in the learning environment (Anderman & Midgley, 1997; Fryer & Elliot, 2007; Kaplan & Midgley, 1999; Midgley, 1993; Wolters, Yu & Pintrich, 1996). Specifically, as students progress through the educational system and encounter new achievement settings that are progressively more performance-focused, mastery goals tend to decrease and performance goals tend to stay relatively stable or increase slightly (Chouinard & Roy, 2008; Fryer & Elliot, 2007). Likewise,

secondary control may be a more complex schema than primary control, and hence may occur more readily in older rather than younger populations (Heckhausen & Schulz, 1998). Following the three complete studies, the General Discussion section focuses on linkages between the studies and their overall contributions to the research literature.

Study 1: Attributional Underpinnings

Introduction

At the broadest level, attributions are the perceived causes of outcomes (Schunk, Pintrich, & Meece, 2008; Weiner, 1985). According to Weiner's attribution theory (1985) there are three causal dimensions that underlie attributions: locus of causality (internal vs. external), stability (stable vs. unstable), and controllability (controllable vs. uncontrollable). For university students, six common attributions for success and failure are effort, ability, strategy, luck, professor quality, and test difficulty. Although the specific dimensions represented by each attribution largely depend on each student's interpretation (i.e., luck as internal or external), considerable consensus exists for these attributions (Weiner, 1983). Effort and strategy usually consists of the internal, unstable, and controllable dimensions. Ability is typically viewed as internal, stable, and uncontrollable. Luck, professor quality, and test difficulty are all external and uncontrollable, but only luck is considered unstable. The purpose of Study 1 was to test whether students' beliefs about mastery and performance goals and primary and secondary control related to different attributions for achievement (Hall, Perry, Ruthig, et al., 2006; Hayamizu & Weiner, 1991).

Hayamizu and Weiner (1991) found that students with mastery goals viewed both ability and effort as unstable attributions, implying that both ability and effort could be

improved (Hayamizu & Weiner, 1991). Hong, Chiu, Dweck, Lin, and Wan (1999) showed that students with mastery goals were equally likely to use ability and effort attributions to explain academic successes and failures (see also Robins & Pals, 2002). Mastery goals also inclined students towards strategy or study skill attributions, suggesting that these students consider not only how much effort is exerted but also how effort is exerted (Robins & Pals, 2002). Finally, Robins and Pals (2002) showed that mastery goals correlated negatively with composite measures of helpless attributions (i.e., luck, ability of others, task difficulty, and reverse scored effort and study skills).

Hayamizu and Weiner (1991) showed that students with performance goals interpreted ability as unstable and therefore something that could be modified (Hayamizu & Weiner, 1991). Students with performance goals were as likely to make ability attributions as those with mastery goals (Hong et al., 1999) but these attributions were more often used to explain failure than success. In other words, the performance students viewed failure to be a result of low ability but did not view success to be a result of high ability. Students' with high levels of performance goals interpreted difficult tasks as more uncontrollable than those with low levels of performance goals (Hayamizu & Weiner, 1991). In line with this, Robins and Pals (2002) found that performance goals correlated positively with composite measures of helpless attributions.[2]

For primary control, Hall, Perry, Chipperfield, Clifton, and Haynes (2006) found that primary control was positively correlated with a composite measure of controllable attributions (i.e., effort and strategy), and negatively correlated with a composite measure of uncontrollable attributions (i.e., ability, luck, test difficulty, and professor quality). Perry et al. (2001) found that primary control was positively correlated with effort

attributions and uncorrelated with ability attributions. Haynes, Ruthig, Perry, Stupnisky, and Hall (2006) also reported a positive correlation between primary control and effort as well as negative correlations with ability and luck. The degree to which primary control has been found to be either unrelated or negatively related to ability may suggest that students differ in whether they view ability as controllable (see Appendix A for a discussion of research on primary control compared to perceived control).

Secondary control, in contrast, often does not correlate with either controllable or uncontrollable attributions (Hall, Perry, Ruthig, et al., 2006). Hladkyj, Perry, Pelletier, and Taylor (2000) divided students into groups endorsing either high or low interpretive secondary control and considered their attributions for either poor or good performance. The results showed that students classified as high interpretive secondary control were more likely to attribute poor and good performance to learning strategies, a controllable attribution, than their low interpretive control counterparts. In addition, compared to other forms of secondary control, high interpretive secondary control positively predicted ability and effort attributions for success, representing a focus on internality (see Appendix B for a discussion of issues associated with studying secondary control in college samples).

Overall, it seems that mastery and performance goals may be similarly related to ability attributions because "the belief that ability is malleable and controllable might be viewed as a necessary condition when students have any achievement goal tendency, whether learning or performance" (Hayamizu & Weiner, 1991, p. 233). However, the goals separate on other attributions such that mastery goals tend to associate with controllable and unstable attributions (e.g., effort, strategy), whereas performance goals

tend to associate with uncontrollable attributions (e.g., task difficulty, luck). Moreover, the attributional pattern for secondary control appears to be less clearly defined than the pattern for primary control. In short, this means that mastery goals, performance goals, primary control, and secondary control correlate differently with the various attributions. Study 1 is a descriptive study that looks at the similarities and differences between the relationships goals and control have with attributions. In this way, attributions functioned as a common metric on which goals and control could be compared.

Method

All analyses conducted in this dissertation involved data from the Motivation and Academic Achievement (MAACH) Project. This cross-sectional and longitudinal program of research included 13 separate studies (1992-2005). Each year a standard four-phase design (Time 1-4) was used in order to examine the academic development of college students at one Canadian doctoral granting university.

To construct the MAACH database, each year a new cohort of students was recruited from several sections of the Introductory Psychology course to complete two omnibus questionnaires (approximately: Time 1 = October; Time 2 = March). The questionnaires consisted of several well-established instruments for assessing individual difference variables. Examples of such instruments include the Motivated Strategies of Learning Questionnaire (MSLQ; Pintrich, Smith, Garcia, & McKeachie, 1993), the Life Orientation Test (LOT; Scheier & Carver, 1985), and Rosenberg's self-esteem scale (1965). At the end of the two-semester academic year (Time 3) the students' final grades in Introductory Psychology were collected from instructors for those who had consented to release this information to the researchers. Approximately one year later (Time 4), the

students' institutional records containing high school grades, faculty of registration, number of credit hours (or courses) completed and dropped, etc. were retrieved from the university's Student Tracking System (STS).

In general, this 4-phase design was repeated for each MAACH cohort resulting in a common core of psychosocial, demographic, and academic measures. By merging the MAACH self-report data with the STS institutional data, up to eight consecutive years of data can be available for 10,697 students. As such, the merged database represents a significant research initiative in terms of a large number of students, richness of measures, and longitudinal framework. The sample for each of the three studies in the dissertation was extracted from this larger database according to the availability of required measures. Moreover, each sample consisted of only first-year university students experiencing the challenges of a new achievement setting. Second and third year students were not included.

The purpose of Study 1 was to examine the correlations between mastery and performance goals, primary and secondary control, and several common attributions (Dweck & Leggett, 1988; Rothbaum et al., 1982; Weiner, 1985). Specifically, six attributions commonly used in achievement settings were examined: ability, effort, strategy, luck, professor quality, and test difficulty. Ability represents an internal and uncontrollable attribution; effort and strategy are internal and controllable attributions; and, luck, professor quality, and test difficulty are external attributions that are traditionally viewed as uncontrollable and luck is also considered unstable. Based on Rothbaum and colleagues' (1982) revisions, luck, professor quality, and test difficulty may be seen as controllable.

Participants and Procedures

Participants in Study 1 were first-year students who participated in the MAACH data collection in either of the 2000 or 2001 academic years. These cohorts were chosen because they included the measures of interest at the appropriate time (n = 752). All participants were enrolled in an Introductory Psychology course. Given that all of the students were in their first year of university, the majority of students had not yet selected a faculty, and most were enrolled in University 1 (93%)[3]. Students indicated their ages in two year categories with the modal response being 17-18 years (age range 17-18 to 25-26 years), 89% reported English as their first language, and 67% were female. Each cohort in the database contains more female participants than male, a 2:1 ratio that approximates the number of women and men registered in the Introductory Psychology courses (see Hall, Perry, Ruthig, et al., 2006; Haynes et al. 2006; Ruthig, Perry, Hall, & Hladkyj, 2004) and is about 10% higher than registered in the university (Office of Institutional Analysis, 2005).

Measures

Background variables. Because Canadian students do not write standardized entrance examinations for university like the SATs, researchers rely on high school academic achievement to control for pre-existing differences in aptitude. There is a substantial literature showing that high school grades are a strong predictor of college success (e.g., Hoffman, 2002; Zheng, Saunders, Shelley, & Whalen, 2002). Each year Institutional Records computes students' graduating high school average based their university entrance requirements (i.e., English, mathematics, chemistry, and physics), hence providing a relatively objective measure of their academic ability and serving as a

proxy for SAT scores (Table 1). Students also reported their gender and whether they considered English as their first language. Of the 752 participants, 504 were female, and 669 reported English as their first language.

Table 1

Descriptive Statistics and Reliabilities for the Variables in Study 1 (n=750)

Time	Variables	# of items	Actual Range	*M*	*SD*	Skewness	Kurtosis	∝
2	Mastery goals	4	4-28	17.59	4.39	-.21	-.27	.77
2	Performance goals	4	6-28	20.56	4.85	-.44	-.40	.80
2	Primary control	7	7-35	28.96	3.85	-.91	1.98	.78
2	Secondary control	4	4-20	13.19	2.71	-.09	-.07	.65
2	Ability attribution	1	1-10	4.27	2.20	.24	-.79	n/a
2	Effort attribution	1	1-10	7.72	2.22	-1.07	.57	n/a
2	Strategy attribution	1	1-10	6.49	2.00	-.43	-.15	n/a
2	Luck attribution	1	1-10	3.86	2.09	.54	-.30	n/a
2	Prof. quality attribution	1	1-10	5.46	2.59	-.06	-.95	n/a
2	Test difficulty attribution	1	1-10	6.56	2.27	-.44	-.44	n/a
4	Graduating high school average	1	51-98	76.92	8.36	-.08	-.40	n/a

Mastery and performance goals. The Motivated Strategies of Learning Questionnaire (MSLQ; Pintrich et al., 1993) contains four items to measure mastery goals, and four items to measure performance goals, which were included in the Time 2 questionnaire (i.e., March). The four mastery items are: “I prefer course material that really challenges me so I can learn new things.” “In a class like psychology, I prefer course material that arouses my curiosity, even if it is difficult to learn.” “Understanding content is most satisfying now.” “When I have the opportunity in my courses, I choose assignments that I can learn from, even if they don’t guarantee a good grade.” The four

performance items are: “Getting good grades in my classes is the most satisfying thing for me right now.” “The most important thing for me right now is getting good grades so that I have a high grade point average.” “If I can, I want to get better grades in this class than most of the other students.” “I want to do well to please my family and friends.” A 7-point Likert scale was used with “1 = Not at all” to 7 = “Very much so.” For each scale, the four items were summed so that high scores represented strong endorsement of mastery or performance goals. In previous research using items from the MSLQ, mastery goals have had an alpha reliability ranging from .67 to .81, and performance goals have had an alpha reliability ranging from .72 to .83 (Daniels et al., 2008; Daniels et al., in press; Hall, 2008; Harackiewicz et al., 2000; Haynes, Daniels, Stupnisky, Perry, & Hladkyj, 2008).

Primary and secondary control. The following seven items were used to assess students’ primary control (Perry et al., 2001): “I have a great deal of control over my academic performance in my psychology course.” “I see myself as largely responsible for my performance throughout my college career.” “My grades are basically determined by things beyond my control and there is little I can do to change that.” “The more effort I put into my classes, the better I do at them.” “When I do poorly in my psychology course, it’s usually because I haven’t given my best effort.” “No matter what I do, I can’t seem to do well in my courses.” “There is little I can do about my performance at university.”

The following four items were used to assess students’ secondary control: “Regardless of what my grades are, I try to appreciate how my university experience can make me a ‘stronger person’ overall.” “No matter how well I do on a test or in a course, I try to ‘see beyond’ my grades to how my experience at university helps me to learn about

myself." "Whenever I have a bad experience at university, I try to see how I can 'turn it around' and benefit from it." "My academic performance and experience has given me a deeper understanding of my life than could be achieved without this experience."

At Time 2, students' responded to each item on a "1 = Strongly disagree" to "5 = Strongly agree" Likert scale. For primary control, three of the seven items were reverse-scored so that, when summed, a higher score indicated a greater endorsement of primary control. For secondary control, high summed scores indicated a strong endorsement of interpretive secondary control. In previous research comparable measures of primary control and secondary control have demonstrated similar reliabilities (primary control α = .75, .81, .78; secondary control α = .77, .64, .67; Daniels et al., 2006; Hall, Chipperfield, et al., 2006; Hall, Perry, Chipperfield, et al., 2006, respectively).

Attributions. At Time 2, students indicated the extent to which the six attributions explained their poor performance (1 = "Not at all" to 10 = "Very much so"). Ability was included as an indicator of an internal/uncontrollable attribution, and effort and strategy represented internal/controllable attributions. Three external and uncontrollable attributions were also included: luck, quality of professor's teaching, and test difficulty.

It should be noted that students were explicitly asked for attributions for "POOR[4] performance" because negative experiences tend to prompt students to look for causal explanations (Weiner, 1985, 2006) and consequently served as an appropriate basis for examining attributional thinking. Virtually all students reflect on the possibility of actual or anticipated unsatisfactory performances at various times during their academic careers. This may be particularly true in new achievement settings when students are unfamiliar

with the standards associated with success and may worry excessively about doing poorly.

Hypotheses

Aligned with Weiner's attribution theory (1985), the following hypotheses were deduced. Given the nature of the university environment, both mastery and performance goals were hypothesized to correlate positively with ability (Hayamizu & Weiner, 1991; Hong et al., 1999). It was also hypothesized that mastery goals would correlate positively with the controllable attributions of effort and strategy, and performance goals would correlate positively with the uncontrollable attributions of luck, test difficulty, and professor quality (Hayamizu & Weiner, 1991). Primary control, in turn, was hypothesized to correlate positively with the controllable attributions of effort and strategy, and negatively with the uncontrollable attributions of ability, luck, test difficulty, and professor quality. Secondary control was hypothesized to correlate positively with the external/uncontrollable attributions to luck, test difficulty, and professor quality. Finally, mastery and performance goals were hypothesized to be positively related to each other, and primary and secondary control were hypothesized to be unrelated (Hall, 2008; Pintrich, 2000; Rothbaum et al., 1982). Mastery goals were hypothesized to correlate positively with both primary and secondary control, and performance goals were hypothesized to only correlate positively with primary control.

Results

Rationale for Analyses

Correlational coefficients were computed for the full sample and are reported below. Additionally, because the failure/success distinction is a critical component of

Weiner's (1985) attribution theory correlations were assessed separately for high- and low-achieving students and are provided in Appendix C. None of the correlation coefficients differed significantly between high- and low-achieving students.

Main Analyses

Because the sample size for Study 1 was quite large, a conservative alpha level ($p < .01$) was chosen to help guard against Type I error (Wilcox, 2003). Of the background variables, graduating high school average correlated positively with performance goals and primary control, as well as attributions to effort, strategy, and test difficulty (Table 2). By in large, these results suggest that students with better grades when they graduated from high school were more likely to be performance oriented, use primary control, and explain poor performance with controllable attributions such as effort and strategy. Test difficulty is a bit of an anomaly in this set of relationships because it is external and uncontrollable.

Language status correlated negatively with primary control and the attribution to effort. This means that students who reported English as their first (or native) language were more likely to endorse primary control and make effort attributions than ESL students. This may reflect the tendency for ESL students to try hard (i.e., exert primary control and effort) but not necessarily reap the benefits from their efforts because of language difficulties. Females were also more likely than males to make attributions to ability and test difficulty. Although the correlations for background variables were relatively small, they were retained because they emerge consistently across the three studies. That is, these results will be shown to replicate across three separate and distinct samples of first-year students.

Table 2

Correlation Coefficients for all of the Variables in Study 1 (n=750)

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Mastery goals													
2. Performance goals	.43*												
3. Primary control	.28*	.20*											
4. Secondary control	.33*	.06	.18*										
5. Ability	-.04	.01	-.24*	.02									
6. Effort	.15*	.11*	.39*	.02	-.03								
7. Strategy	.17*	.17*	.13*	.11*	.09	.45*							
8. Luck	-.09	-.02	-.25*	-.04	.28*	-.08	.12*						
9. Professor quality	-.05	.04	-.10*	.00	.24*	.14*	.21*	.30*					
10. Test difficulty	-.03	.16*	-.10*	.03	.27*	.07	.26*	.27*	.43*				
11. Cohort[a]	-.07	-.06	-.02	-.02	.00	.00	.01	-.01	.15*	.01			
12. Gender[b]	-.03	-.05	.03	-.08	-.18*	.01	-.07	.04	-.07	-.15*	.10*		
13. Language[c]	-.04	-.03	-.16*	.05	.01	-.11*	-.06	.01	-.04	-.06	-.05	-.01	
14. High school[d]	.07	.18*	.16*	.05	-.05	.17*	.13*	-.01	.02	.16*	-.00	-.20*	-.04

[a]1= 2000, 2 = 2001. [b]1=female, 2=male. [c]1=English as first language, 2=ESL. [d]high school = graduating high school average.

*$p < .01$.

The correlations between the attribution items provide some construct validity for the single-item measures. For example, the controllable attributions of effort and strategy were strongly correlated. Likewise, the three external/uncontrollable attributions to luck, professor quality, and test difficulty were strongly correlated. Ability, which is internal but uncontrollable, correlated most strongly with luck, professor quality, and test difficulty, suggesting that these four attributions are similar on the uncontrollability dimension.

Primary control was positively correlated with attributions to effort and strategy, representative of controllable attributions. In addition, primary control was negatively correlated with ability, which, although internal, is traditionally considered an uncontrollable attribution. As hypothesized, primary control was negatively correlated with luck, professor quality, and test difficulty, all of which represent external and uncontrollable attributions. Overall these results suggest a reliable pattern of associations between the controllable dimension of the attributions and primary control.

In contrast, the significant correlations between attributions and secondary control, mastery goals, and performance goals were inconsistent. Both mastery goals and performance goals positively correlated with effort and strategy representing internal and controllable attributions. Performance goals also correlated positively with the attribution for test difficulty (external/uncontrollable). Otherwise, mastery and performance goals did not correlate significantly with the other attributions and certainly could not be distinguished from each other.

Although the correlations with attributions were not as expected, the correlations among the motivational constructs supported the hypotheses. Specifically, mastery and

performance goals were significantly positively correlated. A positive correlation emerged between primary and secondary control. Between the two sets of constructs, mastery goals correlated positively with both primary and secondary control. Also, as expected, performance goals correlated with primary control but not secondary control. These zero-order relationships provide some justification for the hypotheses in Study 2, as will become evident.

Discussion

The results of Study 1 provide some evidence of how goals, control, and attributions relate to each other. Three findings are particularly important. First, the correlations with attributions demonstrated that primary control was the only one of the four variables that had consistent relationships with the attributions. Second, mastery and performance goals both correlated positively with effort and strategy. And third, the correlations between goals and control provided preliminary evidence of interrelationships (or lack thereof) between these variables.

It appears that in college students, primary control is closely aligned with the controllability dimension of attributions (Rothbaum et al., 1982; Skinner, 1996; Weiner, 1985). Primary control was positively associated with effort and strategy as examples of controllable attributions and negatively associated with ability, luck, professor quality, and test difficulty as examples of uncontrollable attributions. This clear association with attributions may explain why primary control is often associated with positive adjustment in highly competitive achievement settings. Specifically, greater reliance on controllable attributions and less reliance on uncontrollable attributions may explain the tendency for primary control to be associated with more positive emotions, fewer negative emotions,

and better achievement for college students (Perry et al., 2001; Perry, Hall, & Ruthig, 2005; Perry, Hladkyj, Pekrun, Clifton, & Chipperfield, 2005; Perry, Stupnisky, et al., 2008).

In contrast, mastery and performance goals were both related to the only two internal and controllable attributions, namely effort and strategy. Perhaps these correlations are not surprising given that college students have likely accumulated their academic successes to date by using internal and controllable attributions that are highly adaptive in competitive achievement settings (Hayamizu & Weiner, 1991; Weiner, 1985). However, the two goal types could not be distinguished by the other attributions. In other words, it was hypothesized that mastery goals and performance goals would have different attributional underpinnings, but they did not.

Perhaps in testing the relationship between mastery goals, performance goals, secondary control, and attributions, the use of single attributions is insufficient. In other words, one explanation for the lack of correlations between mastery goals, performance goals, secondary control, and the attributions may be that the variables correlate with combinations of attributions rather than one dimension. Thus, although using discrete attributions like ability, effort, luck, etc. has been shown to be a valid measurement strategy (see Haynes et al., 2006; Perry et al., 2001; Weiner, 1995) there is also value to testing relationships with attributional dimensions (i.e., internal/external, controllable/uncontrollable, and stable/unstable; Hayamizu & Weiner, 1991; Perry, Stupnisky, et al., 2008; Weiner, 1983). The ambiguity in attributional underpinnings for secondary control, mastery goals, and performance goals may make it difficult to determine how these constructs should affect students' emotions and their achievement.[5]

The correlations between the two types of goals and the two types of control were as expected. In line with the hypotheses, mastery goals positively correlated with both primary and secondary control, and performance goals correlated positively with primary control only. Overall, the results provide some insight into how goals and control relate to each other. Because the three studies in this dissertation build upon each other, further discussion is reserved for the General Discussion section following all three studies.

Limitations and Directions for Future Research

The results of Study 1 must be interpreted with the following specific limitations in mind. First, although several of the students' most common attributions were considered (Schunk & Zimmerman, 2006), other possible attributions such as intelligence, prior knowledge, interest, help-seeking, etc. were not examined. Future research may want to consider additional specific attributions as well as test relationships with attributional dimensions. Second, although the correlational analyses in this study provided evidence that goals and control relate to each other, they did not provide any indication of the predictive or causal ordering of these effects. This is an important avenue of future research and is the focus of Study 2. Specifically, causal ordering was tested in Study 2 by using a more stringent cross-lag panel model.

