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IRVINE

Hot and Cold Paths to Achievement Goals in Adolescence:
Implicit Motivation, Explicit Goals, Motivational Strategies, and Relationships with Parents

DISSERTATION

submitted in partial satisfaction of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

in Psychology and Social Behavior

by

Joseph Simon Kay

Dissertation Committee:
Professor Jutta Heckhausen, Chair
Professor Chuansheng Chen
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2017

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ABSTRACT OF THE DISSERTATION

Hot and Cold Paths to Achievement Goals in Adolescence:
Implicit Motivation, Explicit Goals, Motivational Strategies, and Relationships with Parents

By

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Doctor of Philosophy in Psychology and Social Behavior

University of California, Irvine

Professor Jutta Heckhausen, Chair

This research sought to understand social and motivational precursors of high school students' achievement by examining associations between students' relationships with their parents, implicit achievement motivation and explicit goals, goal pursuit strategies, and achievement attainment, as well as associations with well-being. A distinction was drawn between implicit motivation, or the unconscious affective response that an individual experiences in response to a given situation, and their explicit goals, or the self-declared goal values (Brunstein, 2010; Brunstein & Maier, 2005). Pursuit of goals congruent with implicit motivation is described as *hot* goal pursuit. Pursuit of goals not congruent with implicit motivation is described as *cold* goal pursuit.

To understand these factors, 244 high school students were recruited from school- or after-school programs. All analyses were cross-sectional and based on students' self-reports. Findings indicate that (1) explicit achievement goals are more consistently associated with achievement than implicit achievement motivation, but achievement can

be high when either explicit goals or implicit motivation are high. (2) Associations between explicit goals and achievement are due, in part, to indirect effects through Education-related Selective Primary Control strategies (Ed-SPC). (3) Students' perceptions of parents' warmth and involvement were associated with their achievement (positively and negatively, respectively), partially due to indirect effects through Ed-SPC. (4) Relationships with parents were not associated with pursuit of hot versus cold goals. (5) Associations between achievement and well-being did not depend on whether goals were congruent with implicit motivation. (6) Students were more likely to use Selective Secondary Control (SSC) and Compensatory Primary Control (CPC) when either implicit achievement motivation or explicit achievement goals were high, and (7) relationships with parents were associated with SSC and CPC strategy use.

This research highlights the importance of implicit achievement motivation and explicit achievement goals for high school students' achievement, as well as the role of Ed-SPC, SSC, and CPC. It demonstrates the importance of parent-child relationships, and specifically the possible benefits of perceptions of warmth within these relationships. These results may be used to help teachers develop lessons plans which appeal to implicit motivation, or to promote parents' role in their children's lives.

CHAPTER 1: Introduction

Throughout life, individuals must select and pursue developmentally appropriate goals in order to successfully build and maintain their capacity for action. For adolescents, academic achievement goals are critical, as adolescents' academic performance is related to long-term career and economic success (Vuolo, Staff, & Mortimer, 2012). This research aims to identify different types of motivation used in the pursuit of academic goals, as well as the psychological and social antecedents and consequences of different motivations for achievement goal pursuit. Specifically, this research will examine adolescents' implicit motivation for achievement, their explicit academic goals and general achievement goals, and the degree to which congruence between implicit motivation and explicit goals is associated with goal attainment. Second, this research seeks to identify social antecedents of the congruence between implicit motivation and explicit goals, and whether they are predicted by adolescents' overall relationships with their parents or specific aspects of their relationships. Third, this research aims to identify differences in the motivational strategies used when pursuing goals that are or are not congruent with implicit motivation, and to identify whether selective primary control (SPC) strategies may be one mechanism by which motivational difference lead to achievement. Finally, adolescents' psychological well-being will be evaluated as it relates to achievement of goals that are congruent or incongruent with implicit motivation.

Adolescents' academic aspirations are typically high, but adolescents differ in their abilities to pursue their goals. Some goals are easier to work towards and achieve than others. The ease with which an individual can pursue a goal depends in part on the affective response that such goal pursuit provides (Schultheiss, Jones, Davis, & Kley, 2008).