Study 2: Predictive Ordering of Goals and Control

Introduction

Generally, Weiner's attribution theory (1985) suggests that in as much as primary and secondary control are similar to different attributions, they will influence students' choice of tasks, effort, persistence, and by association, their achievement goals. A similar argument is employed by achievement goal theory (Elliot, 1999). As an alternative, the

control-value theory of emotions (Pekrun, 2006) suggests that goals provide the framework from which control-directed behaviour occurs, and thus, goals influence control. In formulating these arguments, the theorists refer to the broad constructs of students' competency and agency beliefs not goals and control specifically. Nonetheless, the purpose of Study 2 was to test the directional relationships between mastery and performance goals and primary and secondary control as specific constructs representative of competence and agency beliefs.

Regardless of the direction of the relationship between the two types of goals and the two types of control inferences from existing research, including the results of Study 1, suggest that mastery goals should relate to both primary and secondary control, and performance goals should associate with primary control only. Mastery goals have consistently had positive associations with variables that are similar to primary control such as self-efficacy, task values, and self-regulation (Pintrich, 2000; Shell & Husman, 2008; Wolters et al., 1996). Additionally, mastery and secondary control share similar association with variables such as enjoyment, intrinsic motivation, and interest (Harackiewicz et al., 2000; Harackiewicz, Barron, Tauer, & Elliot, 2002; Hladkyj, Pelletier, Drewniak, & Perry, 1998), providing a basis to infer a relationship between the two motivational constructs. Performance goals and primary control both consistently have positive effects on achievement (Elliot, 1999; Harackiewicz, Barron, Tauer, et al., 2002; Perry et al., 2001; Perry, Hladkyj, et al., 2005). Finally, a recent study showed that the correlations between mastery goals and primary and secondary control were positive, and the correlation between performance goals and primary control was positive (Hall, 2008). This set of relationships was replicated in Study 1 of this dissertation.

In addition to ascertaining whether or not both types of goals relate to both types of control it is important to assess whether the causal direction is reciprocal: That is, do goals predict control, control predict goals, or both? The theoretical literature on this question is mixed. On the one hand, a number of researchers argued that control is expressed in the context of goal-directed behaviour, and hence goals should influence control (Pekrun, 2006; Schunk & Zimmerman, 2006; Skinner, 1996; Walls & Little, 2005). On the other hand, some researchers argued that goals are "relatively concrete, situation specific constructs that emerge from more general motivational energies" (Elliot, 1999, p. 174), and hence control should influence goals.

Empirical evidence on the direction of the relationships between goals and control is sparse, but two examples were located in which the authors made opposite predictions. Arguing that "academic goals are defined as behavioural instantiations of individual achievement drives" (p. 303) and thus should result from control beliefs rather than proceed them, Lopez (1999) tested a model in which goals functioned as mediators of the effects of control beliefs on students' intrinsic motivation, test anxiety, and grades. Lopez's model was supported. In contrast, arguing that "relevant theory strongly supports the argument for placing agency in a mediational position", Walls and Little (2005, p. 24) tested agency beliefs as mediators of the effects of motivation on well-being, affect, and grades. Their model was supported. Although the models tested in each of these two studies reported adequate goodness-of-fit, they provide little definitive information because they used cross-sectional data and were conducted on school-aged children. Thus, Study 2 represents a significant improvement over these existing studies because it focuses explicitly on determining the direction of relationships between goals and control

using a two-wave, four-variable, cross-lag panel design before considering additional outcome variables.

Method

Participants and Procedures

Participants (n = 360) were extracted from an online diary study that was conducted in addition to the traditional MAACH data collection during the 2004 academic year. This cohort was chosen to retain the largest number of participants who had completed measures of mastery and performance goals, and primary and secondary control on two occasions (Time 1 = October, Time 2 = December). All students in the study were enrolled in Introductory Psychology. Students were in their first year of university and reported their exact ages in years. The median age was 18 years (age range 17-26 years). Sixty-six percent of the sample was female (n = 237), and 1 participant failed to indicate his or her gender. English was the first language of 81% of the sample. Thus, although this was a completely separate sample from the one used in Study 1, many of the characteristics of the samples were similar.

Measures

Background variables. Because Canadian students do not write standardized university entrance exams like the SATs, researchers rely on high school academic achievement to control for pre-existing differences in aptitude. In fact, there is a substantial literature showing that high school grades are a strong predictor of college success (e.g., Hoffman, 2002; Zheng et al., 2002). As a proxy for SAT scores, students self-reported their graduating high school averages to the nearest whole percent (M = 80.86; SD = 8.79). Students also reported their gender and whether they considered

English as their first language. Of the 360 participants, 237 were female, and 291 reported English as their first language.

Mastery and performance goals. The eight items from the Motivated Strategies of Learning Questionnaire (MSLQ; Pintrich et al., 1993) used in Study 1 were used to measure mastery and performance goals in Study 2 (Time 1 = October, Time 2 = December). However, based on the confirmatory factor analysis of the Time 1 items conducted to verify the measurement model before testing a structural model (Marsh, Byrne, & Yeung, 1999), three of the four items were retained in each scale (see Results for full details). The same items were retained as the measures of mastery and performance goals at Time 2. The descriptive statistics and reliabilities for the scales are presented in Table 3, and the wording, skewness, and kurtosis for each item is presented in Appendix D.

Despite dropping some items, the alpha reliabilities for mastery goals and performance goals were largely consistent with the range that is frequently reported for scales created by these items. Specifically, previous research with college-student samples has found the reliabilities to range from .67 to .81 for mastery goals and from .72 to .83 for performance goals (e.g., Daniels et al., 2008; Daniels et al., in press; Hall, 2008; Harackiewicz et al., 2000; Haynes et al., 2008). Generally, the reliabilities suggest that the three-item scales were similar to the four-item scales reported in the broader literature. Please note that the debate surrounding the removal of items from pre-existing scales will be addressed later in the discussion section of Study 2 and in the General Discussion, hence it is not presented in depth now.

Primary and secondary control. As in Study 1, the students completed seven items assessing their primary control and four items assessing their secondary control on two occasions (Time 1 = October, Time 2 = December). Based on the results of a confirmatory factor analysis (CFA) of the Time 1 items, which was used to confirm the measurement model, three items were retained to measure each scale (see Results for full details). The same three items were retained for Time 2.

Table 3

Descriptive Statistics and Reliabilities for the Variables in Study 2 (n=360)

Time	Variables	# of items	Actual Range	*M*	*SD*	Skewness	Kurtosis	3-item α	Full scale α
1	Mastery[a]	3	3-21	14.16	3.21	-.41	.20	.68	.70
	Performance[b]	3	6-21	17.48	3.07	-.84	.15	.77	.72
1	Primary[c]	3	8-19	15.28	2.59	-.63	-.16	.69	.79
	Secondary[d]	3	3-21	13.78	3.67	-.21	-.09	.79	.77
2	Mastery[a]	3	3-21	14.00	3.49	-.38	.15	.71	.77
	Performance[b]	3	6-21	17.29	3.46	-.96	.46	.84	.80
2	Primary[c]	3	5-19	14.97	2.67	-.64	.26	.70	.81
	Secondary[d]	3	3-21	13.58	3.76	-.25	.27	.83	.81
4	High school average[e]	1	55.0-98.0%	80.86	8.79	-.41	-.26	n/a	n/a

Note. The alpha reliability of each full scale was provided for comparison purposes only. The three-item scales were used throughout the analyses.

[a]Mastery = mastery goals. [b]Performance = performance goals. [c]Primary = primary control. [d]Secondary = secondary control. [e]High school average = graduating high school average.

For secondary control, dropping one item improved the reliability from Study 1 and in comparison to other research that has employed these items. Specifically, the

common range of reliability is from .64 to .77 (e.g., Daniels et al., 2006; Hall, Perry, Chipperfield, et al., 2006). The alpha reliability for the three items measuring primary control was lower than is typically found in the literature (range .75 - .81; e.g., Daniels et al., 2006; Hall, Perry, Chipperfield, et al., 2006). However, because the main analyses involved the use of latent variables it was decided that the strong model fit of the CFA (see Results) compensated for the lower-than-normal Cronbach's alpha.

Hypotheses

It was hypothesized that mastery goals would relate positively to both primary and secondary control, whereas performance goals would relate positively to primary control and be unrelated to secondary control (Hall, 2008). Directional hypotheses were not stated because well-established theories purport opposing directions of influence, namely goals to control (Pekrun, 2006) and control to goals (Elliot, 1999). These hypotheses are not only extracted from the larger literature but extend directly from the results of Study 1.

Results

Rationale for Analyses

The main analyses used latent variables in Structural Equation Modeling with AMOS 7.0 (Arbuckle, 2006) and had two steps. First, a confirmatory factor analysis (CFA) tested the goodness-of-fit of the measurement models (i.e., the relations of the measured items to their respective latent variables) as recommended by Marsh et al. (1999). Second, in order to examine the interrelation between achievement goals and perceived control a two-wave, four-variable, cross-lag structural equation model was estimated.

Correlational analyses with summed scales were run after the CFAs but before testing the structural model.[6] As in Study 1, the sample was divided into high- and low-achieving students, and the differences between correlations were examined. There were no differences in the correlation matrices of high- and low-achieving students. The results are presented in Appendix E.

The goodness of fit of the measurement and structural models were assessed by three common fit indices: chi-square (χ^2), comparative fit index (CFI), and root mean square of approximation (RMSEA). These three indices were chosen because they represent each of the three broad categories of fit indices (Hancock, 2005; Kline, 2005). Specifically, χ^2 belongs to the category of absolute fit indices that compare the observed covariance matrix with the estimated covariance matrix. Ideally the χ^2 value should be non-significant (i.e., not rejecting the null); however, in most applications this standard is unrealistic and typically the χ^2 is quite large compared to the degrees of freedom resulting in the rejection of the null hypothesis (Byrne, 2001). CFI (Bentler, 1990) belongs to the category of incremental fit indices, meaning that it compares the fit of the hypothesized model to the independence model. The independence model assumes that all relationships among measured variables and the latent variables are 0. CFI values range from 0 to 1.00 with values greater than or equal to .90 considered acceptable and values above .95 considered strong (Hu & Bentler, 1999).

RMSEA (Browne & Cudeck, 1993) belongs to the category of parsimony fit indices and is often considered an index of "badness of fit." The principle of parsimony (i.e., Occam's razor) states that when two models provide equivalent solutions preference should be given to the simpler of the two (Kline, 2005). In SEM, however, the parsimony

principle often conflicts with the quest for goodness-of-fit: The fit of complex models is often better than parsimonious models because the inclusion of more parameters provides more opportunities to explain sampling error, thus superficially increasing fit (Myung, 2000). The lower the value of the RMSEA the better: less than .05 suggests good fit, up to .08 suggests reasonable fit, and greater than .10 is considered poor.

There were missing data for approximately 8% (n = 28) of the students on at least one item measuring mastery goals, performance goals, primary control, or secondary control. To deal with the missing data, the relevant parameters were estimated using the full information maximum likelihood (FIML) procedure (Byrne, 2001; Enders & Bandalos, 2001). When using the FIML procedure, AMOS does not provide the tests for multivariate normality or bootstrap estimates; thus, there was no indication of the degree to which the data met the assumption of multivariate normality, a necessary condition for using SEM (Kline, 2005).

The skewness and kurtosis of the observed items for univariate normality, which is a necessary although not sufficient condition for multivariate normality, were examined (Kline, 2005). Several of the items pertaining to performance goals and primary control exceeded skewness of ±1.0, hence suggesting a moderate amount of skewness (Enders & Bandalos, 1999; Appendix D). However, the scales assessing primary control and performance goals have been significantly skewed in previous research. This skewness is thought to result from the tendency for university students to report higher than average performance goals and primary control given their academic successes (e.g., Daniels et al., 2008; Daniels et al., in press; Hall, 2008; Hall,

Chipperfield, et al., 2006). Because the skewness was considered inherent to the variables, no transformations were undertaken (Enders & Bandalos, 1999).

Measurement Models

Mastery and performance goals. According to Marsh et al. (1999), it is important to have a strong fitting measurement model before testing the structural model in order to resolve "potentially troublesome measurement problems…prior to pursuing the possibly more complicated SEM models" (p. 157). Thus, although the MSLQ is a recognized measure of mastery and performance goals (Pintrich et al., 1993), the items were tested in a single confirmatory factor analysis (CFA) with each item loading on one latent factor and no correlations between the errors. The model fit was less than satisfactory, $\chi^2(19) = 68.75$, $p < .001$, CFI = .92, RMSEA = .09 (Figure 1). One explanation for the inadequate model fit may have been that items AM5 and AM8 had weaker loadings than the other items. These two items (AM5 and AM8) have shown similarly poor loadings in CFA in existing research using these scales (Daniels et al., in press).

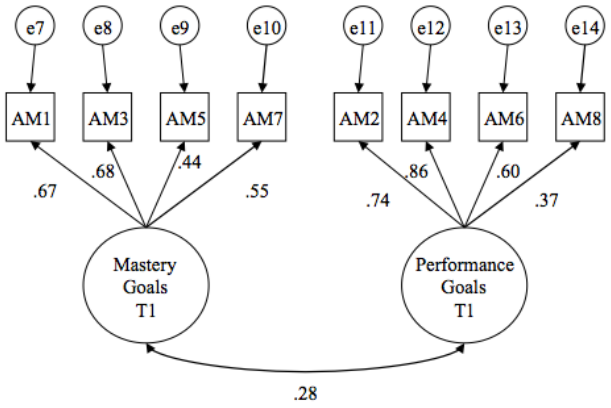

Figure 1. Time 1 confirmatory factor analysis of all the items intended to measure mastery and performance goals in Study 2.

An examination of the wording of AM5 and AM8 may explain why these items made a weaker contribution to the latent factors than the others. Recall that performance goals involve the desire to demonstrate knowledge relative to others (Moller & Elliot, 2006). Unlike the other performance items, AM8 ("I want to do well to please my family and friends") refers to performing well for a social reason, namely to please others. This social component is not usually included in the measurement of performance goals and may account for the poor factor loading (Elliot & Murayama, 2008).

For mastery goals the separation between AM5 ("Understanding content is most satisfying now") and the other items is less clear. One possibility is that AM5 is viewed differently because it suggests having "satisfied" a goal rather than a continued striving for learning as is usually implied by mastery goals (Elliot & Murayama, 2008; Moller & Elliot, 2006). Alternatively, students may see a desire for "understanding" as something conceptually distinct from "learning." Either way, it seems that this item does not contribute as meaningfully to the latent construct as the other three items.

Thus, in an effort to improve the goodness-of-fit for the measurement model, AM5 and AM8 were dropped and the CFA re-run with three measured indicators for each latent construct (Figure 2). The resulting model represented a significant improvement of fit over the original model, new $\chi^2(8) = 18.99$, $p = .01$, CFI = .98, RMSEA = .06; $\Delta\chi^2 = 49.76$, $\Delta df = 11$, c.v. for $p < .05 = 15.51$. Moreover, the reduced six item CFA for the Time 2 latent variables also fit the data well, $\chi^2(8) = 15.30$, $p = .05$, CFI = .99, RMSEA = .05. It should be noted that the correlation between the latent variables dropped from .28, $p < .01$, in the original model to .15, $p < .05$, in the revised model, suggesting the two items that were removed may have been moderately correlated.

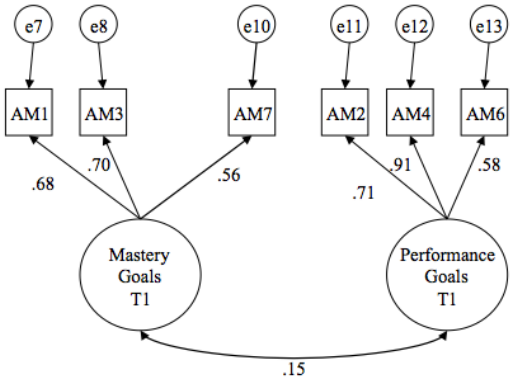

Figure 2. Time 1 confirmatory factor analysis of the items retained to measure mastery and performance goals in Study 2.

Primary and secondary control. Again, although versions of the primary and secondary control scales have been used in previous studies (e.g., Daniels et al., 2006; Hall, 2008; Hall, Perry, Ruthig, et al., 2006; Perry et al., 2001), the items were included in a single CFA with each item loading on one latent factor and no correlations between the items in order to confirm the strength of the measurement model prior to estimating the structural model. As was the case with mastery and performance goals, the fit was inadequate, $\chi^2(43) = 146.87$, $p < .001$, CFI = .91, RMSEA = .09 (Figure 3). Two items, PC16 and SC9, were removed because of their weak prediction by the latent factor relative to the other items.

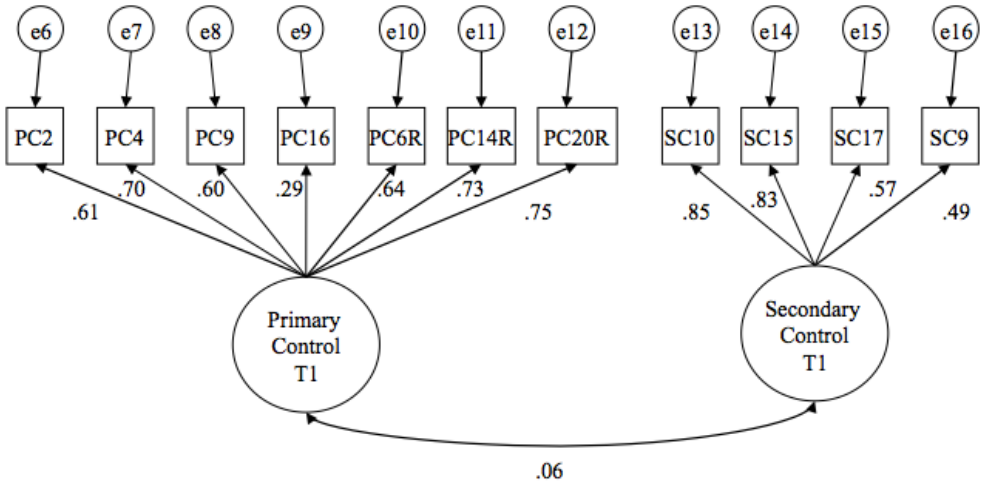

Figure 3. Time 1 confirmatory factor analysis of all the items intended to measure primary and secondary control in Study 2.

In addition to PC16 and SC9, three other primary control items were removed on conceptual and/or methodological grounds. Items PC4 and PC6R were removed because they focused on "doing well or poorly," and as such, were conceptually distinct from the other items that do not reference a positive or negative outcome. This conceptual argument was reinforced empirically for PC4 that was also more skewed and kurtotic at Time 2 than the other items (see Appendix D, Time 2 PC4 skewness = -1.64, kurtosis = 3.43). On similar grounds, PC14R was also removed because it was noticeably skewed at Time 1 (see Appendix D, Time 1 PC14R skewness = -1.68, kurtosis = 3.25). Although some skewness and kurtosis is common in the measurement of primary control, the skewness of PC4 and PC14R was sufficient to suggest that students responded uniformly. Three items were retained for the measurement of primary control: PC2, PC9, PC20R.

In an effort to improve the goodness-of-fit for the measurement model, SC9, PC4, PC6R, PC14R, and PC16 were excluded, and a second CFA was calculated with three measured items for each latent construct. The resulting model (Figure 4) represented a

significant improvement of fit over the original model, new $\chi^2(8) = 35.11$, $p < .001$, CFI = .95, RMSEA = .09; $\Delta\chi^2 = 111.76$, $\Delta df = 35$, c.v. for $p < .05 = 49.80$. Moreover, the reduced six item CFA for the Time 2 latent variables also fit the data adequately, $\chi^2(8) = 34.90$, $p < .001$, CFI = .96, RMSEA = .09.

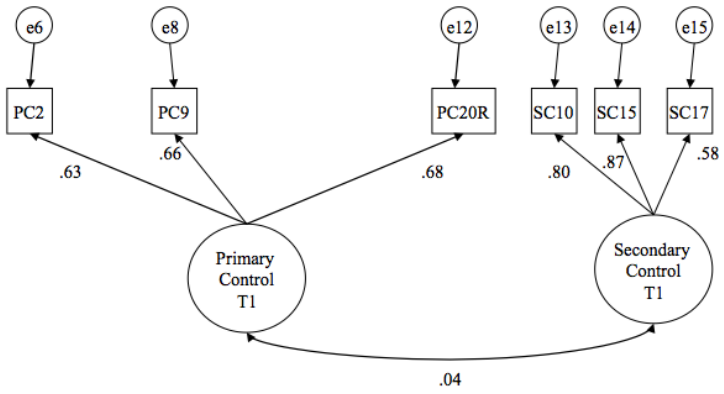

Figure 4. Time 1 confirmatory factor analysis of the items retained to measure primary and secondary control in Study 2.

Correlational Analyses

Correlations were conducted on the full sample, and the alpha level was set at $p < .05$, reflecting the smaller sample size than Study 1. Results showed that high school average correlated positively with performance goals and primary control at both Time 1 and Time 2 (Table 4). Language status correlated negatively with primary control at both Time 1 and Time 2. This implies that ESL students report less primary control than English as a first-language students. There was also a positive correlation between secondary control and language at Time 1. Finally, gender correlated negatively with performance goals at both Time 1 and Time 2, suggesting that males had lower performance goals than females.

Within Time 1, mastery goals correlated significantly with performance goals, primary control, and secondary control. This pattern was replicated amongst the Time 2 variables. As expected, Time 1 performance goals correlated significantly with Time 1 primary but not secondary control. Again, this pattern was reproduced between these variables at Time 2. At Time 1, primary and secondary control were unrelated, whereas at Time 2 a positive correlation emerged between these constructs. This suggests, perhaps, that primary and secondary control become more related to each other as the academic year progresses (Hall, 2008). Overall, the relationships between the constructs at each assessment point were fairly stable.

Table 4

Correlations Coefficients for all of the Variables in Study 2 (n=360)

	1	2	3	4	5	6	7	8	9	10
1. Mastery T1										
2. Performance T1	.15*									
3. Primary T1	.17*	.20*								
4. Secondary T1	.35*	-.11	.05							
5. Mastery T2	.70*	.17*	.18*	.30*						
6. Performance T2	.09	.75*	.19*	-.11	.23*					
7. Primary T2	.21*	.18*	.64*	.09	.32*	.21*				
8. Secondary T2	.41*	-.11	.10	.66*	.42*	-.06	.15*			
9. Gender [a]	-.03	-.18*	.00	-.02	-.01	-.13†	.02	.04		
10. Language [b]	-.03	.01	-.44*	.15†	-.03	.05	-.37*	.05	.04	
11. High school [c]	.03	.14†	.13†	-.07	.03	.15*	.13†	-.09	.13†	.05

Note. T1 refers to variables collected at Time 1 and T2 refers to Time 2.

[a]1=female, 2=male. [b]1=English as first language, 2=ESL. [c]high school = graduating high school average.

†$p < .05$. * $p < .01$.

Between the two assessment points, the strongest correlations emerged between the Time 1 and Time 2 measurements of the same variable. Additionally, mastery goals at

Time 1 correlated with primary and secondary control at Time 2. Time 1 performance goals correlated positively with Time 2 mastery goals and primary control. Time 1 primary control correlated positively with Time 2 mastery and performance goals. Finally, Time 1 secondary control correlated positively with Time 2 mastery goals.

Structural Model

The model was fully recursive, and all Time 1 variables were allowed to correlate except primary control and secondary control, and performance goals and secondary control. The uniquenesses between the corresponding residuals of the Time 1 and Time 2 observed measures of mastery goals, performance goals, primary control, and secondary control were also correlated in order to eliminate systematically biased estimates of the stability coefficients (Marsh & Hau, 1996). In other words, whatever measurement error existed at Time 1 was expected to exist at Time 2, therefore the error coefficients were correlated (Figure 5).

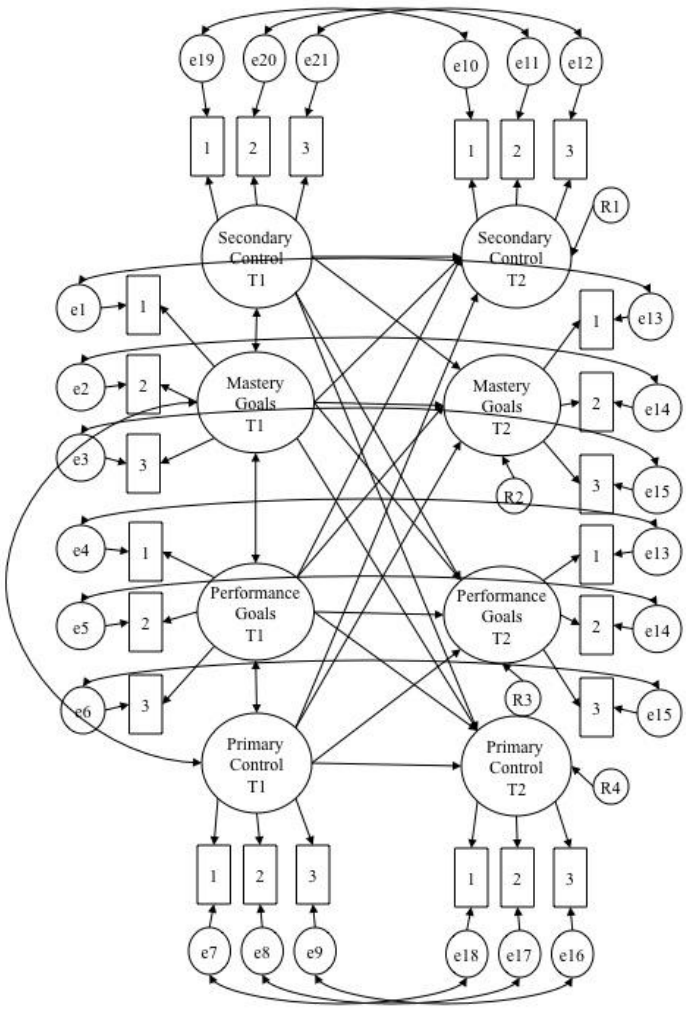

Figure 5. The Full Model for Study 2. Please note that double-headed arrows represent correlations even if they are not curved.

The structural model demonstrated adequate goodness-of-fit, $\chi^2(220) = 443.59$ $p < .001$; CFI = .94, RMSEA = .05, and all measured indicators were significantly predicted by their respective latent variable (β range = .54 to .93). Standardized regression coefficients for the structural paths between the Time 1 and Time 2 assessments of mastery goals, performance goals, primary control, and secondary control are presented in Table 5.

Table 5

Standardized Regression Coefficients for the Study 2 Cross-lag Model (n=360)

Time 1	Time 2			
	Mastery goals	Performance goals	Primary control	Secondary control
Mastery goals	.90*	.07	.28*	.27*
Performance goals	.06	.79*	-.01	-.12
Primary control	.06	.06	.73*	-.01
Secondary control	-.06	-.09	-.09	.63*
R^2	.83	.69	.70	.63

*$p < .01$.

As expected, the strongest predictor of each Time 2 variable was its Time 1 counterpart. Additionally, Time 1 mastery goals were a significant predictor of Time 2 primary and secondary control. For Time 2 mastery goals $R^2 = .83$, for performance goals $R^2 = .69$, for primary control $R^2 = .70$, and for secondary control $R^2 = .63$. No other significant relationships emerged. The structural model with significant standardized parameter estimates is shown in Figure 6 (note that all other paths described above have been omitted to simplify the presentation).

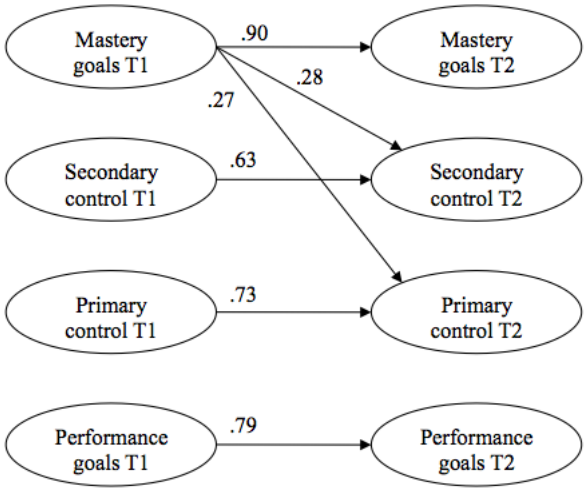

Figure 6. Cross-lag panel model documenting all significant relationships between mastery and performance goals and primary and secondary control.

Discussion

The purpose of Study 2 was to test the predictive or causal relationships between goals and control. Two results are particularly important. First, because virtually no research has considered the connection between goals and control, the finding that mastery goals related to primary and secondary control differently than performance goals related to primary and secondary control makes a substantial contribution to the literature. Specifically, mastery goals predicted both primary and secondary control, but performance goals did not predict either type of control. Second, the results lend support to the goals → control ordering suggested by Pekrun (1992, 2006) and not the control→ goals ordering proposed by Elliot (1999), thus providing some evidence on the possible causal ordering of the variables and implying the effects are not reciprocal.

Time 1 mastery goals significantly predicted Time 2 primary and secondary control (Pekrun, 2006), implying that students who endorse mastery goals early in their first-year of college are able to use such goals to enhance their primary and secondary control later on. The same was not true for performance goals. Specifically, performance goals did not significantly predict either primary or secondary control (Shell & Husman, 2008). In explaining these differences it may be that the intrapersonal perspective associated with mastery goals is sufficiently strong to shift perceptions of control, whereas the interpersonal perspectives associated with performance goals are not (Linnenbrink, 2007). In other words, perhaps students who focus on gaining competence during their first semester at university (i.e., endorse mastery goals) are able to interpret their new achievement setting as being more controllable than students who constantly compare themselves to others (i.e., endorse performance goals).

The results of the structural model also showed that students' Time 1 primary and secondary control did not predict their Time 2 mastery or performance goals. In other words, students' perceptions of control early in the academic year had little influence on their subsequent goals. This finding suggests that when students perceive their new and competitive achievement setting as low control the potential influence of primary and secondary control on their goals is minimized. Perhaps the most significant contribution of this study is that the analysis clearly favours the goals → control ordering suggested by Pekrun (1992, 2006) and not the control→ goals ordering suggested by Elliot (1999), thus establishing a predictive ordering between the constructs that can be applied to future research including the model estimated in Study 3.

Also warranting discussion in Study 2 is the change to the measurement models for mastery goals, performance goals, primary control, and secondary control from Study 1. From a conceptual perspective, the major problem with removing items from a pre-existing scale is that it brings into question the extent to which the reduced scale continues to measure the underlying psychosocial construct (Hulley, Cummings, Browner, Grady, & Newman, 2007). It is important to remember that for both goals and control, theorists continue to debate how the constructs should be conceptualized and measured. As a result, there are many different scales and versions of scales used in the empirical research, all of which are thought to measure similar underlying constructs (e.g., Chang, Chua, & Toh, 1997; Elliot & Murayama, 2008; Grant & Dweck, 2003; Grootenhuis, Last, De Graaf-Nijkerk, Van Der Wel, 1998; Heckhausen & Schulz, 1998; Midgley et al., 2000; Morling & Fiske, 1999; Perry et al., 2009; Rothbaum et al., 1982).

Considering that several different scales can be used to measure the variables, the question then becomes whether all items are always required to measure each construct or whether shorter versions or select items may be equally appropriate. Consider the following scenario (R. Renaud, personal communication, March 5, 2009): You have recently met a new person and are trying to decide whether or not the person is nice. The person shakes your hand, smiles, and nods in agreement. You conclude that he is indeed nice. Now imagine you meet a second person and want to know if he is nice. This person does not shake your hand or smile, but he makes eye contact, asks questions about you, and pays for your coffee. You conclude that this person is also nice. Notice that in this example different criteria were applied to the situation but resulted in the same conclusion. It is also important to notice that only a few of the countless possible indicators of "nice" were observed. The fact that limited and slightly different indicators were used, however, does not prevent one from feeling confident in the conclusion: Both people were nice. The purpose of this example is to highlight that in life we pick and choose indicators of latent variables. The same is sometimes true in statistics.

What is more important than the exact items is the level of confidence in the interpretations made from the results (Messick, 1995). Thus, the next question is whether the reduced scales functioned similarly to the full scales (i.e., convergent and divergent validity). For Study 2, the reduced scales related to other variables in a similar fashion as the way the full scales related to those variables in Study 1. For example, although the magnitude of the correlation differed, in both studies mastery goals correlated positively with performance goals, primary control, and secondary control. Likewise, on each occasion performance goals correlated positively with primary control and did not

correlate significantly with secondary control. In both studies performance goals and primary control correlated positively and significantly with graduating high school average, whereas mastery goals and secondary control did not. Not only do these results align largely with the results of Study 1, they also corroborate the findings in the existing literature (e.g., Daniels et al., 2008; Hall, 2008; Hall, Perry, Ruthig, et al., 2006; Haynes et al., 2008), thus providing confidence in the validity of the interpretations of the results obtained with the reduced number of items.

In sum, these arguments suggest that the underlying constructs were effectively captured by the shorter scales that have the added benefits of stronger CFA goodness-of-fit statistics and greater parsimony when included in the structural model. Further discussion of the reduced scales and the findings of Study 2 are reserved for the General Discussion following the third study.

Limitations and Directions for Future Research

The results of Study 2 must be interpreted with the following specific limitations in mind. Although the cross-lag panel approach to SEM allows for greater confidence regarding the direction of causality than cross-sectional approaches (Cole & Maxwell, 2003), future research could assess goals and control at more than two time points during the academic year, or use experience-sampling methods (Larson & Csikszentmihalyi, 1983) to test whether the direction of influence shifts. This, however, is beyond the scope of the present study.

Moreover, although understanding how goals and control relate to each other is important, future research should examine how these beliefs together contribute to important academic outcomes such as emotions and achievement. It is possible that the

different relationships mastery and performance goals have with primary and secondary control that were identified in Studies 1 and 2 have different effects on emotions and achievement. Specifically, students with mastery goals may have access to some outcomes through secondary control to which students with performance goals do not. Whether this association results in adaptive or maladaptive outcomes remains to be examined. In Study 3, the relationships between mastery and performance goals and primary and secondary control are examined in relation to students' emotions and achievement.

Study 3: Goals, Control, Emotions, and Achievement

Introduction

Building on the results of Study 2, the purpose of Study 3 was to examine the direct and indirect effects of goals and control as independent (exogenous) variables and students' emotions and achievement as dependent (endogenous) variables. Specifically, the following four-step longitudinal model based on the control-value theory of emotions (Pekrun, 2006) was estimated: goals $\rightarrow$ control $\rightarrow$ emotion $\rightarrow$ achievement.

Seven emotions were examined: anger, anxiety, boredom, shame, enjoyment, hope, and pride (Table 6). These emotions were included because they represented all the combinations of the three dimensions in the conceptual framework of the control-value theory of emotions (Pekrun, 1992, 2006, Pekrun, Frenzel, Goetz, & Perry, 2007).

The first two dimensions, valence and activation, are common in classifying emotions (Pekrun, Goetz, Titz, & Perry, 2002). Valence refers to the common distinction between pleasant and unpleasant emotions, and activation refers to the motivational impetus that extends from these emotions. Object focus describes an additional

qualitative difference between emotions that focus on either an outcome (e.g., passing a test) or an activity (e.g., studying). Performance goals, which tend to orient students towards competition and outcomes, are hypothesized to predict outcome-focused emotions including anxiety, shame, hope, and pride (Pekrun et al., 2007). Mastery goals, which tend to orient students towards the learning process, are hypothesized to predict activity-focused emotions like anger, boredom, and enjoyment (Pekrun et al., 2007).

Table 6

Emotions as Specified by the Control-value Theory

Emotions	Valence	Activation	Object focus
Anger	Negative	activating	Activity
Anxiety	Negative	activating	Outcome
Boredom	Negative	deactivating	Activity
Shame	Negative	activating	Outcome
Enjoyment	Positive	activating	Activity
Hope	Positive	activating	Outcome
Pride	Positive	activating	Outcome

Table Adapted from Pekrun et al. (2007)

In addition to providing a classification system for emotions, the control-value theory (Pekrun, 2006) postulates specific relationships between goals, control, emotions, and achievement. These relationships provide the foundation for the hypothesized model estimated in Study 3 (goals $\rightarrow$ control $\rightarrow$ emotion $\rightarrow$ achievement). Several partial components of this sequence have been validated; however, the advantage of specifying the full sequence is to identify mediational mechanisms that explain the already documented partial relationships. For example, research has shown that goals predict emotions (Daniels et al., in press; Pekrun, Elliot, & Maier, 2009). No research, however,

has tested the premise that goals predict emotions because they influence the perceptions of control that give rise to emotions (i.e., control as a mediator of goals → emotion). This premise is one of four mediational mechanisms embedded in the larger sequence of relationships proposed by the control-value theory of emotions. The four specific mediational relationships of interest in Study 3 are outlined below:

Sequence 1: Primary and secondary control as partial mediators of the effects of goals on emotions (goals → control → emotion)

Sequence 2: Primary and secondary control as partial mediators of the effects of goals on achievement (goals → control → achievement)

Sequence 3: Emotions as partial mediators of the effects of goals on achievement (goals → emotion → achievement)

Sequence 4: Emotions as partial mediators of the effects of primary and secondary control on achievement (control → emotion → achievement)

Empirical evidence pertaining to each of these mediational relationships is reviewed next.

Primary and Secondary Control as Mediators

Sequence 1 (goals → control → emotion). Primary and/or secondary control may mediate the relationship between goals and each of the emotions presented in Table 6. In support of this sequence, empirical evidence documenting relationships between (a) mastery and performance goals and discrete emotions, and (b) primary and secondary control and discrete emotions is reviewed.

Most often mastery goals focus students' attention on the learning experience and hence are thought to predict activity-focused emotions like anger, boredom, and enjoyment (Pekrun, 2006). Indeed, Pekrun, Elliot, and Maier (2006) found that mastery

goals positively predicted enjoyment, hope, and pride, and negatively predicted boredom and anger (see also Barron & Harackiewicz, 2001; Daniels et al., 2008; Daniels et al., in press; Harackiewicz et al., 2000; Harackiewicz, Barron, Tauer, et al., 2002; Pekrun et al., 2006). Moreover, these results persisted when controlling for previous achievement, social desirability, temperament, or competence expectancy.

In contrast, performance-approach goals tend to focus students' attention on competition and outcomes and thus are expected to predict outcome emotions like shame, hope, and pride (Pekrun, 2006). Pekrun et al. (2006) found that performance-approach goals positively predicted pride and shame. Unlike mastery goals, the relationships between performance goals and emotions were undone when previous achievement, social desirability, temperament, or competence expectancy were controlled.

For anxiety, which is clearly the most frequently studied emotion and is outcome-focused, conflicting findings have emerged. Mastery goals appear to be either beneficial in reducing anxiety (e.g., Bandalos, Finney, & Geske, 2003; Daniels et al., 2008; Daniels et al., in press; Sideridis, 2005) or unrelated to anxiety (Linnenbrink, 2005; Pekrun et al., 2006; Pintrich 2000; Wolters et al., 1996). In some instances performance-approach goals have been positively related to anxiety (Bandalos et al., 2003; Daniels et al., 2008; Daniels et al., in press; Linnenbrink, 2005; Wolters et al., 1996), but in other instances there has been no significant relationship (Pekrun et al., 2006; Pekrun et al, 2009; Sideridis, 2005).

The range of findings between goals and anxiety may be related to the ways in which the constructs are operationalized. For example, when mastery and performance are broadly defined, as was done in Bandalos et al. (2003) and Daniels et al. (2008, in

press), it seems that mastery goals negatively predict anxiety and performance goals positively predict anxiety. Alternatively, Sideridis (2005) used a combination of items from pre-existing scales to create a mastery scale that focused on learning and a performance scale that focused on competence and likeability. He found that mastery goals were negatively related to the social alienation dimension of anxiety (see Reynolds & Richmond, 1978) and that performance-approach goals were unrelated to all dimensions of anxiety. Using the Pattern of Adaptive Learning Survey (PALS, Midgley et al., 2000), Wolters et al. (1996) and Linnenbrink (2005) found that mastery goals were unrelated to test anxiety and that performance goals were linked to test anxiety.

Considerable evidence also documents correlations between primary and secondary control and some emotions. Ruthig, Haynes, Perry and Chipperfield (2007), for example, showed that primary control was positively associated with emotions with a positive valence and negatively associated with emotions with a negative valence. More specifically, Gavala and Flett (2005) found that primary control positively correlated with enjoyment. Schönwetter, Perry, and Struthers (1993) assessed primary control during the first term of an Introductory Psychology course and found that 8 months later high-control students reported feeling more pride and less shame regarding their academic achievement than low-control students.

For secondary control, at least one study suggests a positive relationship between secondary control and the enjoyment that students had in the courses they were taking (Hladkyj et al., 1998). Additionally, interpretive secondary control has been positively associated with emotions such as hope, pride, and enjoyment (Hladkyj et al., 2003). In short, the research suggests that secondary control is positively associated with positive

emotions, whereas primary control is positively associated with positive emotions and negatively associated with negative emotions. Because secondary control involves adjusting the self to fit the environment in a way to find meaning, it is possible that students may also feel a reduction in negative emotions; however, there is no existing research on college students to support this notion.

Although some consistency is emerging in the research on the relationships between goals and emotions, and control and emotions, no research has tested the hypothesis that control mediates the effects of goals on emotions (Pekrun, 2006; Pekrun et al., 2009). As such, the first mediational mechanism tested in Study 3 is whether primary control and/or secondary control mediate the relationships between goals and emotions to some extent.

Sequence 2 (goals → control → achievement). Primary and secondary control may also mediate between goals and achievement. Because academic achievement is the outcome of primary interest in almost all schools, colleges, and universities, mastery and performance goals have frequently been tested as predictors of achievement. The positive link between performance-approach goals and academic achievement has been demonstrated in many empirical investigations particularly with college students (e.g., Barron & Harackiewicz, 2001; Elliot & Church, 1997; Elliot & McGregor, 1999; Elliot, McGregor, & Gable, 1999; Harackiewicz et al., 2000). In contrast, for mastery goals in college students the effects of have been mixed, resulting in a belief that positive relationships with achievement are uncommon (e.g., Barron & Harackiewicz, 2001; Elliot & Church, 1997; Harackiewicz et al., 2000; Pekrun et al., 2009).

Looking to clarify the effects of mastery goals on achievement, Linnenbrink-Garcia, Tyson, and Patall (2008) recently reviewed the relationships between approach-valenced goals and academic achievement in over 90 peer-reviewed articles of students in all levels of education. They found that across grades about 40% of studies revealed a significant positive relationship between mastery goals and achievement, less than 5% revealed a significant negative relationship, and about 55% had non-significant relationships (for examples of positive effects see, Church, Elliot, & Gable, 2001; Finney, Pieper, & Barron, 2004; Grant & Dweck, 2003; Rhee, Zusho, & Pintrich, 2005). Thus, although non-significant relationships are most common, positive effects can hardly be classified as rare. An examination of possible mediators, such as goals and emotions, may help clarify the relationship between mastery goals and achievement.

The relationship between control and achievement has also received substantial empirical attention. Cassidy and Eachus (2000) found that an external locus of control (i.e., low primary control) was negatively correlated with students' perceived proficiency in a research methods course. Stupnisky and colleagues found that primary control was a stronger predictor of achievement than self-esteem (Stupnisky et al, 2007) or critical thinking disposition (Stupnisky, Renaud, Daniels, Haynes, & Perry, in press). Ruthig et al. (2007) found that primary control correlated significantly with final grades in psychology, GPA, and course attrition. Perry and colleagues have also demonstrated that high primary control is associated with higher grades at the end of the year, as well as, GPAs and voluntary withdrawal from courses over the first three years of university (Perry et al., 2001; Perry, Hladkyj, et al., 2005).

The studies relating secondary control to achievement are fewer in number and not as straightforward as those for primary control. This may be, at least in part, because of the complexities of studying secondary control in college students (refer to Appendix B). Of the limited findings in this area, Hladkyj et al. (2000) found that interpretive secondary control had a stronger positive association with final grades than other types of secondary control. Likewise, Hall, Perry, Ruthig et al. (2006) found that students who had high primary control and high secondary control had higher GPAs and withdrew from fewer courses than students who had high primary control but low secondary control.