An individual's tendency to respond affectively to certain types of situations or the affective response that certain situations elicit reflects an individual's implicit motivation (McClelland, Koestner, & Weinberger, 1989; Schultheiss & Kollner, 2014). Pursuing and achieving goals that are aligned with implicit motivation, that is, pursuing motive-congruent goals, results in positive affective responses which help promote goal pursuit; this results in virtuous cycles whereby implicit motivation reinforces goal pursuit and promotes achievement which produces further positive affective responses (Schultheiss & Kollner, 2014). On the other hand, at some point, we all must pursue goals that are not congruent with implicit motivation and do not produce the same level of positive affective responses. Pursuit of these goals is still valuable for long-term development. However, these goals may be more difficult to pursue and successes may be harder to attain, as they require greater self-regulation more effortful control, since their pursuit is less reinforced by affective responses (Schultheiss et al., 2008).

There is little research measuring the social or developmental antecedents of motive congruence. However, adolescents' relationships with their parents are associated with their explicit specific academic and more general achievement goals, as well as with the value they place on different domains of life (Kay, Shane, & Heckhausen, 2016; Kriegbaum, Villarreal, Wu, & Heckhausen, 2016; Marchant, Paulson, & Rothlisberg, 2001; Simons, Whitbeck, Conger, & Conger, 1991). When adolescents feel their autonomy in goal-setting is supported, they should be better able to select goals that are congruent with their implicit motivation. Given that motive congruence is based on the alignment of explicit goals with implicit motivation, parental relationships, and specifically, the degree to which parents support adolescents' autonomy in goal-setting and allow adolescents to choose

their own goals, are expected to be important in determining the degree to which adolescents' explicit goals are congruent with their implicit motivation.

Adolescents' relationships with parents may also be important when pursuing goals that are not congruent with implicit motivation or goals which are not highly valued. Pursuit of goals that are not congruent with implicit motivation provides less affective feedback. Self-regulation and the ability to use self-motivating strategies are more necessary in order to compensate for the lack of affective reinforcement or low goal engagement in these pursuits (Schultheiss et al., 2008; Villarreal, Heckhausen, Lessard, Greenberger, & Chen, 2015). Adolescents' relationships with their parents should be important for the pursuit of goals under these conditions, since parents influence adolescents' abilities to use motivational strategies and their self-regulatory skills related to academic achievement. General measures of parenting are related to adolescents' self-regulatory skills (Belsky & Beaver, 2011; Moilanen, Rasmussen, & Padilla-Walker, 2014), and adolescents' perceptions of their relationships with their parents are associated with academic behaviors and attitudes towards learning (Larose, Bernier, & Tarabulsky, 2005). More specifically, parental involvement in adolescents' lives is related to adolescents' self-regulatory capacity and use of self-motivational strategies for academic goals (Gonzalez-Dehass, Willems, & Holbein, 2005). This indicates that parental relationships could help adolescents compensate for incongruence between or low levels of both implicit and explicit motivation through their impact on adolescents' self-regulation and motivational strategies.

Congruent high versus low levels of both or incongruence between implicit motivation and explicit goals leads to distinct motivational pathways that adolescents, as

well as adults, must use to achieve their goals. The first pathway, when pursuing goals that are reinforced by implicit motivation, is a *hot* pathway since it involves affective responses. The second pathway, when pursuing goals that are not reinforced by implicit motivation, is a *cold* pathway since it is less driven by affective responses and relies more on effortful self-regulatory processes. This research examines the hot motivational pathway as it relates to adolescents' motivational strategy use, success in pursuing academic and general achievement goals and subsequent well-being, as well as the ways in which parental relationships are associated with this pathway. The cold motivational pathway is also tested by examining whether adolescents' relationships with their parents are associated with motivational strategies necessary to pursue cold goals, and whether these strategies are associated with goal attainment.

CHAPTER 2: Literature Review and Theoretical Context

Personal agency and control over the life span

Throughout life, individuals must actively select and pursue goals, often at the expense of alternative goals. At any given time, some goals may be more optimal to pursue than others due to societal and individual opportunities and constraints. According to the Motivational Theory of Lifespan Development (MTD), successful goal pursuit requires individuals *optimize* their goal selections based on the expected long-term consequences. That is, an individual should select a goal which is appropriate given the opportunities and constraints present, ideally selecting a goal that will produce long-term benefits with few costs, and allow for improvement across multiple domains of life (Heckhausen, Wrosch, & Schulz, 2010).