Given that primary control consistently and secondary control occasionally positively predicts achievement (Perry, 1991, 2003, Perry et al., 2001; Perry, Hall, et al., 2005), it could be that the inconsistent effects of goals on achievement are explained by a mediational relationship with primary and/or secondary control. Testing this causal sequence may provide a better understanding of the mechanism linking goals to achievement, which is particularly important in light of the inconsistent direct effects of mastery and performance goals on achievement found in previous research (Kaplan & Maehr, 2007; Linnenbrink-Garcia et al., 2008). Moreover, these relationships may have implications for interventions that are intended to improve achievement by either adjusting goals or control. The second mediational mechanism tested in Study 3 concerned whether primary and/or secondary control mediated the effects of goals on achievement to some extent.

Emotions as Mediators

Sequence 3 (goals → emotion → achievement). Emotions may mediate the effects of goals on achievement. As argued above, the relationships between goals and emotions and control and emotions are emerging in the literature and showing some consistency (Bandalos et al., 2003; Barron & Harackiewicz, 2001; Daniels et al., 2008; Daniels et al., in press; Gavala & Flett, 2005; Harackiewicz et al., 2000; Harackiewicz, Barron, Tauer, et al., 2002; Hladkyj et al., 1998; Hladkyj et al., 2000; Linnenbrink, 2005; Pekrun et al., 2006; Pintrich 2000; Ruthig et al., 2007; Schönwetter et al., 1993; Sideridis, 2005; Wolters et al., 1996). However, these mediation models were also predicated on the hypothesis that emotions are a significant predictor of achievement, and this literature is reviewed next.

Emotions are thought to influence the way people attend to and process information and achievement (Bless, 2000; Levine & Burgess, 1997; Meinhardt & Pekrun, 2003; Pekrun et al., 2002; Weiner, 1985). In support of the influence of emotions on achievement, anxiety tends to exert uniformly negative effects on achievement at all grade levels from elementary to graduate school (Hembree, 1988; Seipp, 1991; Zeidner, 2007). In several recent studies, anxiety has a negative relationship with many indicators of achievement including grades in a specific course, GPAs, and course persistence (Daniels et al., in press; Daniels et al., 2008; Hall, Perry, Ruthig, et al., 2006; Ruthig et al., 2004).

Research on the effects of other emotions on achievement is increasing. Pekrun, et al., (2004) found that hope and pride correlated positively with achievement, whereas anger and shame correlated negatively. Other researchers have replicated these

relationships (Hall, Hladkyj, Perry, & Ruthig, 2004; Hall, Perry, Chipperfield, et al., 2006; Pekrun et al., 2004).

For activity-focused emotions in college students, enjoyment relates positively not only to final grades and GPA (Daniels et al., 2008; Daniels et al., in press; Hall, Perry, Ruthig, et al., 2006; Harackiewicz et al., 2000; Ruthig et al, 2008) but also to the quality of students' creative writing (Larson, 1989). Boredom, in contrast, relates negatively to college students' achievement (Daniels et al., 2008; Daniels et al., in press; Pekrun et al., 2002; Pekrun, Goetz, Daniels, Stupnisky, & Perry, 2008; Perry et al., 2001; Ruthig et al., 2008).

With emotions becoming established as predictors of achievement, the question then becomes whether they mediate other variables. The goals → emotion → achievement relationship has been the topic of recent empirical investigations. As explained above, goals have been found to predict a variety of emotions (Bandalos et al., 2003; Barron & Harackiewicz, 2001; Daniels et al., 2008; Daniels et al., in press; Harackiewicz et al., 2000; Harackiewicz, Barron, Tauer, et al., 2002; Pekrun et al., 2006; Pintrich, 2000; Robins & Pals, 2002; Sideridis, 2005; Wolters et al., 1996). A few of these investigations extended the relationship between goals and emotions to include achievement. The results of these investigations showed that the effect of mastery goals on achievement was at least partially mediated by anger, anxiety, boredom, enjoyment, hope, and pride. In contrast, the effect of performance-approach goals on achievement was at least partially mediated by anxiety, hope, and pride (Daniels et al., in press; Elliot & McGregor, 1999; Pekrun et al., 2009). Thus, the third mediational relationship tested in

Study 3 was intended to reinforce emotions as partial mediators of the effects of goals on achievement.

Sequence 4 (control → emotion → achievement). As for the control → emotion → achievement sequence, this relationship has not been tested empirically. In related work, one study demonstrated that the benefits of high primary control were enhanced by enjoyment, but diminished by boredom and anxiety (Ruthig et al., 2007). Specifically, enjoyment bolstered the effects of primary control, hence increasing GPA and decreasing voluntary withdrawal. In contrast, boredom and anxiety seemed to disengage the positive momentum of high primary control resulting in lower GPAs and increased attrition. Thus, the final mediational mechanism tested in Study 3 was the extent to which emotions mediate the effect of control on achievement.

Method

The purpose of Study 3 was to assess a structural model estimating the effects of both goals and control on emotions and achievement using a longitudinal dataset. In its entirety (goals → control → emotion → achievement) the model suggests that the relationships between variables that occur early in the model and those that occur later are mediated to some extent by the interceding constructs (Kenny, Kashy, & Bolger, 1998).

Participants and Procedures

For the purposes of Study 3, first-year students from the 2004 cohort of the merged MAACH/STS database were used (n = 251). This cohort was chosen because the standard four-phase procedure was slightly altered so that self-report data were collected at three times. The traditional MAACH self-report data collection points (i.e., Time 1 =

October, Time 2 = February) were preceded by an additional questionnaire administered in September (i.e., Time 0). Final grades were still provided to the researchers at the end of the academic year (Time 3), and institutional data were released approximately one year later (Time 4). This data collection protocol ensured that there was a clear temporal separation of the measurement of goals, control, emotions, and achievement, which is important (Kenny et al., 1998).

All volunteers were enrolled in Introductory Psychology. As in Study 1, the majority of students were enrolled in University 1 (94%). Students indicated their age according to 2-year categories and the modal categorical response was 17-18 years (range = 17-18 to 25-26 years), 70% of the sample was female, and 86% reported English as their first language. Thus, although this was an independent sample different from those used in Studies 1 and 2, many of the characteristics were again similar.

Measures

The variables used in Study 3 were mastery and performance goals, primary and secondary control, emotions, and achievement. Final grade in psychology was used as the achievement variable because it matched the domain specificity of the other variables (Tukey, 1969). High school average was included in the structural models to take into account the effect of prior achievement on future achievement.

Background variables. Because Canadian students do not write standardized university entrance examinations, researchers rely on measures of high school academic achievement to control for pre-existing differences in aptitude. There is a substantial literature showing that high school grades are a strong predictor of college success (e.g., Hoffman, 2002; Zheng et al., 2002). Each year the Institutional Records office computes

students' graduating high school average based on the university entrance requirements (i.e., English, mathematics, chemistry, and physics), hence providing a relatively objective measure of their academic ability (M = 78.81; SD = 8.62). Students also reported their gender and whether they considered English as their first language. Of the 251 participants, 176 were female, and 216 reported English as their first language.

Mastery and performance goals. As in Study 2, three items taken from the Motivated Strategies of Learning Questionnaire (MSLQ; Pintrich et al., 1993) were used to measure mastery goals, and three items were used to measure performance goals related to students' Introductory Psychology course at Time 0 (i.e., September). The wording, skewness, and kurtosis for each manifest indicator are presented in Appendix F. Table 7 presents the descriptive statistics and reliabilities for all scales.

The reliabilities for mastery and performance goals were lower in this study than in Study 1 and Study 2. The items were identical to those used in Study 2; however, students completed the items about one month earlier in Study 3 than in Study 2 (i.e., September rather than October). Recall from the Introduction that although goals are relatively stable they are most prone to instability in response to shifts in the learning environment (Anderman & Midgley, 1997; Fryer & Elliot, 2007; Kaplan & Midgley, 1999; Midgley, 1993; Wolters et al., 1996). Most would agree that September of the first year of university represents a major shift from a familiar to novel and highly competitive learning environment that may impact students' responses to the goal items.

Primary and secondary control. The same three primary control and three secondary control items used in Study 2 were used to measure the respective variables in Study 3 at Time 1 (i.e., October). The Cronbach's alpha reliability for secondary control

remained within its usual range (.64 to .77, e.g., Daniels et al., 2006; Hall, Perry, Chipperfield et al., 2006), although it was somewhat reduced from Study 2. In contrast, the Cronbach's alpha reliability for primary control was both outside its common range (.75 to .81, e.g., Daniels et al., 2006; Hall, Perry, Chipperfield, et al., 2006) and lower than in Studies 1 and 2. Despite this lower than desirable reliability, the confirmatory factor analysis demonstrated adequate goodness-of-fit (see Results for full details), and because the central analyses relied on latent variables, the three items were retained.

Table 7

Descriptive Statistics and Reliabilities for the Variables in Study 3 (n=251)

Time	Variables	# of items	Actual Range	*M*	*SD*	Skewness	Kurtosis	α
0	Mastery[a]	3	3-21	13.73	3.14	-.27	.33	.61
	Performance[b]	3	4-21	17.56	2.67	-.93	1.85	.64
1	Primary[c]	3	7-15	12.66	1.75	-.46	-.36	.60
	Secondary[d]	3	3-15	9.70	2.47	-.12	-.46	.65
2	Anger	1	1-7	2.66	1.60	.83	-.11	n/a
	Anxiety	6	6-30	15.53	5.46	.25	-.73	.84
	Boredom	6	6-30	15.65	5.68	.36	-.49	.88
	Shame	1	1-7	2.58	1.65	.86	-.17	n/a
	Enjoyment	6	7-30	19.34	4.38	.09	-.15	.75
	Hope	1	1-7	4.83	1.51	-.34	-.60	n/a
	Pride	1	1-7	3.92	1.59	.06	-.74	n/a
3	Final grade Intro Psych	1	28.67-97.07%	72.96	12.40	-.36	.10	n/a
4	High school average[e]	1	57-97%	78.81	8.62	-.19	-.61	n/a

[a]Mastery = mastery goals. [b]Performance = performance goals. [c]Primary = primary control. [d]Secondary = secondary control. [e]High school average = graduating high school average.

Emotions. At Time 2 (i.e., March) anxiety, boredom, and enjoyment were each assessed by six items taken from an early version of the Achievement Emotions Questionnaire (AEQ; Pekrun, Goetz, & Perry, 2005). Participants were asked to think about each item in relation to their Introductory Psychology course and rate the extent to which it was "1 = not at all true" or "5 = completely true" for them. Boredom and enjoyment were included as negative and positive activity-focused emotions, whereas anxiety was included as a negative outcome-focused emotion. Complete wording for the items in these scales is presented in Appendix F. Previous investigations using these scales report similar reliabilities (enjoyment α = .75, .73, .71; boredom, α = .90, .91, .89; anxiety, α = .81, .82, .82, see Daniels et al., in press; Daniels et al., 2008; Ruthig et al., 2008, respectively). As in other instances (e.g., Daniels et al., in press), all six items were retained and included in the structural model (see Results).

In addition, several other emotions that are included in the control-value theory of emotions were assessed by single-items (Pekrun, 2006; Weiner, 1985). Specifically, hope and pride are positive outcome-focused emotions, whereas shame is a negative outcome-focused emotion. Anger is another negative activity-focused emotion. Participants rated the extent to which they experienced each emotion in their Introductory Psychology course on a "1 = not at all" to "7 = very much so" scale.

Academic achievement. The MAACH/STS database contains several measures of academic achievement provided directly from the course instructors or Institutional Records at the end of the academic year. For the current study, final grade in Introductory Psychology, reported as percentages, were used as the measure of achievement. Given that all other non-demographic variables in the model were course-specific, final

Introductory Psychology grades represented the most appropriate measure of achievement (Tukey, 1969).

Hypotheses

Mastery goals were hypothesized to correlate positively with performance goals, primary control, secondary control, and enjoyment, and negatively with anxiety, boredom, and anger. Performance goals were hypothesized to positively correlate with primary control, anxiety, shame, hope, and pride (all outcome emotions) and achievement. Primary control was hypothesized to relate positively to achievement and positive emotions and negatively to negative emotions. Secondary control was hypothesized to enhance positive emotions, especially hope and enjoyment, but it was unclear how secondary control would relate to achievement. Each emotion was hypothesized to correlate significantly with achievement (positive effect for positive emotions, negative effect for negative emotions).

In the structural equation modeling analyses, four sets of meditational effects were tested:

1. Primary and secondary control were hypothesized to at least partially mediate the effects of mastery and performance goals on emotions;
2. Primary and secondary control were hypothesized to at least partially mediate the effects of mastery and performance goals on achievement;
3. Emotions were hypothesized to at least partially mediate the effects of mastery and performance goals on achievement;
4. Emotions were hypothesized to at least partially mediate the effects of primary and secondary control on achievement.

Results

Measurement Models

As in Study 2, the structural equation modeling analyses were conducted in two steps using AMOS 7.0 (Arbuckle, 2006). First, Marsh et al. (1999) recommend using Confirmatory Factor Analysis (CFA) to test the measurement models before assessing relationships between the variables. As such, CFAs were used to test the relationship between the measured items and the latent variables before estimating the structural model.

Mastery and performance goals. The same three items measuring mastery goals and the same three items measuring performance goals from Study 2 were tested in a CFA. This process verified the model established in Study 2. The model fit the data adequately, $\chi^2(8) = 21.85$, $p < .01$, CFI = .94, RMSEA = .08 (Figure 7) and each item was satisfactorily predicted by the latent variable. This reinforces the appropriateness of the measurement model defined in Study 2. Interestingly, the correlation between the two latent variables was higher in Study 3 than in Study 2. Because these variables were measured prior to any exam feedback in Study 3, this may reflect students' early desires to both "learn" and "perform" in their new achievement setting before they have a sense of the standards required by their new achievement setting – standards which may force the two types of goals apart. This, however, is only one possible explanation for this change in the correlation coefficient and not tested explicitly.

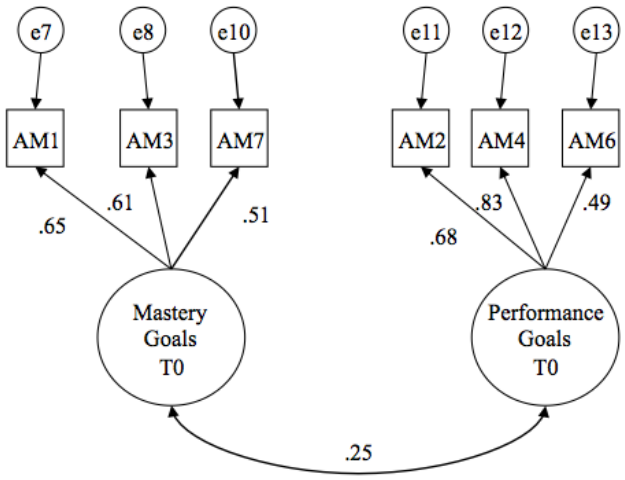

Figure 7. Time 0 confirmatory factor analysis of the items used to measure mastery and performance goals in Study 3.

Primary and secondary control. The same three items measuring primary and secondary control were tested in a confirmatory factor analysis (CFA), thus corroborating the measurement model established in Study 2. As was the case in Study 2, the model fit the data well with all items having an adequate factor loading for the latent variable, $\chi^2(8) = 5.80$, $p = .67$, CFI = 1.00, RMSEA = .00 (Figure 8). The finding that CFI = 1.00 and RMSEA = .00 does not mean that the model fits the data perfectly but rather reflects the fact that when the χ^2-value is smaller than the degrees of freedom, as was the case here, CFI is set to 1.00 and RMSEA is set to .00 (Kline, 2005). In other words, this model does not show that $\chi^2 = 0$, which would indeed suggest the model perfectly explained the data, but that the difference between χ^2 and the degrees of freedom is less than one and hence assumes the value of zero in the calculations of CFI and RMSEA (see Kline, 2005 for a full explanation and the equations for CFI and RMSEA).

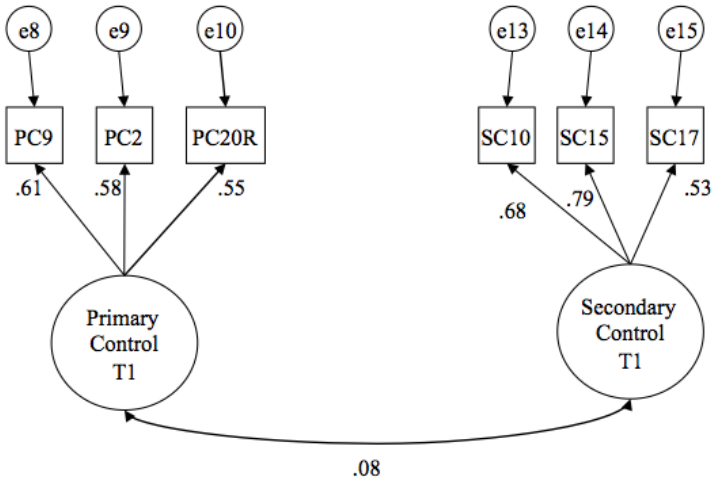

Figure 8. Time 1 confirmatory factor analysis of the items used to measure primary and secondary control in Study 3.

Emotions. Anxiety, boredom, and enjoyment were each measured by six items. These items were parceled in order to estimate fewer parameters, improve model fit, and reduce bias in the estimation of structural parameters (Bandalos, 2002; Coffman & MacCallum, 2005; Little, Cunningham, Shahar, Widaman, 2002). Specifically, two items based on similar wording (see Appendix F) and inter-item correlations (range *r*s = .33 to .69) were parceled together (i.e., summed together) resulting in three parcels for each latent variable. The model fit the data well, $\chi^2(24) = 61.52$, $p < .001$, CFI = .96, RMSEA = .08, and the scales were retained for all analyses (Figure 9).

The benefits of parceling are well documented (see Bandalos, 2002 for a review). With unidimensional items, as the emotion items have been shown to be (Daniels et al., in press), Little and colleagues (2002) suggest that it is appropriate to parcel items when the primary interest is to understand the relations among latent variables more so than among individual items, as is the objective here. Furthermore, parceling adheres to the principle of parsimony, which posits that one should pursue the simplest model or the

least number of parameters possible. Finally, parceling has been shown to result in more stable parameter estimates and better overall model fit than using either a large number of individual items as indicators or using only manifest variables in a path analysis (Bandalos, 2002; Coffman & MacCallum, 2005).

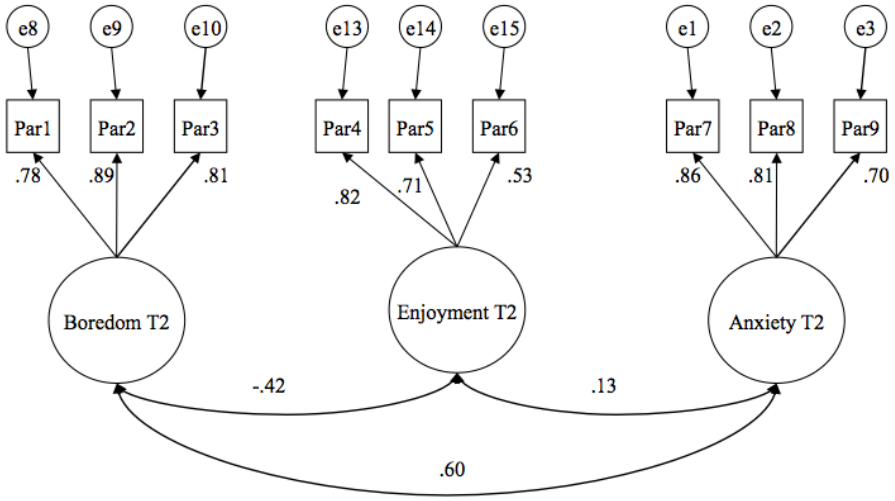

Figure 9. Time 2 confirmatory factor analysis of the parceled items used to measure boredom, enjoyment, and anxiety in Study 3.

Correlational Analyses

Following the CFAs, summed scales were created and the zero-order correlations between mastery and performance goals, primary and secondary control, and the emotion and achievement outcomes were calculated for the full sample (Table 8). An alpha level of $p < .05$ was used (Wilcox, 2003). Additionally, correlations were run separately for high- and low-achieving students. Only two differences emerged in the pattern of correlations between high- and low-achieving students, thus the results are not presented here but are in Appendix G for interested readers.

Table 8

Correlation Coefficients for all of the Variables in Study 3 (n=251)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Mastery goals														
2. Performance goals	.25*													
3. Primary control	.15†	.17†												
4. Secondary control	.28*	.02	.08											
5. Anger	-.19*	.03	-.21*	-.07										
6. Anxiety	-.22*	-.04	-.36*	-.02	.38*									
7. Boredom	-.26*	-.18*	-.26*	-.06	.41*	.50*								
8. Shame	-.09	.01	-.18*	.03	.62*	.41*	.38*							
9. Enjoyment	.20*	-.18*	.03	.23*	-.21*	.07	-.33*	-.14†						
10. Hopeful	.11	.21*	.18*	.06	-.25*	-.19*	-.38*	-.33*	.35*					
11. Pride	.05	.18*	.15†	.05	-.32*	-.20*	-.38*	-.45*	.34*	.63*				
12. Final grade[a]	.05	.16†	.35*	-.11	-.36*	-.33*	-.33*	-.43*	.07	.44*	.44*			
13. Gender[b]	.02	-.14†	-.09	.07	.01	.05	.09	.02	-.01	.02	.07	-.03		
14. Language[c]	.09	.06	-.22*	.02	-.03	.00	-.03	-.02	.11	.06	-.01	.09	.06	
15. High school[d]	.04	.06	.18*	.08	-.22*	-.16†	-.18*	-.18*	.05	.24*	.27*	.63*	-.05	-.06

[a]Final grade = final grade in Introductory Psychology as reported in percentages. [b]1 = female, 2 = male. [c]1 = English as a first language, 2 = ESL. [d]High school = graduating high school average.

† $p < .05$. * $p < .01$.

In terms of background variables, high school average correlated positively with primary control and final grade in Introductory Psychology, as well as several emotions including anger, anxiety, boredom, shame (negative), hope, and pride (positive). The correlations suggest that students with higher graduating high school averages are more likely to feel in control, have a positive emotional experience, and achieve high grades early in university. Language status correlated negatively with primary control, thus replicating the findings from Studies 1 and 2 and suggesting that ESL students report less primary control than English as a first-language students. Gender correlated negatively with performance goals, suggesting females endorsed this type of goal more than males.

As was the case in Studies 1 and 2, mastery and performance goals were positively correlated, and primary and secondary control were not significantly correlated (Pintrich, 2000; Rothbaum et al., 1982). Mastery goals also had a strong positive correlation with secondary control. The correlations between primary control and both mastery goals and performance goals were significant but small.

For the emotions, mastery goals were significantly negatively correlated with anger, anxiety, and boredom and positively correlated with enjoyment. Performance goals were positively related to hope and pride, both of which are outcome emotions. These correlations support the hypotheses and earlier research (Pekrun et al., 2006). Performance goals unexpectedly correlated negatively with boredom and enjoyment, two activity emotions. Primary control negatively correlated with anger, anxiety, boredom, and shame and positively correlated with hope and pride. Secondary control correlated with enjoyment but no other emotions.

Primary control was positively correlated with achievement, as measured by final grades in Introductory Psychology, as were performance goals, although the relationship was much weaker. Mastery goals and secondary control were not significantly correlated with achievement. All emotions except enjoyment were strongly correlated with achievement, such that positive emotions were positively correlated and negative emotions were negatively correlated.

Main Analyses

There were missing data for approximately 7% of the sample on at least one item, thus the longitudinal model was estimated using Full-Information-Maximum-Likelihood (FIML) procedures to compensate for missing data (Byrne, 2001). This prevented the calculation of both indicators of multivariate normality and bootstrap estimates. The same goodness-of-fit indices used in Study 2 were applied to Study 3: chi-square, CFI, and RMSEA.

The skewness and kurtosis of each observed item was inspected for univariate normality, which is a necessary although not sufficient condition for multivariate normality (Kline, 2005). As in Study 2, several of the items on the performance goals and primary control scales exceeded skewness of ±1.0, hence suggesting a possible problem (see Appendix F). Although Tabachnick & Fidell (2001) recommend transforming skewed variables, other researchers point out that this can be problematic particularly in terms of validity if the skewness is a conceptual part of the variable (Enders & Bandalos, 1999). Based on past research (e.g., Daniels et al., 2006; Daniels et al., in press; Hall, 2008; Hall, Chipperfield, et al., 2006), it is common for some items on these two scales to be negatively skewed and yet accurately reflect the tendency for students to endorse

beliefs about performance goals and primary control quite strongly. Consequently, the items were not transformed.

Seven versions of the structural model were estimated, one for each emotion: anger, anxiety, boredom, shame, enjoyment, hope, and pride. The residuals of mastery and performance goals were allowed to correlate, whereas primary and secondary control were not (Figure 10).

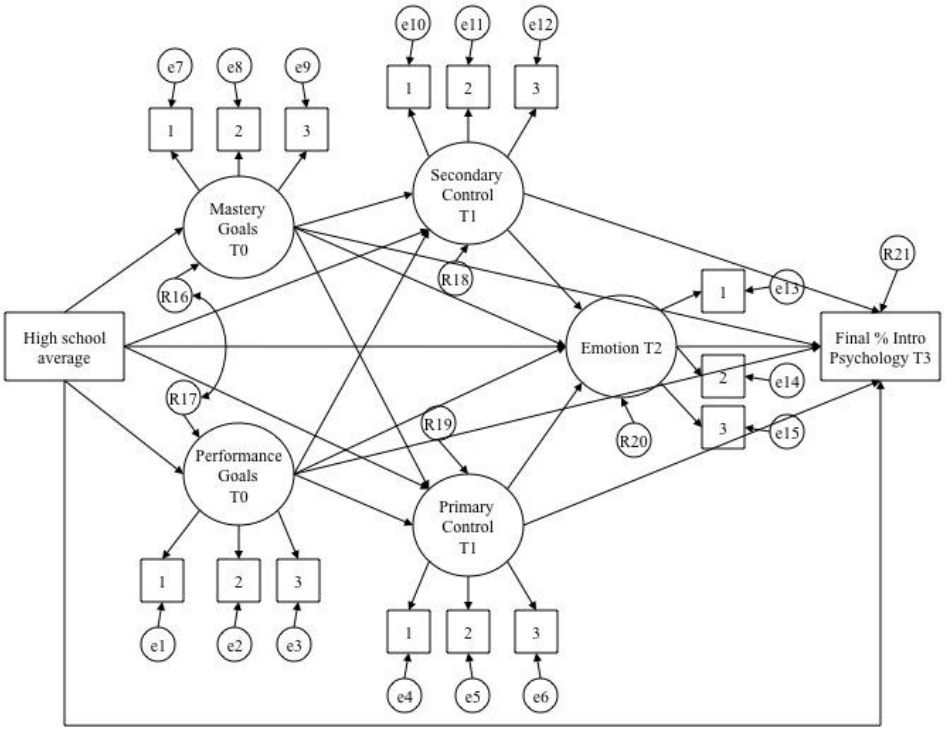

Figure 10. The General Structural Model for Study 3. The models testing anger, shame, hope, and pride were modified slightly from this figure because a single indicator measured each of the emotions. Hence, the latent variable labeled "Emotion T2" and its associated indicators and errors were replaced by a single manifest variable and error term in four of the seven models.

Goodness-of-fit statistics for each version of the model are presented in Table 9. As discussed in detail in Study 2, CFI values denote acceptable model fit at ≥ .90 and RMSEA values denote reasonable model fit at ≤ .08, and strong model fit at ≤ .05. Thus,

inspection of these indices suggests that, with the exception of enjoyment, the models had acceptable, albeit not excellent, goodness-of-fit. The CFI for the enjoyment model fell just short of the minimum cut off for CFI (.90); however, because the RMSEA was adequate despite the relatively small sample size, the model was retained and interpreted. Overall the hypothesized models adequately describe the direct and indirect effects relating mastery and performance goals, primary and secondary control, emotions, and achievement.

Table 9

Goodness of Fit Statistics for each Version of the Model Estimated in Study 3 (n=251)

Model	χ^2	*Df*	*p* <	CFI	RMSEA
Anger	141.00	73	.001	.90	.06
Anxiety	179.43	101	.001	.92	.06
Boredom	175.96	101	.001	.93	.05
Shame	138.65	73	.001	.91	.06
Enjoyment	189.09	101	.001	.89	.06
Hope	141.84	73	.001	.90	.06
Pride	139.69	73	.001	.90	.06

Note. CFI = comparative fit index. RMSEA = root mean square of approximation.

To guide the reader through the results the following strategies were used. First, because most variables held both exogenous (i.e., independent) and endogenous (i.e., dependent) roles in the model, the direct effects predicting each variable in its endogenous capacity are reviewed. Second, to examine the mediational mechanisms, the causal effects are decomposed into to their direct, indirect, and total causal effects (Alwin & Hauser, 1975; Bollen, 1987).

Direct effects. Table 10 presents the direct effects for goals and control as endogenous variables regressed on each prior variable in the model. Graduating high school average positively predicted primary control (ßs = .21, $p < .05$), suggesting that

doing well in high school predicted greater primary control for first-year university students (Perry, Hall, Ruthig, 2005). High school average did not have significant effects on mastery goals, performance goals, or secondary control.

Table 10

Average Standardized Regression Coefficients for the Direct Effects of all Exogenous Variables on Goals and Control as Endogenous Variables (n=251)

Exogenous variables	Endogenous variables			
	Time 0		Time 1	
	Mastery	Performance	Primary Control	Secondary Control
High school[a]	.12	-.02	.21*	.03
Mastery T0[b]			.25*	.40*
Performance T0[c]			.21*	-.11

Note. Because the effects were largely consistent across all seven versions of the model, for simplicity, the regression coefficients presented in this table are the average beta weight for the effect as calculated by finding the mean value across all seven models.

[a]High school = graduating high school average [b]Mastery T0 = mastery goals Time 0.

[c]Performance T0 = performance goals Time 0.

* $p < .05$.

As hypothesized, mastery goals positively predicted primary control (ßs = .23 to .27, $p < .05$) and secondary control (ßs = .38 to .42, $p < .05$). Performance goals were also a positive predictor of primary control, (ßs = .20 to .22, $p < .05$). On averge, the model accounted for approximately 19% of the variance in primary control and about 16% of the variance in secondary control.

Each emotion held an endogenous role in the model and was regressed on the exogenous variables of high school average, mastery and performance goals, and primary and secondary control. These results are presented in Table 11. High school average was

a positive predictor of hope and pride, suggesting these emotions are directly influenced by prior achievement.

Table 11

Standardized Regression Coefficients for the Direct Effects of all Exogenous Variables on the Seven Emotions as Endogenous Variables (n=251)

Exogenous Variables	Endogenous Variables Time 2 (separate by model versions)						
	Anger	Anxiety	Boredom	Shame	Enjoyment	Hope	Pride
High school[a]	-.16	-.05	-.15	-.13	.02	.22*	.24*
Mastery T0[b]	-.23*	-.29*	-.31*	-.09	.15	.05	.01
Performance T0[c]	.24*	.16	-.02	.15	.11	.12	.12
Primary T1[d]	-.21*	-.46*	-.23*	-.21*	-.05	.15	.11
Secondary T1[e]	.03	.15	.07	.09	.23*	.04	.02
R^2	.19	.33	.22	.09	.12	.12	.11

Note. The calculation of R^2 is based on the direct effects presented here as well as indirect effects discussed later.

[a]High school = graduating high school average [b]Mastery T0 = mastery goals time 0. [c]Performance T0 = performance goals time 0. [d]Primary T1 = primary control time 1. [e]Secondary T1 = secondary control time 1.

* $p < .05$.

Three of the four hypothesized direct relationships between mastery goals and emotions were supported. Specifically, mastery goals negatively predicted anger, anxiety, and boredom, but the anticipated positive relationship with enjoyment was not found. This was surprising because mastery goals tend to focus students' attention on the learning process, thus relating to activity-focused emotions such as enjoyment (Daniels et al., in press; Pekrun et al., 2006; Pekrun et al., 2009). Performance goals unexpectedly positively predicted anger, which is an activity-emotion. This is unusual because performance goals tend to focus students' attention on outcomes and competition and

hence emotions that are outcome- rather than activity-focused (Daniels et al., in press; Pekrun et al., 2006; Pekrun et al., 2009). Contrary to hypotheses, none of the effects of performance goals on outcome emotions, including anxiety, shame, hope, or pride were statistically significant.

The relationships between primary control and emotions were partially consistent with the hypotheses. Specifically, primary control negatively predicted anger, anxiety, boredom, and shame. Contrary to the hypotheses, primary control did not have significant positive effects on enjoyment, hope, or pride. These findings conflict with existing results that suggest students with high levels of primary control tend to experience more positive emotions (Ruthig et al., 2007). For secondary control, a significant positive relationship emerged with enjoyment but not with the other emotions (Hladkyj et al., 1998; Hladkyj et al., 2000).

Overall, the effects for anxiety and boredom were similar in that they were negatively predicted by mastery goals and primary control. Anger stands out as the only emotion predicted by mastery goals, performance goals, and primary control. Moreover, the predictors explained a fairly large amount of variance in anger (R^2 = .19), anxiety (R^2 = .33), and boredom (R^2 = .22). A smaller percentage of the variance in shame, enjoyment, hope, and pride were explained by the independent and intervening variables in the model (range R^2 = .09 to .12).

The final endogenous variable was achievement, operationalized as final grade in Introductory Psychology and predicted by all variables in the model. These results are presented in Table 12. In total, depending on the version of the model between 52% and 59% of the variance in achievement was explained.

Table 12

Standardized Regression Coefficients for the Direct Effects of all Exogenous Variables on Final Percentage in Introductory Psychology as an Endogenous Variable (n=251)

Exogenous Variables	Endogenous Variable	
	Final grade Intro Psychology Time 3	R^2 for final grade Intro Psych by model version
High school[a]	.53*	
Mastery goals Time 0	.01	
Performance goals Time 0	.05	
Primary control Time 1	.26*	
Secondary control Time 1	-.22*	
Anger Time 2	-.19*	.55
Anxiety Time 2	-.15*	.53
Boredom Time 2	-.17*	.54
Shame Time 2	-.29*	.59
Enjoyment Time 2	.07	.52
Hope Time 2	.25*	.57
Pride Time 2	.26*	.57

Note. Because of consistency across the models and for simplicity, the regression coefficients for high school, mastery goals, performance goals, primary control, and secondary control are the average beta weight for the effect as calculated by finding the mean across the seven versions of the model. The regression coefficients for each emotion are exact and represent the effect of the specific emotion on achievement separate from the other emotions. The measure of R^2 consists of both direct and indirect effects.

[a]High school = graduating high school average.

*$p < .05$.

As expected, high school average had a positive effect on final grade for students in Introductory Psychology (ßs = .50 to .57, $p < .05$), reinforcing considerable empirical evidence that current achievement is strongly predicted by prior achievement (Hoffman, 2002; Zheng et al., 2002). Next, aligned with the hypotheses, primary control positively predicted final grade in Introductory Psychology (ßs =.22 to .30, $p < .05$), and mastery goals were not significantly related to achievement (ßs =.00 to .02, $p > .05$). It was

hypothesized that performance goals would have a positive effect on final grades in Introductory Psychology, however no significant effects were found. Again, this suggests that one or both types of control may mediate the common relationship between performance goals and achievement. A negative effect of secondary control on achievement was recorded (*ß*s = -.21 to -.24, $p < .05$). Overall, the results showed that goals had essentially no direct effect on final grades in Introductory Psychology, whereas both primary and secondary control exerted significant influences even after controlling for the effects of prior achievement.

The negative emotions anger, anxiety, boredom, and shame each had a significant negative effect on the students' achievement in Introductory Psychology. Each positive emotion had a significant positive effect on achievement, except enjoyment that was non-significant. It may be that because hope and pride are both outcome-focused emotions, their effects on achievement are stronger than enjoyment, which is an activity-focused emotion (Pekrun et al., 2009). Overall, these findings support existing literature that suggests emotions are important predictors of achievement (Pekrun, 2006).

Decomposition of direct, indirect, and total causal effects. Next, the results for the four proposed mediational mechanisms are presented by considering how the direct and indirect effects combine for total causal effects between the variables in the model. In interpreting the meaningfulness of these results, several factors were taken into account. First, any total causal effect exceeding ± .20 was defined as large, relationships ranging from ±.10 to .19 were defined as moderate, and those less than ±.10 were defined as small. I chose to classify total causal effects this way because most direct effects ranged from .10 to .25 (see Tables 10, 11, and 12) and, when paired with small positive or

negative indirect effects (which they were bound to be given indirect effects are based on multiplying two direct effects), it seemed that the largest total effects possible would only slightly exceed ± .20 making this an appropriate upper boundary.

Second, the Sobel test was used to determine whether the indirect effects were statistically significant at $p < .05$ one-tailed (Preacher & Leonardelli, 2003; Sobel, 1982; Wilcox, 2003). The Sobel test uses the following equation to convert the unstandardized beta weights of the independent variable and the mediating variable and their respective standard errors into z-scores which can then be compared to the normal curve: z-value = $a*b/\text{SQRT}(b^2*s_a^2 + a^2*s_b^2)$. Recently, this traditional Sobel test has been found to be overly conservative and to lack power even with large samples (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002) and now researchers recommend testing the significance of indirect effects by a bootstrap method utilizing 95% confidence intervals (MacKinnon et al., 2002; Mallinckrodt, Abraham, Wei, & Russell, 2006; Shrout & Bolger, 2002). The bootstrap method requires full data that was not available in the present study and hence the traditional Sobel test was used despite its limitations.

Broadly, an indirect effect shows the percentage change in the standard deviation of an endogenous variable that results from a one standard deviation change to an exogenous variable. For example, an indirect effect of .05 means that a one standard deviation change to the exogenous variable results in a 5% of a standard deviation change to the endogenous variable (Wilcox, 2003). Third, small direct, indirect, and total causal effects documenting patterns or relationships that contribute substantially to the literature were discussed even if they did not meet the above criteria.

The first mediational sequence tested whether primary control and secondary control mediated, at least in part, the effects of goals on emotions (Sequence 1: goals → control → emotions; Pekrun, 1992, 2006). The direct, indirect, and total causal effects for this sequence are presented in Table 13.

Table 13

Direct, Indirect, and Total Causal Effects of Mastery and Performance Goals on the Emotions When Primary and Secondary Control are Considered as Mediators (n=251)

Exogenous variables Time 0	Endogenous variables Time 2	Direct effects	Indirect effects		Total causal effects
			PC[a] Time 1	SC[b] Time 1	
Mastery goals	Anger	-.23*	-.06*	.01	-.28
Mastery goals	Anxiety	-.29*	-.12*	.05	-.36
Mastery goals	Boredom	-.31*	-.06*	.03	-.34
Mastery goals	Shame	-.09	-.05	.04	-.10
Mastery goals	Enjoyment	.15	-.01	.09*	.23
Mastery goals	Hope	.05	.04	.02	.11
Mastery goals	Pride	.01	.03	.01	.05
Performance goals	Anger	.24*	-.04	.00	.20
Performance goals	Anxiety	.16	-.09*	-.02	.05
Performance goals	Boredom	-.02	-.05	-.01	-.08
Performance goals	Shame	.15	-.04	-.01	.10
Performance goals	Enjoyment	.11	-.01	-.03	.07
Performance goals	Hope	.12	.03	.00	.15
Performance goals	Pride	.12	.02	.00	.14

[a]PC = primary control. [b]SC = secondary control.

* $p < .05$.

Recall that in terms of direct effects mastery goals significantly predicted anger, anxiety, and boredom. The effects of mastery goals on these emotions were also significantly mediated by primary control. Moreover, these indirect effects were at least twice as large as the secondary control indirect effects, suggesting that primary control was the main mediator between mastery goals and these negative emotions. The indirect

effect of mastery goals on enjoyment through secondary control was significant. Aggregating the direct and indirect effects, it is not surprising that the total causal effects of mastery goals on anger, anxiety, boredom, and enjoyment were large. There were neither significant direct nor indirect effects of goals and control on shame and hope, but the total causal effects were moderate. Pride was the only emotion with very small direct and indirect effects and thus small total causal effects.

As already discussed, only one direct effect emerged from performance goals to the emotions; namely, performance goals positively predicted anger. This significant direct effect translated into a large total causal effect of performance goals on anger even though the indirect effects through primary and secondary control were not significant. In short, the large total causal effect of performance goals on anger consisted mainly of the direct effect. Shame, hope, and pride had moderate total causal effects, and anxiety, boredom, and enjoyment had small total causal effects. Despite the small total causal effects, primary control was a significant mediator of the effects of performance goals on anxiety. The direct effect of performance goals on anxiety was positive and the indirect effect through primary control was negative, thus showing that primary control attenuates the otherwise detrimental effect of performance goals on anxiety.

In sum, for the first mediational sequence testing control as a mediator of the effects of goals on emotions, some support was evident for certain emotions. Specifically, primary control served an adaptive mediational role by further reducing anger, anxiety, and boredom for students with mastery goals and by undoing some of the otherwise detrimental effect of performance goals on anxiety. Moreover, secondary control

mediated the effects of mastery goals on enjoyment such that students' reported increased levels of enjoyment.

The second mediational relationship tested primary and secondary control as at least partial mediators of the effects of goals on achievement (Sequence 2: goals → control → achievement). The direct, indirect, and total causal effects, separated according to model version, are presented in Table 14.

Table 14

Direct, Indirect, and Total Causal Effects of Mastery and Performance Goals on Final Grade in Introductory Psychology When Primary and Secondary Control are Considered as Mediators (n=251)

Version		Direct effects	Indirect effects		
Emotions	Exogenous variables Time 0	Final grade Intro Psychology Time3	PC[b] Time 1	SC[c] Time 1	Total causal effects
Anger	Mastery goals	.00	.07*	-.09*	-.02
Anxiety	Mastery goals	-.00	.06*	-.08*	-.02
Boredom	Mastery goals	-.02	.06*	-.09*	-.05
Shame	Mastery goals	.03	.06*	-.08*	.01
Enjoyment	Mastery goals	.02	.07*	-.10*	-.01
Hope	Mastery goals	.01	.07*	-.09*	-.01
Pride	Mastery goals	.00	.07*	-.09*	-.02
Anger	Perform. goals[a]	.07	.05*	.02	.14
Anxiety	Perform. goals	.05	.04	.02	.11
Boredom	Perform. goals	.03	.05*	.03	.11
Shame	Perform. goals	.06	.05*	.02	.13
Enjoyment	Perform. goals	.03	.06*	.03	.12
Hope	Perform. goals	.00	.05*	.03	.08
Pride	Perform. goals	.00	.06*	.03	.09

[a]Perform. goals = performance goals. [b]PC = primary control. [c]SC = secondary control.

* $p < .05$.

Recall that neither mastery goals nor performance goals exerted a significant direct effect on achievement, thus implying that the major causal effects of goals on

achievement must be through indirect effects. Additionally, recall that primary control exerted a direct positive effect on achievement and secondary control exerted a direct negative effect on achievement.

Primary control was a significant positive mediator of the effects of mastery goals on achievement. Secondary control was a significant negative mediator of the effects of mastery goals on achievement. Together these opposing indirect effects revealed that the positive indirect effect on achievement through primary control was countered by a negative indirect effect through secondary control, thus resulting in small total causal effects.

Although performance goals did not directly predict achievement, primary control was a significant positive mediator of the effects of performance goals on achievement. Thus, overall the total causal effect of performance goals on achievement was positive and of moderate magnitude. This pattern means that performance goals lead to gains in primary control, and primary control leads to gains in achievement (Pekrun, 2006).

In sum, for the second mediational sequence testing control as a mediator of the effects of goals on achievement, compelling evidence was gained. Specifically, primary control positively mediated the effects of both mastery and performance goals on achievement, thus reinforcing its utility. In contrast, secondary control negatively mediated the effects of mastery goals on achievement, thereby bringing into question its utility for students.