Once a goal has been selected, individuals must invest effort and resources according to the demands of the goal. When a goal is easily attainable, using selective primary control (SPC) strategies of investing time and effort to work toward the goal may be sufficient for its achievement. For goals that are more demanding, compensatory primary control (CPC) strategies of recruiting external supports, such as enlisting others' help or seeking alternative means to pursue the goal may also be necessary. SPC and CPC strategies may be insufficient to achieve goals that are more difficult, have unexpected challenges, or when attractive alternative goals are present. When the chosen goal is attainable but difficult to pursue or achieve, selective secondary control (SSC) strategies may be necessary. These are self-motivating strategies used to boost the perceived value or controllability of the goal, or to decrease the value of competing goals. SSC strategies help to increase goal engagement by allowing the individual to focus more on their selected goal

and to invest more energy into achieving that goal. This is adaptive when these goals are difficult but still achievable, since difficult goals require greater effort and engagement to achieve. Finally, when goals become unattainable, disengagement through compensatory secondary control (CSC) strategies is adaptive. MTD explains that successful development over the lifespan requires that individuals select appropriate goals based on the opportunities available to them, use suitable primary and secondary control strategies to effectively and efficiently pursue the goals, and disengage when goals are no longer attainable.

Selecting goals that are developmentally appropriate given the opportunities for control allows an individual to be more engaged in his or her goals (Wrosch & Schulz, 2008). When outcomes are controllable, individuals who are better able to use SPC strategies have greater success in achieving their goals (Shane & Heckhausen, 2012; Shane, Heckhausen, Lessard, Chen, & Greenberger, 2012). When outcomes are more difficult, use of SSC strategies leads to increased use of selective and compensatory primary control strategies, which ultimately leads to higher goal attainment (Hamm et al., 2013). On the other hand, disengagement via CSC strategies serves to protect the individual from psychological harm due to goal failure when goals are unattainable (Wrosch, Scheier, Carver, & Schulz, 2003).

Much research has demonstrated the adaptiveness of optimizing goals to opportunities and using the appropriate primary and secondary control strategies in their pursuit (see review in Heckhausen et al., 2010). However, associations between CPC or SSC and goal attainment are not always consistent in cross-sectional research since CPC and SSC strategies are most important when goals are difficult to attain. As a result, CPC and

SSC strategies are used when achievement rates are expected to be low, so associations with goal attainment may not exist, or may even be negative. This is in contrast to associations with SPC, which are often found in both longitudinal and cross-sectional research data.

This research focuses on adolescents' education-specific selective and secondary primary and compensatory control strategies. In the case of adolescents' academic goals, education-specific SPC (Ed-SPC) strategies consist of investing time and effort into school work. When these academic goals are difficult to achieve, adolescents may use education-specific CPC (Ed-CPC) strategies, such as asking for help or getting tutoring. To increase motivation for these goals in the face of difficulties or after initial setbacks, for example, if alternative goals are more attractive or feel more rewarding, or after receiving a poor grade on an early class assignment or test, adolescents could use education-specific SSC (Ed-SSC) strategies to remind themselves of the value of academics or increase the perceived controllability of their goals. Finally, adolescents may disengage from unattainable academic goals using education-specific CSC (Ed-CSC) strategies, for example, by telling themselves that other goals are more valuable, or that school does not matter for their future. This research examines how adolescents' implicit achievement motivation and explicit academic goals, as well as more general explicit achievement goals, are associated with their use of selective and compensatory primary and secondary control strategies to successfully pursue academic and social goals, and how their relationships with their parents are associated with the use of these motivational strategies.