The third and fourth mediational relationships are presented together in order to facilitate comparisons between the role of emotions as a partial mediator of the effect of goals on achievement (Sequence 3: goals $\rightarrow$ emotion $\rightarrow$ achievement) versus a partial

mediator of the effect of control on achievement (Sequence 4: control → emotion → achievement). Recall that the direct effects of mastery and performance goals on achievement were not statistically significant, whereas the direct effects for primary control and secondary control were statistically significant. The direct, indirect, and total causal effects, separated according to the emotion in the model, are presented in Table 15.

The effects of mastery goals on achievement were significantly and positively mediated by anger, anxiety, and boredom, thus supporting other recent findings (Daniels et al., in press; Pekrun et al., 2009). However, in all three instances the total causal effects were negligible, meaning that although there was greater understanding of the mechanisms linking mastery goals to achievement, there was essentially no effect on grades. The effects of performance goals on achievement were significantly and negatively mediated by anger, but again the total causal effect was negligible.

The effects of primary control on achievement were significantly and positively mediated by anger, anxiety, boredom, and shame. In each of these instances the negative association between primary control and each of the negative emotions further enhanced the already positive direct effect of primary control on achievement (Ruthig et al., 2008). In short, the adaptiveness of primary control was further highlighted. Finally, no emotions mediated the negative effect of secondary control on achievement. This is particularly worrisome because it means that emotions cannot help ameliorate the significant negative impact secondary control exerts on achievement, as evidenced by the large negative total causal effect.[7]

Table 15

Direct, Indirect, and Total Causal Effects of Mastery and Performance Goals and Primary and Secondary Control on Final Grade in Introductory Psychology When Emotions are Considered as Mediators (n=251)

Model version		Direct effects	Indirect effect	
Emotion	Exogenous variables	Final grade Intro Psychology Time 3	Emotion Time 2	Total causal effects
Anger	Mastery goals T0[a]	.00	.05*	.05
	Performance goals T0	.07	-.05*	.02
	Primary control T1[b]	.26*	.04*	.30
	Secondary control T1	-.23*	-.01	-.24
Anxiety	Mastery goals T0	-.00	.04*	.04
	Performance goals T0	.05	-.02	.03
	Primary control T1	.22*	.07*	.29
	Secondary control T1	-.21*	-.02	-.23
Boredom	Mastery goals T0	-.02	.05*	.03
	Performance goals T0	.03	.00	.03
	Primary control T1	.26*	.04*	.30
	Secondary control T1	-.21*	-.01	-.22
Shame	Mastery goals T0	.03	.03	.06
	Performance goals T0	.06	.01	.07
	Primary control T1	.23*	.06*	.29
	Secondary control T1	-.21*	-.03	-.24
Enjoyment	Mastery goals T0	.02	.01	03
	Performance goals T0	.03	-.03	.00
	Primary control T1	.30*	.00	.30
	Secondary control T1	-.24*	.02	-.22
Hope	Mastery goals T0	.01	.01	.02
	Performance goals T0	.00	.03	.03
	Primary control T1	.26*	.04	.30
	Secondary control T1	-.23*	.01	-.22
Pride	Mastery goals T0	.00	.00	.00
	Performance goals T0	.00	.03	.03
	Primary control T1	.27*	.03	.30
	Secondary control T1	-.22*	.01	-.21

[a]T0 = time 0. [b]T1 = time 1.

* $p < .05$.

In sum, for the third and fourth mediational sequences testing emotions as mediators of the effects of goals and control on achievement, the evidence varies depending on the type of goal and type of control in question. For mastery goals, an additional positive effect on achievement was found through a reduction of certain negative emotions (anger, anxiety, and boredom). For performance goals, however, only anger was a significant mediator and the effect was negative. Primary control had a significant direct effect on achievement and substantial positive indirect effects with anger and boredom each mediating 13% of the effect of primary control on achievement, anxiety 24%, and shame 21%. Emotions did not function as mediators between secondary control and achievement. Thus, most of the negative emotions appear to mediate the effects on achievement for mastery goals but not performance goals, and primary control but not secondary control. None of the positive emotions served any mediational purpose.

Discussion

The purpose of Study 3 was to move beyond examining the relationship between goals and control and to consider the direct and indirect effects of these variables on two outcomes important in novel and highly competitive achievement settings, namely emotions and academic achievement. Four results are particularly important. First, the results again supported different effects of goals and control. Specifically mastery goals predicted primary and secondary control, whereas performance goals predicted only primary control. Second, primary control had a positive direct effect on achievement and positive indirect effects through a reduction of negative emotions, whereas secondary control exerted only a negative direct effect on achievement. Third, both mastery and performance goals positively predicted achievement through primary control; however,

for mastery goals this effect was undone by a negative indirect effect through secondary control. Fourth, positive and negative emotions functioned differently in the model. Positive emotions were not predicted by goals and control, but they had a positive direct impact on achievement, whereas negative emotions were predicted (directly and indirectly) by goals and control and had a negative direct impact on achievement.

As was the case in Studies 1 and 2, mastery goals predicted primary and secondary control, and performance goals only predicted primary control. Within the full model, this set of relationships poised mastery goals to have indirect effects on emotions and/or achievement through both primary and secondary control and performance goals to have indirect effects through only primary control.

Compared to secondary control, the adaptive role of primary control was highly apparent. Primary control negatively predicted negative emotions and positively predicted achievement. In contrast, secondary control was largely unrelated to emotions and negatively predicted achievement. Thus, these direct effects suggest that associations with primary control result in positive effects, whereas associations with secondary control do not. This became further evident through the mediational effects discussed next.

For control as a mediator of the effects of goals on achievement (sequence 2: goals $\rightarrow$ control $\rightarrow$ achievement), both mastery and performance goals exerted positive indirect effects on achievement through primary control. However, the mastery-secondary control relationship resulted in a decrease in achievement. Secondary control negatively mediated the effects of mastery goals on achievement. This finding highlights the importance of including of secondary control in research with college students (Perry,

Haynes, et al., 2009; Perry, Chipperfield, et al., 2008; Perry, Stupnisky, et al., 2008) because only by looking at both primary and secondary control were these conflicting effects on achievement detected.

These mediational mechanisms are particularly important because they help explain the common findings between goals and achievement in the literature (see Linnenbrink-Garcia et al., 2008 for a review). Mastery goals often do not significantly predict achievement and this may be because the negative indirect effects of secondary control undo the positive indirect effects of primary control. Likewise, the indirect effects of primary control may explain the consistent positive relationship between performance goals and achievement documented in the literature.

In considering control as a mediator of the effects of goals on emotions (sequence 1: goals $\rightarrow$ control $\rightarrow$ emotion), the relationship between mastery goals and secondary control resulted in few adaptive emotional outcomes. Secondary control positively mediated the effects of mastery goals on enjoyment. This was the only adaptive outcome associated with secondary control: It neither reduced any of the negative emotions nor enhanced any of the other positive emotions. The lack of adaptive emotional outcomes associated with secondary control was unexpected and continues to bring its utility for students into question.

Primary control, in contrast, was a significant mediator in terms of reducing negative emotions but not increasing positive emotions. Results showed that the effects of mastery goals on anger, anxiety, and boredom and the effects of performance goals on anxiety were mediated to some degree by primary control. By extension, it can be assumed that interventions used to enhance primary control (e.g., Haynes et al., 2008;

Perry, Hall, et al., 2005) may also be useful in reducing anger, anxiety, and boredom, all of which can often be difficult to target directly. Although reducing the experience of negative emotions is in and of itself an important outcome, an additional advantage is that the negative effects of anger, anxiety, and boredom on achievement would also be lessened (Pekrun et al., 2008; Zeidner, 2007).

For the role of emotions as mediators of the effects of goals on achievement (sequence 3: goals $\rightarrow$ emotions $\rightarrow$ achievement) and of the effects of control on achievement (sequence 4: control $\rightarrow$ emotions $\rightarrow$ achievement) an obvious separation between negative and positive emotions emerged. Although pride and hope exerted positive direct effects on achievement, they were not predicted by goals or control and thus could not function as mediators. In contrast, the effects of mastery goals and primary control on achievement were mediated by the negative emotions, thus resulting in additional achievement gains. The effects of secondary control were not mediated by any emotions, thus leaving the strong direct negative effect on achievement unmodified. Performance goals were mediated by anger in such a way that the effect was in a detrimental direction. Further discussion is reserved for the General Discussion section.

Limitations and Directions for Future Research

The results of Study 3 need to be interpreted with the following specific limitations in mind. First, the sample size was small relative to the number of parameters being estimated, thus potentially reducing the goodness-of-fit statistics for the models and producing unstable parameter estimates. Second, several of the emotions were measured with single items, which prevents the calculation of reliability. These issues can be remedied in future research, but were unable to be prevented in the current study due to

its reliance on pre-existing data. In spite of these two limitations the models fit the data adequately, and the correlations between the single-item indicators of emotions and the other emotions suggested a fairly high level of convergent validity.

Another limitation specific to Study 3 relates to the design of the study. Based on the evidence gathered in Study 2 a four-phase longitudinal model was estimated, the results of which made a unique contribution to the literature. The next step is to estimate this sort of longitudinal model as a cross-lag design. Controlling for baseline levels of primary and secondary control and emotions (Cole & Maxwell, 2003) or using experimental designs by manipulating goals and/or control will bring even stronger evidence to bear on the relationships identified in Study 3.

General Discussion

The overall purpose of this dissertation was to explore the associations between achievement goals and perceived control and to better understand how these beliefs jointly contribute to students' emotions and achievement in a new achievement setting, namely, the first year of university. These motivational variables were chosen because separately each has been shown to predict students' emotions and achievement (Elliot & McGregor, 1999; Harackiewicz et al., 2000; Karabenick, 2003; Perry et al., 2001; Perry, Hladkyj, et al., 2005; Pintrich, 2000). However, the contribution from the literature on goals has been largely independent of the literature on control and vice versa. Noticing this lack of investigation, researchers are increasingly calling for empirical evidence addressing relationships between motivational constructs such as these (Shell & Husman, 2008; Walls & Little, 2005). In other words, the series of studies presented in this dissertation sought to address the lack of research considering similarities, differences,

and combined effects of goals and control, two crucial beliefs shaping students academic success and adjustment. To borrow from Pintrich (2003)

> this type of synthetic and integrative research would not only shed light on motivational dynamics and potential mediating and moderating roles of different constructs, it could help lead to some clarity and parsimony in the field as it becomes clear how different constructs serve similar functions. (p. 677)

The studies presented above reflect three investigations into potential relationships between goals and control. Study 1 correlated mastery and performance goals, primary and secondary control, and several attributions that are common to university achievement settings (Weiner, 1985). Study 2 moved beyond the descriptive and correlation analyses presented in Study 1 to test the predictive order and reciprocity between the two types of goal beliefs and the two types of control beliefs (Elliot, 1999; Pekrun 2006), which has not been investigated in past research. Finally, Study 3 further expanded on the relationships between goals and control that emerged from Studies 1 and 2 by considering them in relation to emotions and achievement (Pekrun, 2006; Ruthig et al., 2008).

Even though the three studies used separate samples of students and measured the variables with different numbers of items, a coherent understanding of the relationship between goals and control and between these beliefs and emotions and achievement emerged. Toward this end, three sets of findings are particularly important and contribute both in terms of theoretical and practical advancement. First, the consistent relationships between goals and control must be highlighted. Mastery goals were positively associated with primary and secondary control, but performance goals were only related to primary

control. Although this pattern was expected from a few previous studies (e.g., Hall, 2008), the mastery goals-secondary control association had an unexpectedly maladaptive effect on students' achievement and thus warrants discussion. Second, a consistent set of effects for demographic variables emerged. Performance goals and primary control were significantly correlated with demographic variables such as language status, gender, and prior achievement, whereas mastery goals and secondary control were not systematically related to demographic variables. This suggests that performance goals and primary control may be more influenced by pre-existing individual differences than mastery goals or secondary control. Although the demographic variables occur first in the temporal ordering of effects, they are discussed after the relationships between goals and control because these results are most important to the dissertation. Third, the direct, indirect, and total causal effects of mastery and performance goals and primary and secondary control on emotions and achievement revealed several mediating relationships and suggested that primary control was particularly beneficial for reducing negative emotions and enhancing achievement. These results will be highlighted in this general discussion section that focuses how the consistencies that emerged across the studies contribute to the literature on goals and control, and to students' emotional and academic adjustment in a new and competitive achievement setting.

Relationships between Goals and Control

The zero-order Pearson correlation coefficients between the two types of goals and two types of control can be interpreted with a high level of confidence because they were replicated across the three studies in this dissertation. Although the samples were taken from different years, each consisted of a cohort of first-year students in

Introductory Psychology. Thus, the cohorts were fairly homogenous both in terms of their demographic characteristics and in terms of all being involved in a new achievement setting. Given this, it is perhaps not surprising that the correlation coefficients were quite similar across the three studies, even though the measurement models for goals and control differed between Study 1 and Studies 2 and 3.

In each sample, mastery and performance goals were moderately positively correlated (Barron & Harackiewicz, 2001). This suggests that first-year college students may be inclined towards using both mastery and performance goals, an intuitive finding for any student who has been in an achievement setting and been motivated both to learn and to demonstrate excellence (Pintrich, 2000). Additionally, the positive correlation between mastery and performance goals may explain why the two types of goals were not distinguished by their correlations with attributions in Study 1. As students become more inclined towards using combinations of mastery and performance goals, it makes sense that their relationships with causal attributions may be less readily identified at the zero-order level. If students choose when to use and/or combine mastery goals and performance goals, then to some extent the goals themselves are controllable making them more likely to be associated with controllable attributions and less likely to be associated with uncontrollable attributions. Although none of the studies in this dissertation focused on this question, it is an avenue of future research.

Next, with the exception of Time 2 in Study 2, primary control and secondary control were not significantly correlated. On both the empirical and theoretical level, researchers are still debating the extent to which primary and secondary control should be expected to correlate (Heckhausen & Schulz, 1995, 1998; Morling & Evered, 2006;

Skinner, 2007). Some studies have reported a significant positive correlation (Daniels et al., 2006; Hall, Chipperfield, et al., 2006), whereas other studies have reported no correlation (Hall, Perry, Ruthig, et al., 2006). Most recently, Hall (in press) has shown that perhaps primary and secondary control become related over the course of the school year. The results of the three studies presented here suggest that, at least early in their first year, students rely on primary control separately from secondary control. Again this finding likely rings true with students who recall exerting effort first (i.e., primary control) and only looking for other means (i.e., secondary control) once effort has failed (Morling & Evered, 2006; Rothbaum et al., 1982).

Alternatively, some researchers have suggested that secondary control is a more complex construct than primary control (Morling & Evered, 2006; Morling & Evered, 2007; Skinner, 2007). This complexity may be one explanation for the lack of correlation with the attributions in Study 1. Perhaps, rather than focusing on specific attributions, secondary control is more likely to correlate with combinations of attributions. For example, students have been shown to combine attributions in ways that indicate relinquished control, devalued control, effort reliance, and self-protection (Perry, Stupnisky, et al., 2008). Interestingly, the self-protective cluster, which highly endorsed effort, strategy, test difficulty, and professor quality, was as adaptive in terms of cognitions, emotions, and achievement as the effort-reliant cluster, which endorsed high effort and low ability, test difficulty, and professor quality. Although these results were not interpreted from the perspective of secondary control, it is possible that students in the self-protective cluster viewed ability, test difficulty, and professor quality as controllable (i.e., secondary control) and that defining these traditionally maladaptive

attributions as such allowed them to predict adaptive outcomes. The use of person-centered approaches such as cluster analysis or latent class analysis would help shed light on this issue.

Finally, mastery goals correlated significantly and positively with both primary and secondary control, whereas performance goals correlated significantly and positively with primary control but not with secondary control. The fact that a significant correlation between performance goals and secondary control failed to emerge across the three studies conducted in this dissertation provides a certain amount of confidence that this lack of an effect is a true finding and not due to poor power or Type II error (Wilcox, 2003). Together, these results between goals and control suggest that students who endorse mastery goals are also likely to have high levels of both primary and secondary control, whereas students who endorse performance goals only have high levels of primary control. These relationships largely aligned with the hypotheses that were derived from attribution theory (Weiner, 1985), the control-value theory of emotions (Pekrun, 2006), and achievement goal theory (Elliot, 1999).

The relationships between mastery and performance goals and primary and secondary control were tested more stringently in the cross-lag analyses in Study 2. As expected, the strongest predictor of each Time 2 construct was its Time 1 counterpart. That is, Time 1 mastery goals were the strongest predictor of Time 2 mastery goals, Time 1 performance goals were the strongest predictors of Time 2 performance, Time 1 primary control was the strongest predictor of Time 2 primary control, and Time 1 secondary control was the strongest predictor of Time 2 secondary control. This suggests that each construct has a reasonably high level of stability over time (i.e., test-retest

reliability, Miller, 1998). Additionally, because each Time 1 construct explains a large portion of the variance in its Time 2 counterpart, the model represents a fairly conservative test.

Nonetheless, some other noteworthy effects still emerged. Specifically, as the correlations suggested, Time 1 mastery goals positively predicted both Time 2 primary and secondary control. However, the cross-lag model revealed that these associations were not reciprocal: Neither Time 1 primary control nor secondary control predicted Time 2 mastery. This has not been tested in previous research and is important because it establishes a predictive ordering between the constructs, thus suggesting that mastery goals influence students' perceptions of control but perceptions of control do not influence goals (Pekrun, 2006). Students who endorse mastery goals may interpret their situation in such as way that is conducive to enhancing their perceptions of control because they define competence intrapersonally (Dweck & Leggett, 1988; Kaplan & Maehr, 2007; Linnenbrink, 2007; Pintrich, 2000). For example, as students start to feel competent according to personal standards, thereby meeting mastery goals, they may also feel more in control of their environment and start to find value in their struggles, thus developing secondary control and sustaining primary control (Linnenbrink, 2007).

Regarding performance goals and control, there was no significant relationship between the Time 1 constructs and the Time 2 constructs, suggesting that performance goals were essentially detached from control in the cross-lag model tested in Study 2. Although these results may be surprising, they align fairly closely with other research that found extrinsic motivation, which is akin to performance goals, to be unrelated to agency as measured by effort and ability (Walls & Little, 2005). It may be that the interpersonal

standard of competence endorsed by students with performance goals, like the external values of students motivated extrinsically, works against the development of primary and/or secondary control (Dweck & Leggett, 1998; Elliot, 1999; Kaplan & Maehr, 2007; Linnenbrink, 2007; Schunk & Zimmerman, 2006). For example, it may be difficult for first-year students, who are in a new and competitive achievement setting that is often viewed as low control, to feel competent relative to others. A skewed perception of university based on their high school experiences perpetuates unrealistic standards and comparisons that, when unmet, leave their performance goals unfulfilled and unable to exert an effect on primary or secondary control in the new achievement setting.

Although some theorists support the hypothesis that control predicts goals (e.g., Elliot, 1999; Lopez, 1999; Perry, 2003), the empirical evidence from Study 2 largely refutes this theoretic proposition. In short, neither Time 1 primary control nor secondary control influenced Time 2 mastery or performance goals. Although both the goals and control constructs have been conceptualized as having state- and trait-like dimensions, it may be that, when compared to each other within the pyschosocial context created by a new achievement setting, the stable components of goals may be more salient than the unstable, and the unstable components of control may be more prevalent than the stable. For example, Nicholls (1984) claimed that goal orientations represent relatively stable, enduring, or trait-like dispositions that individuals take with them into achievement situations. In response to a new and challenging achievement setting, like the first-year of university, students may cling to their pre-existing goal orientations, relying on approaches that they know brought them success in the past. In contrast, the same new achievement setting may trigger changes to students' perceptions of control as they are

challenged by unfamiliar standards, expectations, and criteria leading them to view the situation as low control (Perry, 2003; Perry et al., 2005; Pintrich, 2003; Shell & Husman, 2008). Whether this change to "state" perceived control influences students' more dispositional perceptions of control is a question for future research. In the present case, however, students' achievement goals appear to have a greater influence on their perceptions of control in the competitive achievement environment of first-year university than control on goals. Overall, this finding contributes to the position that many researchers have taken that control beliefs are "subservant to the effects of motivation" (Walls & Little, 2005, p. 24) as measured by variables like mastery and performance goals (see also, Dweck, 1986; Wentzel, Weinberger, Ford, & Feldman, 1990)

The Effects of Demographic Variables

Although the primary focus was to examine relationships between students' goals and control, these beliefs exist in a broader context: They are influenced by demographic variables and exert an influence on important academic outcomes. Often researchers fail to examine the potential influence of demographic variables on their models (Davies & Shackelford, 2006; Lippa, 2006; Zuriff, 2006). To address this, each of the three studies presented above included measures of English language status, gender, and graduating high school average as demographic variables that may affect students' goals and control beliefs.

The correlations between language, gender, and graduating high school average and goals and control were tested in each study, and the results were largely consistent across the three samples. Students' language status correlated negatively with primary

control in all three studies. This finding suggests that students who reported English as their second language (ESL) experienced less primary control than their English-as-a-first-language peers. Although the cultural demographics of the ESL participants are unknown, many international students from Asia regularly participate in the MAACH studies. In this respect, considerable research has suggested that Asian students may rely less on primary control, and more on secondary control than North American students (Weisz, Rothbaum, & Blackburn, 1984). Language status correlated positively with secondary control at Time 1 in Study 2, but the relationship was not significant in Studies 1 or 3. As such, although it may be appealing to say that ESL students used more secondary control than native language speakers, it is more accurate to conclude that they reported less primary control.

ESL students may report lower levels of primary control than non-ESL students because, in addition to traditional transition issues, they may have to deal with issues related to language barriers, immigration, a new country, etc., all of which likely contribute to greater decrements in primary control (Dalgard, Thapa, Hauff, McCubbin, & Syed, 2006). As such, this finding may reflect the degree of change, unknowns, or challenges associated with the new achievement setting rather than a culture phenomenon. Although interesting, the language differences should be interpreted cautiously because only about 20% of any sample consisted of ESL students.

Students' gender did not correlate with either goals or control variables in Study 1, but evidence of a negative relationship between gender and performance goals was present in both Study 2 and 3 (*r*s = -.18 and -.14, respectively). The negative relationship suggests that female students reported higher performance goals than their male peers.

This finding contradicts existing research, which shows that male students are usually more performance-goal focused than female students (Linnenbrink, Ryan, & Pintrich, 1999). One explanation is that female students may be more invested in their psychology course than male students. Some evidence for this may be inferred from the fact that many more female students register in introductory psychology courses than male students. Likewise, many more female students than male choose to pursue an honour's degree, likely leading to a career in psychology. Indeed, the 2008 graduating honour's class consisted of 41 women and 12 men (five gender unknown; provided from the department of psychology, April 9, 2008). This evidence may suggest that women see their Introductory Psychology course as germane to their careers, thus heightening their performance goals, whereas men may view it as an elective course, thus making performance less focal. The three studies provide only partial support for this conclusion.

Students' graduating high school average correlated significantly and positively with performance goals (Study 1 and Study 2) and with primary control (all three studies). These findings suggest that students who achieved at high levels during high school are likely to endorse performance goals in university and likely to report experiencing more primary control. These students may have relied on performance goals and primary control in high school to secure their strong grades and apply a similar formula to their new achievement setting. Some research suggests that these students have likely had little experience with failure in their academic careers thus far, making performance goals and primary control suitable to their needs (Perry, Hall, et al., 2005).

Direct, Indirect, and Total Causal Effects of Goals and Control on Outcome Variables

In addition to demographic variables, Study 3 included measures of emotions and final grades in Introductory Psychology as important outcomes that may be directly or indirectly predicted by students' beliefs about goals and control. As stated throughout this dissertation, mastery and performance goals and primary and secondary control have rarely, if ever, been included together in analyses predicting students' emotions and achievement (for exceptions with related constructs see Lopez, 1999; Shell & Husman, 2008; Walls & Little, 2005). By exploring primary and secondary control as mediators of the effects of goals on emotions and achievement several unique and important comparisons emerged that have not been identified before.

The results of Study 3 did not corroborate the common direct effect of performance goals on achievement (Linnenbrink-Garcia et al., 2008). This benchmark finding essentially disappeared when primary and secondary control were considered in the model, meaning that any effect of performance goals on achievement had to be indirect. A positive indirect effect for performance goals emerged through primary control, but the indirect effect of secondary control was not significant. This suggests that the common positive direct effect of performance goals on achievement may be more appropriately represented as an indirect effect through primary control than a direct effect. Identification of primary control as an important mediational mechanism casts some doubt on the authenticity of performance goals as a predictor of achievement.

Researchers have often questioned why performance goals are beneficial for achievement, even though they are often associated with negative processes such as competition, shallow processing, and lack of persistence (for a review see Moller &

Elliot, 2006). The most common response to this dilemma is that, for better or worse, performance goals align with the competitive and normative grading procedures used in universities and thus can exert a positive effect on achievement under these conditions (Elliot, Shell, Henry, & Maier, 2005). The results of Study 3 point to an alternative explanation: Students with performance goals use primary control, and primary control is consistently positively related to high achievement (Perry, Hall, et al., 2005). Thus, these results suggest that students with performance goals match the characteristics of their competitive learning environment and this match endows them with more primary control. This interpretation goes beyond the analyses and raises the idea as a question for future research.

The finding that mastery goals did not directly predict achievement was corroborated in Study 3 (see also Linnenbrink-Garcia et al., 2008). Again, primary and secondary control were tested as mediators that could explained, in part, why the relationship between mastery goals and achievement is often lacking. In this case, both types of control emerged as significant mediators. It is vital to note that primary control was a positive mediator and secondary control was a negative mediator. In other words, the negative indirect effect through secondary control offset the positive indirect effect through primary control. Overall, testing primary and secondary control as mediators provides a possible explanation for why mastery goals often fail to predict achievement. Importantly, only by considering both primary and secondary control were these competing effects found. As long as researchers continue to examine goals and control separately, they risk not fully explaining the often-inconsistent results. The results of

Study 3 provide clear evidence of the utility of combining motivational constructs rather than isolating them.

In offering explanations for the lack of direct effect of mastery goals on achievement, researchers often argue that the focus of mastery goals are to some extent contrary to the competitive and normative grading system used, especially for students who are just beginning their studies at university which is highly competitive (Elliot et al., 2005). Mastery goals focus students' attention on ongoing mastery, on controllability and available skills, which may need to be improved, and on the value, interest, or enjoyment in the activity itself (Elliot & Pekrun, 2007; Pekrun et al., 2007). By focusing on parts of the activity that are controllable, these students are inclined towards primary control. Additionally, not being put off by failure and looking for value in each learning experience may also explain these students proclivity for secondary control. Thus, it makes sense, as has been argued from the outset of this project, that mastery goals should be associated with both primary and secondary control. What was not anticipated was the strong negative effect of secondary control on achievement.

In explaining why secondary control seems to impede students' achievement, two reasons are possible. First, university students generally have the potential to enact primary control. They choose which courses to take, from which professor, at what time, whether or not to attend lectures, how much to study, etc. Some researchers have argued that secondary control is most effective when primary control has failed or when opportunities for control are low (Rothbaum et al., 1982). Perhaps for these students secondary control functions as an excuse so they avoid having to invest effort rather than as a mechanism by which they find value or meaning in their situation. Second, with the

exception of enjoyment, secondary control did not enhance positive emotions, contrary to the findings of at least one other study (Hladkyj et al., 1998). Because secondary control was largely unrelated to the emotions, the emotions could not mediate the effects of secondary control on achievement. In short, Study 3 did not identify a mediational mechanism that was able to undo the detrimental effects of secondary control on achievement. Obviously both of the above explanations require further research because they were not tested in this dissertation and because of the potential negative effects of secondary control for university students.

Turning to the emotion outcomes, the results of Study 3 clearly add to the growing body of literature that shows mastery goals negatively predict negative activity-emotions represented by anger and boredom. Also, for mastery goals the results of Study 3 support other work showing that mastery goals reduce anxiety, even though it is an outcome emotion (for similar results see Bandalos et al., 2003; Daniels et al. 2008, in press). Researchers have often speculated, but never tested, that these goal-emotions relationships exist because goals influence the control appraisals that underlie emotions (Elliot & Pekrun, 2007; Pekrun, 2006). The results of Study 3 show that primary control is in fact a significant mediator of the effects of mastery goals on anger, anxiety and boredom and that secondary control is a mediator of the effects of mastery goals on enjoyment. These mediational relationships imply that interventions that focus on enhancing mastery goals and/or primary control (Haynes et al., 2008) can affect the students' emotions that are difficult to target directly with interventions. Although reducing negative emotions is an important outcome, the results of Study 3 also reinforce that emotions are predictors of achievement and thus contribute to a growing body of

literature documenting the influence of emotions on achievement (Daniels et al., in press; Elliot & Pekrun, 2007; Pekrun et al., 2009).

Because the negative emotions had strong negative effects on students' achievement, the fact that mastery goals and primary control reduced the experience of anger, anxiety, boredom, and shame was important. Following from the earlier relationships in the analyses, anger, anxiety, and boredom mediated the effects of both mastery goals and primary control on achievement. For primary control, this was also the case for shame. In other words, both mastery goals and primary control exerted indirect positive influences on the students' achievement because they reduced the negative emotions that were detrimental for achievement.

With the exception of its relationship with secondary control, mastery goals held a largely adaptive role in the model. Students with mastery goals can expect to experience increased primary control and reduced negative emotions and thus positive increments in their achievement through these mediating effects. Of course, the effects of mastery goals on achievement can be quickly undone by secondary control. Perhaps what becomes more important than either type of goal is the type of control used by students.

To conclude, primary control was highly adaptive for students (Perry, Hall, et al., 2005). Whether primary control is gained through mastery or performance goals, its direct effect on achievement is important, especially considering the effects of prior achievement were controlled in the model. Moreover, primary control decreased the effects of all the negative emotions, thus negating their otherwise detrimental effects on achievement. Consequently, it seems that primary control was the most adaptive of the four motivational beliefs included in the analyses, both directly and in terms of its

indirect effects with mastery and performance goals on students' negative emotions and achievement. Although these results make substantial contributions to the empirical literature, they need to be considered in light of the limitations that are presented next.

Limitations and Directions for Future Research

A brief discussion of the limitations directly related to each study was presented at the conclusion of each study. In designing this dissertation, each of the studies was intended to build on the previous studies: Study 2 developed from Study 1, and Study 3 developed from both Study 1 and Study 2. In doing this, some of the limitations presented at the conclusion of each specific study were remedied in the subsequent studies. However, some limitations still persisted. Four limitations need to be considered when interpreting the results across all three studies and when designing future research. These limitations relate to the broad topics of theoretical advances, measurement models, secondary data analyses, and methodology.

The first limitation pertains to how each study related to recent advances in the goal and control literatures. The measures of mastery and performance goals did not take into account the recent advances in the avoidance dimensions of mastery and performance goals (Elliot, 1999). Although it is unlikely that the inclusion of the avoidance dimensions would change the relationships documented, these studies do not contribute to an understanding of how perceptions of control may relate to avoidance goals. Aside from avoidance-goals, other researchers endorse a multiple-goals perspective in which students can combine mastery and performance goals (Pintrich, 2000). This perspective was also not represented in the studies and may be particularly

important given the positive relationship that was documented between mastery and performance goals in each study.

Similarly, the measure of secondary control did not take into account recent conceptualizations of secondary control involving both acceptance and adjustment components (Morling & Evered, 2006). In fact, Morling and Evered (2006) argued that only when both acceptance and adjustment are present is secondary control adaptive. Recent evidence suggests that acceptance and adjustment may be critical to some cognitive and affective outcomes in competitive achievement settings (Perry, Chipperfield, et al., 2008; Perry, Haynes, et al., 2009). Nonetheless, the series of studies presented deal with the basic constructs of goals and control, and hence lay the groundwork for future research with these types of variables.

Also related to the measurement of the variables, the second limitation pertains to the fact that different measurement models were used for mastery goals, performance goals, primary control, and secondary control in Study 1 compared to Studies 2 and 3. Studies 2 and 3 were not designed to tackle potential problems with the existing items/scales used in Study 1. The confirmation of measurement models in the latter two studies was only undertaken because it is strongly advised to do so as the first step in structural equation modeling (Marsh et al., 1999). Some discussion regarding the conceptual concerns of dropping items was presented in the discussion section of Study 2; here the focus is more on methodological concerns associated with using a reduced number of items. In particular, when working with SEM the importance of Cronbach's alpha relative to fit indices must be considered.

One ramification of dropping items from an established scale is that the reliability of the scale may be compromised (Miller, 1995). On the other hand, estimating fewer parameters in SEM, especially with limited samples, tends to result in improved fit. In other words, as with all statistical analyses a benefit in one area has an associated cost in another. Indeed, in Study 2 the reliabilities of the mastery goals and primary control scales dropped after items were removed; however, the CFAs for all four variables improved.

In total, three reasons contributed to the decision to proceed with the reduced item-scales in Studies 2 and 3. First, although some reliability was sacrificed, the alpha levels remained above .60 which was the lower limit for alpha originally recommended by Nunnally (1967). Second, the CFA fit indices for the three-item scales were significantly better than the longer-item scales, and a strong fit is imperative in SEM in order to interpret the parameter estimates with confidence (Byrne, 2001; Kline, 2005). Third, perhaps the most compelling evidence in support of the reduced-item scales was found in convergent and divergent validity. Largely, the reduced-item goals and control scales continued functioned as expected: Significant correlations emerged where expected and non-significant relationships remained so (Campbell & Fiske, 1959; Messick, 1995).

Overall, there is little evidence suggesting that the reduced-item scales used in Studies 2 and 3 in any way undo the results of Study 1 or other research involving the full scales. It is clear that future research should not only focus on further validating the scales employed throughout this dissertation but should address the relative utility of basing SEM decisions on Cronbach's alpha versus CFA goodness-of-fit indices.

The third limitation pertains to secondary data analysis that has become an indisputable reality not only in psychology, but education, health, medicine, political sciences, sociology, and other areas. A search of the term "secondary data analysis" in PsycInfo resulted in 352 hits ranging from recent dissertations to articles as early as 1984 (conducted March 19, 2008). By design, secondary data analysis both imposes certain restrictions on the researcher and affords certain opportunities, neither of which exist if primary data had been collected. Some restrictions include the specific measurement scales that were used, how and in what order they were used, and how many participants were involved. All three of these restrictions posed challenges for this dissertation. As already described, the measures of goals and control did not target the most recent theoretical advances. Additionally, certain measures were collected at some time points but not others. This was the case in Study 3 when each variable was only assessed at one point in time, hence making it impossible to control for baseline levels of the variables. Likewise, the sample size for Study 3 was smaller than desirable, given the complexity of the model being estimated.

These specific restrictions aside, the opportunities afforded by secondary data analysis often outweigh the limitations. For example, separate cohorts of students were investigated and several consistencies in terms of correlational patterns emerged. This provides more confidence in the results than could be achieved from a single group. In short, the data used in this thesis by way of secondary data analysis far exceeded what could have been established through a personal investment of time, finances, and personnel resources.

The fourth limitation relates to methodology. As already described, many of the statistical analyses used in this dissertation were restricted by the way in which the data were originally collected. Using a cross-lag model in Study 2 and a predictive model in Study 3 was the best way to answer the questions using the existing data. Future research should consider using experimental manipulations of goals, control, or both in order to most clearly understand the causal effects of these constructs on each other and on academic outcomes such as emotions and achievement. This type of future research is important if the effects of goals and control are to be better understood.

Also from a methodological perspective, although the use of mediational analyses can result in small effect sizes, the results from Study 3 clearly show that even small indirect effects can make important contributions to theory and practice (Lipsey & Wilson, 1993; Ozer, 2007; Prentice & Miller, 1992). Consider for instance that some cognitive interventions, such as Attributional Retraining, explain approximately 5-10% of the variance in GPA (range η^2 =.05 to .10), and yet translate into approximately a 10% achievement gain for students (Hall, Perry, Chipperfield, et al., 2006; Haynes et al., 2006). Although the indirect effects presented here are small, it is important to remember that these effects are above and beyond the contribution of well-known predictors such as prior achievement and that they represent important advances to the literature on goals and control. Moreover, it was not the intention of this author to maximize the amount of variance explained but to explain the same variance in a more detailed way, a goal that was successfully attained.

Implications for Competitive Achievement Settings

The advantages to increasing our understanding of the relationships between goals, control, emotion, and achievement through testing mediational relationships are clear. For example, the results of Study 2 suggest that goals predict control and not the other way around. Thus, from an interventionist perspective it may be more advantageous to target interventions early in the academic year (i.e., September) towards goals than control. Students who receive an intervention that encourages them to adopt mastery or performance goals in their courses will also likely show an increase in primary control. However, a control-based intervention may not result in the adoption of particular types of goals. Alternatively, it could be argued that because primary control appears to be more beneficial in directly reducing negative emotions and bolstering achievement than either mastery or performance goals it should be the focus of interventions. These arguments highlight that, although the empirical combination of constructs equals the sum of the parts, knowing how the parts fit together can be particularly important in translating the results of empirical research into everyday applications for students, instructors, and higher education in general.

Many educational reforms and interventions have been designed to take into account achievement goals or perceived control. Most goal-based reforms have been implemented in elementary and secondary schools rather than post-secondary institutions. Such reforms generally involve establishing classroom practices that support mastery goal adoption by the students (Ames, 1992; Meece, Anderman, & Anderman, 2006; Urdan & Schoenfelder, 2006). If mastery goals are encouraged for students in college classrooms, secondary control should simultaneously be discouraged. If these two do not

occur in tandem then students may not reap the full benefits associated with mastery goals in terms of reducing negative emotions and increasing achievement.

College programs and interventions focus more on increasing students' perceptions of control than on their specific goals. This may be because increasing primary control appears to result in a direct increase in achievement. One such intervention that has shown impressive results is Attributional Retraining (AR), a cognitive intervention based on Weiner's (1985) attribution theory. The purpose of AR is to make students aware of the attributions they use to explain their performance and to replace potentially maladaptive attributions with adaptive ones. In doing this, AR has been shown to increase students' perceptions of control (Haynes et al., 2006; Haynes et al., 2008), reliance on mastery goals (Haynes et al., 2008), and their achievement (Hall, Perry, Chipperfield, et al., 2006; Hall et al., 2007; Haynes et al., 2006; Ruthig et al., 2004). In fact, the intervention has been associated with achievement gains of around 10% (Haynes et al., 2006). Understanding whether students' endorse mastery or performance goals, however, may have important implications for the efficacy of AR. Although both mastery- and performance-oriented students could benefit from AR, it may be particularly beneficial for students with mastery goals. This would particularly be the case if AR encouraged primary control and discouraged secondary control.

In conclusion, only by knowing how goals and control relate to each other and their indirect effects on important outcomes like students' emotions and achievement can interventions such as those described above be tailored to meet the needs of students. Perhaps making some classroom adjustments towards mastery goals paired with attributional retraining that encourages primary control but not secondary control may be

the best way to help first-year students manage their new achievement setting, at least in terms of decreasing negative emotions and bolstering achievement. Overall, the results from the three studies presented in this dissertation reaffirm that goals and control are pivotal beliefs in students' adjustment and success in first-year university. Moreover, the results reinforce the importance of considering these types of motivational beliefs together rather an in isolation.

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Footnotes

[1] All structural models tested in this dissertation were fully recursive, meaning that all possible paths were included. However, in discussing certain components of the fully recursive models I used a simplified notation of words and arrows to focus the readers' attention. For example, "goals → control → emotion" was used to represent the hypothesized meditational role of control in explaining the effects of goals on emotions. In general, this notation style included two major simplifications: 1. Some direct paths unrelated to the specific mediational mechanism were omitted, here, the direct path from goals to emotion is not included and 2. There is no distinction between the different types of goals, control, and emotions. In short, each of the in-text "word-and-arrow" figures was meant as simple visual representation of the more complex models. None of these figures were intended to reflect the statistical procedures which were fully explained in words and represented by complex figures showing all tested paths, indicators, error terms, and correlations (see Figure 5 and Figure 10).

[2] Hayamizu and Weiner (1991), Hong et al. (1999), and Robins and Pals (2002), each discuss mastery and performance goals in relation to "theories of intelligence". It is thought that students with mastery goals often have an incremental theory of intelligence meaning that they believe ability can be increased. In contrast, performance goals are usually associated with an entity theory of intelligence meaning that they believe ability is fixed (Dweck, 1986). To simplify the presentation of the results in the body of the document, I have referred to mastery and performance goals even if the authors were measuring incremental versus entity beliefs as the underlying component of goals.

[3] University 1 is an unclassified or open year for first-year students. By enrolling in University 1 students are able to receive credit for courses from different faculties before choosing a specific faculty or major (i.e., Arts, Science, etc.).

[4] The word POOR is capitalized because this is how it appears in the actual instructions participants received.

[5] As supplemental analyses, the specific attributions were summed into scales representing the underlying attributional dimensions based on Weiner's theoretical considerations. For example, effort and strategy were added together to represent the "controllable" portion of the controllability dimension; effort and ability were summed together to reflect the "internal" side of locus of causality, etc. The correlations were re-run and largely supported the effects found for individual attributions. Specifically, secondary control, mastery goals, and performance goals remained uncorrelated with the variables representing the causal dimensions. Primary control correlated positively with the variables created to reflect internal, unstable, and controllable dimensions and negatively with the variables created to represent stable and uncontrollable dimensions. Again, of the four constructs only primary control had clear attributional underpinnings.

[6] Because the correlational analyses in each study were conducted using summed scales rather than the latent variables, the correlation matrices discussed in the body of the dissertation for Studies 2 and 3 are not the exact correlation matrices used to fit the SEM models. SEM uses correlations of the latent variables (Byrne, 2001). Because each correlation matrix consisted of at a minimum 55 individual correlations, it was decided that using summed scales for the calculation, presentation, and discussion of zero-order correlations was more efficient than calculating each using the latent variables. This was

additionally important in the tests for differences in correlations between high- and low-achieving students, which, if calculated in SEM, would have required a discussion of the model fit and χ^2 difference test for each pair of correlations. To confirm that correlations based on summed scales are highly similar to those calculated using latent variables, several correlations between the Study 2 latent variables were calculated and are presented here for comparison purposes. Overall the similarities suggest that, for the purposes of this dissertation, the use of summed-scales to calculate and discuss zero-order correlations was sufficient. This process and explanation are not repeated for Study 3 in which the same principles apply.

Correlated Variables	Summed-scale *r*	Latent-variable *r*
Mastery T1 – Performance T1	.15	.15
Performance T1 – Secondary T1	-.11	-.18
Mastery T2 – Performance T1	.17	.20
Primary T2 – Secondary T2	.15	.15
Primary T1 – Language	-.44	-.53

[7] It is also possible to calculate the total causal effects of mastery and performance goals on achievement through all intervening variables (primary control, secondary control, and emotions). However, as can be inferred from Tables 12 through 15 these effects become very small (range: .02 to < .01) and hence are not included.

Appendix A

Perceived versus Primary Control and Early Experimental Studies

Because the original conception of perceived control was re-construed as primary control by Rothbaum and colleagues (1982), it is difficult to separate these two literatures. It seems likely that many researchers may have retained the label of perceived control even though they investigate the construct described as primary control by Rothbaum. A search of the PsycInfo database (conducted on September 19, 2007) using the terms "perceived control" and "college students" supports this argument: This search retrieved a total of 257 books, journal articles, and dissertations on the subject published between 1970 and 2007. The publications presented relationships between perceived control and many issues relevant to college students' lives (Table A1).

Table A1

Empirical Research on Perceived Control in College Student Samples

Year	Author	Topic
1991	Roth & Armstrong	eating disorders
1999	Nagoshi	alcohol use & binging
1999	Clinton & Anderson	loneliness
2001	Perry, Hladkyj, Pekrun & Pelletier	motivation, emotions, grades
2001	Endler, Speer, Johnson, & Flett	self-efficacy
2003	Rolison & Scherman	risk-taking
2003	Laird	student activism
2004	Kidwell & Turrisi	money management
2005	Goodie	pathological gambling
2005	Clements, Ogle, & Sabourin	abusive relationships
2006	Daniels, Clifton, Perry, Mandzuk & Hall	career decisions
2006	Hall, Perry, Ruthig, Hladkyj, Chipperfield	emotions
2007	Ruthig, Haynes, Perry, & Chipperfield	optimistic bias

In contrast, a search of the same database using the terms "primary control" and "college students" revealed only 10 hits. Moreover, it seems that the label "primary

control" tends to be reserved for research that involves both primary and secondary control. The empirical review of the literature throughout this dissertation consists of research on the effects of primary control (i.e., perceived control, academic control, locus of control, etc.) on important academic outcomes, particularly emotions and achievement (Perry, Hall, et al., 2005).