Goals to motivate action

Humans play an active role in shaping their development through their selection and pursuit of goals. Goals serve to direct action towards a specific desired end state and are selected because of the outcomes they are expected to produce (Heckhausen & Heckhausen, 2010). The decision to select a given goal is based on the interaction between personal (i.e., their needs and motivations) and situational characteristics (i.e., the opportunities and constraints present). In selecting goals, individuals must consider their expected probability of succeeding at that goal (that is, the expectancy) as well as the value that success would have for them (Eccles & Wigfield, 2002; Heckhausen & Heckhausen, 2010). Thus, the most adaptive goals to pursue are those which are highly valuable and have high expectancies for success. If no such goal exists, the individual must engage in a careful evaluation of alternative goal options before selecting a goal to pursue.

Each goal has the potential to have a significant impact throughout life, based on how it shapes the life course. In order to optimize outcomes, consideration of the value of a goal must account for long-term implications across multiple domains of life, including the possibility that it will influence the expectancies for the successful attainment of other goals (Heckhausen & Schulz, 1999). For example, a high school student who chooses to focus on athletic pursuits may suffer academically, which could reduce his or her options for university programs and ultimately career opportunities many years later. In this case, pursuing athletics would have the effect of lowering the expectancy for academic and career success. The process by which one's goal selection and pursuits at one time limit possible alternative goals later in life is referred to as *canalization* (Baltes, 1987; Heckhausen & Schulz, 1999). Essentially, goal pursuit decisions place the individual onto

one track; the longer one has pursued a goal at the expense of other goals, the more difficult it is to switch tracks. For example, if the adolescent decides to focus on athletics at the expense of academics in ninth grade, he or she would have an easier time shifting that focus back to academics in tenth grade than in twelfth grade. The longer he or she is on the path away from academics, the harder it is to get back to that path.

Prior to deciding to pursue a goal, individuals should examine their options and consider their alternatives. During this pre-decisional period, it is beneficial to be impartial and consider the value and costs of each potential goal, including the likelihood of attaining each (Beckman & Gollwitzer, 1987). Once an individual selects a goal, he or she crosses a *decisional Rubicon* (Heckhausen et al., 2010), which refers to the Rubicon river which Julius Caesar crossed to mark the irrevocable decision to begin a civil war, upon which it is said that he announced “the die is cast”. Crossing the decisional Rubicon is similarly irreversible in that it sets the individual on a path which limits the possibility of pursuing or attaining alternative goals. Once one has selected a goal to pursue, one’s mindset switches from impartial to biased in favor of the selected goal, from deliberative in weighing the alternatives to implemental in focusing on the selected goal, and one’s perceptions of control over the goal increase (Achtziger & Gollwitzer, 2010). Thus, after deciding to focus on athletics at the expense of academics, the adolescent should no longer impartially consider the value of focusing on academics. Instead, this adolescent begins to perceive athletics as more valuable than he or she did prior to making the decision, believes there is a greater chance to become a professional athlete than prior to making the decision, and focuses more exclusively on pursuing athletics.

Pursuit of developmentally appropriate goals. Pursuing goals that are developmentally appropriate allows the individual to effectively use his or her motivational resources. Interactions between society and biology provide an age-graded normative timeline for goal pursuits which most people recognize and to which most people adhere (Zepelin, Stills, & Heath, 1986). Societal structures and biological opportunities and constraints change throughout the course of the life span, resulting in sequential changes in appropriateness and normativity of certain goals. Societal expectations and constraints play a large role in creating these developmental timelines, since these can create structures and supports for “on-time” goals, such as structured academic and career guidance for high school students entering university or starting their careers. These structures make on-time goals easier to pursue and more controllable than “off-time” goals (Wrosch & Heckhausen, 2005). Support structures are less common for individuals seeking off-time goals, such as for adults entering university or starting their careers later in life. Additionally, biological constraints, such as the biological clock for women seeking to have children, and societal constraints, such as mandatory retirement in some professions, result in developmental deadlines which should be considered when pursuing certain goals. After these deadlines have passed, goals may be unattainable, pursuit maladaptive, and goal disengagement through CSC strategies may become beneficial.