Next, a few classic experimental studies on perceived control are reviewed. They are presented here because the studies in the body of the dissertation focus on non-experimental research. Early experimental studies showed that perceived control could be manipulated by providing students with either contingent or non-contingent feedback on an aptitude test (Perry & Dickens, 1984; Perry & Magnusson, 1989; Perry, Magnusson, Parsonson, & Dickens, 1986). Generally, students in the non-contingent condition reported less perceived control, and felt their performance was due less to ability and effort than those in the contingent condition (Perry & Dickens, 1984). Moreover, the extent to which perceived control was compromised appeared to depend on the degree of non-contingency (i.e., low non-contingent = 12/50 wrong vs. medium non-contingent 20/50 wrong; Perry et al., 1986). In other words, more severe non-contingent feedback resulted in greater decrements in perceptions of control. Extrapolating these experimental results to naturalistic settings, it may be suggested that the extent to which students view their new achievement setting as low control may be directly related to decrements in their primary control.

Appendix B

Studying Secondary Control in University Students

It is argued that the effects of secondary control are most obvious under two conditions: when perceptions of primary control are low and/or when primary control efforts have been unsuccessful (Rothbaum et al., 1982; Hall, 2008; Heckhausen & Schulz, 1995). As such, secondary control has generally been studied in populations for whom the opportunities for primary control, or lack thereof, are hard to dispute (i.e., objectively low control situations). Some examples include studying men with HIV (Thompson, Nanni, & Levine, 1994), imprisoned adolescents (Halliday & Graham, 2000), women past child-bearing age (Heckhausen, Wrosch, & Fleeson, 2001), cancer patients (Thompson & Collins, 1995), and survivors of terrorism (Rhoades et al., 2007; Thompson et al., 2006). Expanding this research to the area of students poses a challenge because the college environment can be considered, by comparison, relatively controllable. Just focusing on academic choices, students can choose which courses to take and at what time, they can select which professor they want and what sorts of course requirements they prefer. Students also choose whether to attend lectures, read the textbook, and complete assignments on time with far fewer external reminders than would have been present in high school.

The fact that students' can control these choices, however, does not necessarily mean they perceive this control appropriately: This may be particularly true in new achievement settings (Heider, 1958). This notion of can was first proposed by Heider (1958) to represent the relation between the power of the person and the strength of environmental forces: Only when power exceeds the environment will an outcome

possibly be realized. There are certain realities inherent to the education system that students cannot overcome such as having to take tests, being graded by others, and eventually having to declare a major. In addition to these uncontrollable requirements, it has been argued that the first year of university may be perceived as a low control environment because students face unexpected hurdles including increased pressure to excel, higher standards, competition, and a greater likelihood of failure (Perry, 1991, 2003; Perry et al., 2001; Perry, Hall, et al., 2005; Perry, Hladkyj, et al., 2005). If students fail to recognize the increased need for academic autonomy and self-reliance they may become overwhelmed by the low-control aspects of the university environment, revealing a complex paradox of failure in which some bright and skilled students are unsuccessful (Perry et al., 2001). When faced with feelings of low success students may turn to secondary control to manage the indisputable constraints, unpredictability, and unexpected failure often encountered in the university system.

To study secondary control in college students, at a minimum two questions must be answered. First, are college students an appropriate sample for investigating secondary control? An efficient way to approach this question is to change one variable and keep all others constant. In other words, examine outcomes secondary control has been shown to impact (e.g., health) in one sample (i.e., the elderly) but do it with college students. Within this perspective, the short answer is yes. Studies show that college students' mental (Lim & Ang, 2006) and physical health (Hall, Chipperfield, et al., 2006) are positively associated with secondary control in much the same way as they are in older populations (e.g., Chipperfield, Perry, Bailis, Ruthig, & Chuchmach, 2007). Although this shared association across two samples is not definitive evidence that college students

are an appropriate sample for studying secondary control, it does provide a rudimentary foundation to begin considering the effects of secondary control on achievement-related outcomes.

Assuming college students are an appropriate potential sample for studying secondary control, the second question is more complex: Does secondary control influence students' academic outcomes, such as emotions and grades? Demonstrating the influence of primary and secondary control on students' achievement-related emotions and attainment is more challenging and currently lacks much empirical research despite its potentially important impact for students. The three studies presented in this dissertation add to the few studies that have navigated this otherwise relatively unexplored terrain (for examples see Daniels et al., 2006; Hall, 2008; Hall, Perry, Ruthig, et al., 2006; Hladkyj, Perry, Hall, Ruthig, & Pekrun, 2003; Wong, Li, & Shen, 2006).

Appendix C

Results for Correlation Analyses in Study 1 Separated by Low- and High-Achieving Students

To investigate whether the correlations between goals, control, and attributions differed according to students' achievement levels, three groups of students were identified. There were 210 low-achieving students (≤ 73% graduating high school average), 256 high-achieving students (≥ 81% graduating high school average), and 284 average students (74% ≥ 80%). The average students were excluded from the analyses to create a more extreme distinction between high- and low-achieving students. Correlations were run separately for these two samples (Table C1).

The following procedure (Lane, 2007) was used to test whether the correlation coefficients for high-achieving students were statistically different from the correlation coefficients for low-achieving students:

a. All correlation coefficients were converted to z-scores.
b. The standard error of difference between the two correlations was estimated by the following equation: $SE = SQRT[(1/(n_1 - 3) + (1/(n_2 - 3)]$ where n_1 and n_2 are the sample sizes of the two groups.
c. The difference between the two z-scores was divided by the standard error. These values are presented in Table C2.
d. When the value calculated in (c) above was greater than or equal to 2.58, the difference between the correlation coefficients was significant at $p < .01$.

None of the 78 possible comparisons differed significantly between high- and low-achieving students.

Table C1
Correlation Coefficients for all Variables in Study 1 Separated by Low and High Achieving Students

	1	2	3	4	5	6	7	8	9	10	11	12
1. Mastery goals		.31*	.30*	.31*	-.07	.17	.15	-.04	-.01	-.04	-.08	.00
2. Performance goals	.42*		.15	.01	.03	.03	.10	-.01	.09	.09	-.03	-.11
3. Primary control	.30*	.22*		.16	-.25*	.32*	.08	-.23*	-.09	-.15	.08	-.14
4. Secondary control	.35*	.09	.21*		-.09	.06	.09	-.06	.07	.01	-.13	.03
5. Ability	.05	.06	-.16	.08		-.05	.10	.22*	.29*	.30*	-.16	.04
6. Effort	.23*	.14	.39*	.02	-.00		.41*	-.12	.14	.05	-.07	-.01
7. Strategy	.20*	.18*	.15	.12	.15	.53*		.11	.23*	.28*	-.10	-.02
8. Luck	-.09	-.01	-.24*	.04	.26*	-.04	.16		.22*	.23*	.11	-.00
9. Professor quality	-.09	.00	-.11	-.04	.25*	.12	.18*	.24*		.49*	-.16	-.11
10. Test difficulty	-.07	.15	-.06	.04	.29*	.07	.26*	.27*	.46*		-.10	.01
11. Gender	.01	-.10	.07	-.13	-.22*	.06	-.08	-.05	-.14	-.27*		-.00
12. Language	-.06	.00	-.14	.07	-.02	-.16	-.11	.01	.07	-.13	-.05	

Note. The bottom of the table is low-achieving students (n = 210) and the top of the table is high-achieving students (n = 256).
* $p < .01$

Table C2
Calculated Difference Scores for Correlations between High- and Low-Achieving Students

	1	2	3	4	5	6	7	8	9	10	11
1. Mastery goals											
2. Performance goals	1.36										
3. Primary control	0.00	0.77									
4. Secondary control	0.48	0.85	0.55								
5. Ability	1.28	0.32	1.00	1.82							
6. Effort	0.67	1.18	0.86	-0.43	0.53						
7. Strategy	0.55	0.87	0.76	0.32	0.54	1.65					
8. Luck	-0.54	0.00	-0.11	1.07	-0.49	0.86	0.54				
9. Professor quality	-0.86	-0.96	-0.22	-1.17	-0.46	-0.22	-0.56	0.23			
10. Test difficulty	-0.32	0.65	0.97	0.32	-0.12	0.21	-0.23	0.46	-0.41		
11. Gender	0.96	-0.75	-0.11	0.00	-0.66	1.39	0.21	-1.71	0.22	-1.88	
12. Language	-0.64	1.18	0.00	0.43	-0.64	-1.62	-0.96	0.11	1.93	-1.50	-0.53

Note. Values > ±2.58 are significant at $p < .01$.

Appendix D

Univariate Skewness and Kurtosis for all Mastery and Performance Goal Items and Primary and Secondary Control Items in Study 2

		Time 1		Time 2	
Item	Wording	Skewness	Kurtosis	Skewness	Kurtosis
AM1	I prefer course material that really challenges me so I can learn new things.	-.73	.22	-.48	-.22
AM3	In a class like psychology, I prefer course material that arouses my curiosity, even if it is difficult to learn.	-.62	-.02	-.71	.07
AM5	Understanding content is most satisfying now.	-.79	.59	-.58	-.21
AM7	When I have the opportunity in my courses, I choose assignments that I can learn from, even if they don't guarantee a good grade.	-.14	-.43	-.10	-.48
AM2	Getting good grades in my classes is the most satisfying thing for me right now.	-1.05	1.19	-1.11	.94
AM4	The most important thing for me right now is getting good grades so that I have a high grade point average.	-1.11	1.07	-.98	.45
AM6	If I can, I want to get better grades in this class than most of the other students.	-1.19	.93	-1.28	1.42
AM8	I want to do well to please my family and friends	-1.06	.56	-.95	.23
PC2	I have a great deal of control over my academic performance in my psychology course.	-.58	.23	-.83	.85
PC9	I see myself as largely responsible for my performance throughout my college career.	-1.06	.97	-.80	.35
PC20R	My grades are basically determined by things beyond my control and there is little I can do to change that.	-1.21	1.70	-1.14	1.04
PC4	The more effort I put into my classes, the better I do at them.	-1.04	1.03	-1.64	3.43
PC16	When I do poorly in my psychology course, it's usually because I haven't given my best effort.	-1.08	.97	-1.15	1.36
PC6R	No matter what I do, I can't seem to do well in my courses.	-.76	-.81	-.66	-.34
PC14R	There is little I can do about my performance at university.	-1.68	3.25	-1.09	.82
SC10	Regardless of what my grades are, I try to appreciate how my university experience can make me a "stronger person" overall.	-.49	-.17	-.53	-.18
SC15	No matter how well I do on a test or in a course, I try to "see beyond" my grades to how my experience at university helps me to learn about myself.	-.16	-.50	-.24	-.59
SC17	Whenever I have a bad experience at university, I try to see how I can "turn it around" and benefit from it.	-.32	-.19	-.21	-.42
SC9	My academic performance and experience has given me a deeper understanding of my life than could be achieved without this experience.	-.18	-.16	-.54	.28

Appendix E

Results for Correlation Analyses in Study 2 Separated by Low- and High-Achieving Students

To investigate whether the correlations between goals and control differed according to students' achievement levels, three groups of students were identified. There were 128 students defined as low-achievers (≤ 78% graduating high school average), 139 defined as high-achievers (≥ 85% graduating high school average), and 65 defined as average (79 ≥ 84%). Average achievers were dropped to create a more extreme separation between high- and low-achievers. Correlations were calculated for each sample separately (Table E1)

Table E1

Correlation Coefficients for all Variables in Study 2 Separated by Low- and High-Achieving Students

	1	2	3	4	5	6	7	8	9	10
1. Mastery goals T1		.15	.23*	.44*	.71*	.00	.19	.44*	-.00	-.06
2. Performance goals T1	.17		.18	-.15	.14	.72*	.12	-.12	.15	-.07
3. Primary control T1	.03	.19		.08	.22*	.12	.68*	.22*	.10	-.45*
4. Secondary control T1	.29*	-.02	.06		.35*	-.18	.06	.71*	.02	.19
5. Mastery goals T2	.70*	.18	.05	.33*		.10	.31*	.46*	-.00	-.03
6. Performance goals T2	.18	.72*	.21*	.02	.28*		.11	-.12	.05	.04
7. Primary control T2	-.24*	.21*	.54*	.12	.32*	.24*		.24*	-.04	-.44*
8. Secondary control T2	.37*	.05	.02	.58*	.45*	.18	.09		.14	.14
9. Gender	.05	.30*	-.02	-.06	.07	.25*	.11	.02		.01
10. Language	.07	-.01	-.47*	.14	-.02	.02	-.33*	.02	.05	

Note. The bottom of the table is low-achieving students (*n*=128) and the top of the table is high-achieving students (*n*=139).

* $p < .01$.

As was the case in Study 1, the correlation coefficients for high-achieving students were compared to those for low-achieving students (Lane, 2007). As can be seen

in Table E2, none of the 45 values exceeded the critical ratio; hence, there were no significant differences between the correlations for high- and low-achieving students.

Table E2

Calculated Difference Scores for Correlations between High- and Low-Achieving Students

	1	2	3	4	5	6	7	8	9
1. Mastery goals T1									
2. Performance goals T1	0.17								
3. Primary control T1	-1.68	0.08							
4. Secondary control T1	-1.43	1.08	-0.17						
5. Mastery goals T2	0.00	0.34	-1.43	-0.19					
6. Performance goals T2	1.50	0.00	0.76	1.66	1.54				
7. Primary control T2	0.43	0.76	-1.85	0.50	0.09	1.11			
8. Secondary control T2	-0.69	1.40	-1.68	-1.85	-0.10	2.49	-1.27		
9. Gender	0.41	1.30	-0.99	-0.66	0.58	1.69	1.24	-1.00	
10. Language	1.07	0.49	-0.21	-0.42	0.08	-0.16	1.07	-1.00	0.33

Note. Values > 2.58 are significant at $p < .01$.

Appendix F

Univariate Skewness and Kurtosis for all Items Used to Measure Mastery and Performance Goals, Primary and Secondary Control, Boredom, Enjoyment, and Anxiety in Study 3

Item	Wording	Skewness	Kurtosis
AM1	I prefer course material that really challenges me so I can learn new things.	-.57	.20
AM3	In a class like psychology, I prefer course material that arouses my curiosity, even if it is difficult to learn.	-.65	.09
AM7	When I have the opportunity in my courses, I choose assignments that I can learn from, even if they don't guarantee a good grade.	.09	-.35
AM2	Getting good grades in my classes is the most satisfying thing for me right now.	-1.15	1.46
AM4	The most important thing for me right now is getting good grades so that I have a high grade point average.	-1.16	2.01
AM6	If I can, I want to get better grades in this class than most of the other students.	-1.08	1.56
PC2	I have a great deal of control over my academic performance in my psychology course.	-.34	-.76
PC9	I see myself as largely responsible for my performance throughout my college career.	-1.01	.68
PC20R	My grades are basically determined by things beyond my control and there is little I can do to change that.	-1.00	.79
SC10	Regardless of what my grades are, I try to appreciate how my university experience can make me a "stronger person" overall.	-.28	-.74
SC15	No matter how well I do on a test or in a course, I try to "see beyond" my grades to how my experience at university helps me to learn about myself.	.19	-.61
SC17	Whenever I have a bad experience at university, I try to see how I can "turn it around" and benefit from it.	-.38	-.44
BOR1	When studying for this course I feel bored. AND[a] The things I have to do for this course are often boring.	.07	-.73
BOR2	The content is so boring that I often find myself daydreaming. AND When studying, my thoughts are everywhere else except the course material.	.39	-.66
BOR3	The material is so boring that it makes me exhausted even to think about it. AND Often I am not motivated to invest effort in this boring course.	.79	-.04

ENJ1	Some topics are so fascinating that I am very motivated to continue studying them. AND Because this course is fun for me, I study the material more extensively than is necessary.	.33	-.51
ENJ2	I enjoy learning new things. AND Some topics are so enjoyable that I look forward to studying them.	-.49	-.17
ENJ3	After I finish studying, I am gratified that I know more than before. AND After studying for this course, I feel relaxed and worry-free.	-.17	-.13
ANX1	I feel queasy when I think of having to study and to do all the work for this course. AND When studying the material in this course, my heart rate increases because I get anxious.	.51	-.69
ANX2	Before I start studying material in this course, I feel tense and anxious. AND While I am studying, I sometimes distract myself in order to reduce my anxiety.	.32	-.74
ANX3	When studying for this course, I worry that I won't be able to master all the material. AND When I have problems with learning the material in this course, I get anxious.	.12	-.68

[a] AND represents the combination or parcel of two individual items.

Appendix G

Results for Correlation Analyses in Study 3 Separated by Low- and High-Achieving Students

To investigate whether the correlations between goals, control, emotions, and achievement differed according to students' achievement levels, a median-split was used to identify students who entered university with low high school averages (bottom half) or high high school averages (top half). For the sample in Study 3, this resulted in 120 low-achieving students (≤ 79% graduating high school average, *mdn* = 79) and 114 high-achieving students (≥ 80% graduating high school average). The correlations were run separately for each sample (Table G1). As was the case in Studies 1 and 2, the correlation coefficients for high-achieving students were compared to those for low-achieving students and are shown in Table G2 (Lane, 2007).

Table G1

Correlation Coefficients for all Variables in Study 3 Separated by Low- and High-Achieving Students

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Mastery goals		-.05	.16	.31*	-.19†	-.18	.21†	.15	.06	-.11	-.13	.01	.08	.16
2. Performance goals	.48*		-.00	-.06	.12	-.10	.15	.27*	.19†	.10	.15	.14	-.11	.03
3. Primary control	.12	.26*		.16	-.47*	-.41*	.15	.25*	.25*	-.30*	-.26*	.39*	-.03	-.24†
4. Secondary control	.29*	.09	.06		-.04	-.10	.24†	.02	-.08	.05	-.11	-.05	.02	.15
5. Anxiety	-.22†	-.10	-.20†	-.02		.49*	-.05	-.22†	-.28*	.38*	.41*	-.44*	-.07	.01
6. Boredom	-.32*	-.19†	-.07	-.02	.47*		-.46*	-.49*	-.50*	.39*	.42*	-.39*	.01	-.02
7. Enjoyment	.18	.25*	-.09	.21†	.21†	-.20†		.36*	.31*	-.15	-.21†	.16	-.04	.20†
8. Hopeful	.02	.11	.06	.04	-.05	-.20†	.34*		.62*	-.31*	-.17	.41*	-.05	.12
9. Pride	-.05	.13	.07	.13	-.08	-.22†	.39*	.64*		-.43*	-.24†	.48*	-.02	-.02
10. Shame	.02	-.01	-.02	.01	.40*	.34*	-.16	-.29*	-.41*		.59*	-.51*	-.02	.04
11. Anger	-.18	-.01	-.11	-.06	.31*	.36*	-.21†	-.23†	-.34*	.60*		-.37*	-.16	-.10
12. High school	-.05	.12	.27*	-.19†	-.16	-.18	-.05	.35*	.29*	-.30*	-.20†		-.03	.10
13. Gender	-.04	-.13	-.13	.12	.15	.16	.02	.10	.15	.05	.12	-.03		.03
14. Language	.01	.08	-.26*	-.11	.08	.03	.02	-.04	.00	-.06	.10	-.04	.10	

Note. The bottom of the table is low-achieving students (n=120) and the top of the table is high-achieving students (n=114).

† $p < .05$. * $p < .01$.

Table G2

Calculated Difference Scores for Correlations between High- and Low-Achieving Students

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Mastery goals													
2. Performance goals	4.28*												
3. Primary control	-0.30	1.99											
4. Secondary control	-0.16	1.12	-0.76										
5. Anxiety	-0.31	-1.65	2.30	0.15									
6. Boredom	-1.12	-0.69	2.73*	0.60	-0.19								
7. Enjoyment	-0.23	0.78	-1.80	-0.24	1.97	2.20							
8. Hopeful	-0.98	-1.24	-1.46	0.15	1.30	2.49	-0.17						
9. Pride	-0.82	-0.46	-1.38	1.57	1.55	2.43	0.68	0.25					
10. Shame	0.97	-0.82	2.16	-0.30	0.18	-0.43	-0.08	0.16	0.18				
11. Anger	-0.38	-1.20	1.24	0.38	-0.86	-0.53	0.00	-0.47	-0.82	0.11			
12. High school average	-0.45	-0.15	-1.01	-1.06	2.32	1.72	-1.58	-0.52	-1.68	1.89	1.39		
13. Gender	-0.90	-0.15	-0.75	0.75	1.65	1.13	0.45	1.12	1.28	0.52	2.11	0.00	
14. Language	-1.13	0.37	-0.16	-1.95	0.52	0.37	-1.36	-1.20	0.15	-0.75	1.50	-1.05	0.52

Note. Values > 2.58 are significant at $p < .01$.

As can be seen in Table G2, 2 of the 91 possible differences between correlations were significant. First, the relationship between mastery goals and performance goals differed. Specifically, for low-achieving students there was a strong positive relationship between mastery and performance goals. In contrast, for high-achieving students mastery and performance goals were not significantly correlated. It is possible that this difference reflects the types of goals students use depending on their past experiences with success. For example, perhaps high-achieving high school students established and used performance goals to secure the strong high school achievement and are doing so again in university. This strategy may work well for them, at least until their successes are challenged. Second, the relationship between boredom and performance goals differed. Specifically, for high-achieving students there was strong negative relationship between boredom and performance goals. In contrast, for low-achieving students the relationship between boredom and performance goals was negative but non-significant. This difference in correlations may suggest that high-achieving students, with performance goals are less susceptible to boredom than low-achieving students. In other words, perhaps the high-achieving students' with performance goals find Introductory Psychology interesting and challenging, whereas for low-achieving students their performance goals are unrelated to their experiences of boredom.