Achieving off-time goals is often possible, but requires greater effort and investment of resources. As developmental deadlines approach, the level of engagement required increases since the goal typically becomes more difficult to attain. Use of primary and especially secondary control strategies increase as a developmental deadline nears, since the goal becomes more urgent and requires full engagement. After a deadline has passed

and a goal becomes unattainable, disengagement from that goal is necessary (Heckhausen, 2000). Indeed, individuals who fail to achieve their developmental goals are more likely to use self-protective CSC strategies in order to avoid the negative repercussions that come about as a result of goal failure (Heckhausen, Wrosch, & Fleeson, 2001; Wrosch & Heckhausen, 2005). Because on-time goals are easier to attain, striving for off-time goals is often maladaptive. In selecting and pursuing goals, it is important to identify those that are actually attainable and to tailor the motivational strategies used to the demands of the goals. This allows individuals to avoid the frustration of wasting resources by striving for unattainable goals and to conserve effort by avoiding committing unnecessary resources to an easily attainable goal.

Even goals without definitive deadlines can still be considered on- or off-time depending on whether they are pursued according to the normative developmental schedule. For example, young-adulthood is the typical developmental age for vocational training and career entry, but there is no deadline prohibiting older adults from vocational training or beginning their careers. Nonetheless, midlife entry into vocational training is more difficult, so a greater investment of resources is necessary (Elman & O’Rand, 1998). Similarly, delaying completion of high school even by as little as a few months puts students’ college entry off-time and makes university completion more difficult. Individuals who delay high school graduation, even if by less than one year, are less likely to complete bachelors’ degrees, even after controlling for academic success in high school and socioeconomic factors. However, those individuals who delay high school graduation are more likely to achieve alternative goals, such as marriage or parenthood, than those who complete high school on time (Bozick & DeLuca, 2005). Bozick and DeLuca’s study

demonstrates that by not following the normative developmental timeline for high school graduation and college entry, individuals lose social and societal support for that goal, and increase the likelihood of pursuing alternative goals. This results in a long-term reduction of the chances of attaining the normative goal and highlights the value of following the on-time developmental schedule. This also demonstrates the importance of investing appropriate motivational resources for developmental goal pursuits.

Adolescents' developmental goals. Education or career entry are important for adolescents and young adults (Chang, Chen, Greenberger, Dooley, & Heckhausen, 2006). University attendance and completion rates have increased over the last several decades (although high school graduation rates have remained fairly stable) indicating that career entry is being delayed for a large segment of the population (Heckman & LaFontaine, 2010). However, even though the timing for completing education has changed, the perceived value of these goals has remained consistently high among American high school students over the last forty years (Twenge, Campbell, & Freeman, 2012).

Educational goals are adolescents' most common self-identified goals, and they generally believe that they have control over these goals (Chang et al., 2006). Adolescents' expectations for when they will complete these goals is based on normative developmental timelines, as they expect to complete their educational goals while in their early twenties (Chang et al., 2006; Nurmi, Poole, & Kalakoski, 1994). Adolescents expect to achieve these goals slightly later today than previously, likely reflecting the increasing importance of university education. Adolescents are correct in valuing their academic goals as success in academics during adolescence is associated with long-term academic and career success (Kay, Shane, & Heckhausen, 2017; Roisman, Masten, Coatsworth, & Tellegen, 2004). In

attempting to identify factors related to the success within these goals, this research examines adolescents' academic and more general achievement goals as they relate to implicit motivations, and the degree to which these predict academic goal pursuit behaviors and ultimately their achievement within these goals.

Since adolescents are required to be in school, and schools encourage post-secondary educational attainment, overall educational achievement is an especially salient developmental task. Academic achievement during adolescence is an important developmental goal since it is related to future career and economic success, and delaying education is detrimental to future prospects (Bozick & DeLuca, 2005; Elman & O'Rand, 1998). Across middle and high school, academic achievement is an important predictor of long-term success, as it is associated with academic performance later in high school and beyond (Ma, 2001). Academic achievement in high school predicts later academic and career outcomes, including the probability of entering and completing a post-secondary degree (Vuolo et al., 2014), and career success, as measured by hourly wage and likelihood of unemployment over ten years later (Vuolo et al., 2012). Overall, adults who complete university have higher annual incomes, lower unemployment, and greater success at weathering economic downturns compared with those who do not complete university, advantages which have increased in the United States and across the developed world in the last two decades and since the most recent recession (OECD, 2011, 2014). Given the importance of academic achievement while adolescents are in high school for their long-term academic achievement and careers, understanding the factors related to success in high school will provide important insights into predictors of long-term success.

Although there is some variability in adolescents' academic goals and expectations, almost all American high school students, including those who get mostly Cs and below, expect to complete at least 2-year or vocational college degrees (Heckhausen & Chang, 2009). Aspirations are slightly higher than expectations, but high school students, on average, aspire and expect to complete more than a four-year university degree (Chang et al., 2006), meaning that many high school students have unrealistic goals and expectations for themselves. However, high aspirations are valuable as they are associated with higher achievement in the United States and elsewhere even if youth do not ultimately attain their initial goals (Heckhausen & Chang, 2009; Kay et al., 2016; Villarreal et al., 2015).

Adolescents who believe that academics are important (Miller & Byrnes, 2001) and who have higher academic expectations for themselves (Ma, 2001) have higher GPAs in high school than those who place less value on their academics or have lower expectations for themselves. These differences extend longitudinally into post-secondary education, as those with high academic or career goals while in high school are more likely to complete post-secondary education and have better career trajectories ten years later compared to high school students who have lower academic aspirations (Kay et al., 2016; Vuolo et al., 2014). Even though lofty goals may be unrealistic, they are still beneficial regardless of whether the original goals are ultimately achieved (Villarreal et al., 2015).

However, it is not always clear how or under what conditions these high academic goals are associated with academic achievement. This research assesses the importance of their interactions with implicit motivation for achievement as they lead to hot and cold motivational pathways for academic goal pursuits. It is expected that when explicit academic goals or more general achievement goals and implicit achievement motivation

are both high, adolescents will experience greater success in achieving these goals. Furthermore, these goals will be easier to pursue, and adolescents will engage in more Ed-SPC strategies when they are both high.

Two motivational pathways: Hot and cold motivation

Two independent aspects of motivation are important for goal pursuit. The above discussion of goals refers to an individual's explicitly held, self-attributed opinions about the value of these goals. These reflect beliefs about social norms and expectations of others, beliefs about the value of different domains of life, and the achievability of the goals (Massey, Gebhardt, & Garnefski, 2008). In addition to these explicit goals, individuals differ in the way they respond to certain situations. The affective responses that people have to specific situations or types of situations reflect their *implicit motivation*, that is, the individual's capacity or tendency to experience situations as rewarding or aversive (Schultheiss, Rösch, Rawolle, Kordik, & Graham, 2010). Implicit motivation and explicit goals are largely independent; studies find low correlations between the two (Thrash & Elliot, 2002). Both implicit motivation and explicit goals are important for goal pursuits, but in different ways.

Goal pursuits which reflect implicit motivation are hedonically driven and require less effortful control and self-regulation to pursue (Kehr, 2004a). The pursuit of these goals is affectively rewarding, and results in improvements in well-being. On the other hand, some goals are perceived as important but do not reflect implicit motivation. For these goals, the explicitly held beliefs identify it as valuable, even though the goal does not inherently provide affective rewards. Successful pursuit of these goals is more difficult as they require greater effort and use of volitional control strategies, including SSC strategies,

in order to make up for the lack of hedonic rewards. Kehr (2004a) explains that when a goal is less implicitly motivated (i.e., the goal pursuit does not result in positive affective response), the individual must use volitional control to compensate for the lack of implicit motivation. This results in two separate goal pursuit pathways. Schultheiss and colleagues (2008) describe the pursuit of affectively rewarding goals (i.e., those which are congruent with implicit motivation) as a *hot* goal pursuit, and pursuit of non-affectively rewarding goals (i.e., those which are not reinforced by, or are incongruent with, implicit motivation) as a *cold* goal pursuit. Hot and cold goal pursuits are thought to have different correlates, given the different affective effects that such pursuits have on the individual.

This research considers how the motivational control strategies used to pursue goals discussed in MTD (i.e., SPC, CPC, and SSC) relate to hot and cold goal pursuits. According to MTD, SPC strategies are required for all goal pursuits, while CPC strategies are necessary when goals are difficult, and SSC strategies are required to boost motivation for pursuing difficult or less inherently engaging goals (Heckhausen et al., 2010). Since cold goals are not reinforced by implicit motivation, SSC strategies may be more necessary in these pursuits, and individuals may use SSC strategies to compensate for the lower motivation associated with cold goals compared to hot goals, as well as with goals that are not highly valued. This research assesses adolescents' hot and cold pursuits of academic goals, and the control strategies used to pursue these goals. Additionally, since parents influence adolescents' goals, achievement, and motivation, the ways in which adolescents' relationships with their parents are associated with these pursuits is also examined. The following sections describe implicit motivation and the hot and cold goal motivational pathways in greater depth.

Implicit motivation. Implicit motivation refers to an individual's tendency to experience certain types of situations as rewarding or aversive. The three primary implicit motives are achievement, affiliation, and power; each is discussed in greater detail below. The study of implicit motivation has a long history, starting largely with McClelland and colleagues' discussion on the achievement motive (McClelland, Atkinson, Clark, & Lowell, 1953). Interest in implicit motivation declined in the 1970s and 1980s due to methodological critiques and inconsistent findings (e.g., Entwisle, 1972; Fineman, 1977). More recently, however, research on implicit motivation has begun to grow again, with a renewed focus on addressing the methodological challenges (Schultheiss et al., 2010), and understanding why results from earlier research were inconsistent. This renewed focus has led to research on the importance of the interactions between implicit motivation and explicit goals, and on a more detailed analysis of the implicit motivation measures.

Implicit motivation is difficult to study because it operates outside of an individual's conscious awareness and is based on situational incentives learned in early childhood (McClelland et al., 1989). Implicit motivations consist of an individual's affective responses to different situations and to the degree to which those situations reflect the possibility for achievement (i.e., to get better at something), affiliation (i.e., to build relationships with others), or power (i.e. to influence other people). The non-conscious nature of implicit motivation means that it is not always translatable into conscious or verbal representations and cannot be measured using typical survey questionnaires, and so other methods of assessment are required. However, implicit motivation is related to behavioral outcomes including attention (Schultheiss & Hale, 2007) and volitional control (Kehr, 2004a). Because they are non-conscious, implicit motivation more strongly influences

responses to non-verbal or non-conscious behavioral measures, and more strongly predict long-term task performance, persistence, behavior, and attention in less structured situations than do explicit measures of goals or motivation (Schultheiss, 2001). However, implicit motivation is less predictive of attitudes or judgements than are explicit measures (Schultheiss & Kollner, 2014). Implicit motivation is associated with behavioral outcomes both in laboratory settings, in which people are more likely to remember stimuli that are congruent with their implicit motivation (Bender & Woike, 2010), and in applied settings, in which implicit motivation is a better predictor of long-term behavior and persistence than are measures of explicit goals (Kehr, 2004a). This is especially true for long-term goal pursuit in unstructured settings, in which there is a greater need for continued effort and persistence towards the goal and identification of opportunities for motive-relevant goal-pursuit behaviors (Boyatzis & Kelner, 2010).

Activation of implicit motivation is associated with changes in affect. Over time, the affective responses produced by implicit motivation in a specific type of situation leads to incentive learning which is typically unconscious and outside of awareness (Schultheiss, 2001). When positive (or negative) affect repeatedly results from implicit motivation in the context of a certain type of situation (i.e., one that reflects achievement, affiliation, or power) the individual forms unconscious associations between the situations and the resulting affective changes. These associations lead the individual to seek out those situations, or to perform those behaviors that bring about the desired affective changes, even if the associations are not consciously recognized. When behaviors are linked to positive affect, even if outside of the individual's conscious awareness, individuals are more likely to perform those behaviors (Custers & Aarts, 2005).

Measuring implicit motivation. Since individuals are not consciously aware of their implicit motivation, implicit motivation cannot be gathered from explicit measures or questionnaires about the importance or value of goals or situations. Rather, implicit motivation is assessed through projective tests like the Picture Story Exercise (PSE). Projective tests are based on the notion that even though implicit motivation is unconscious, it influences individual's interpretations of ambiguous stimuli. Thus, implicit motivation can be assessed by examining an individual's interpretations of ambiguous stimuli even though they are unaware of the role that implicit motivation plays in their interpretations. For the PSE, individuals write stories about ambiguous pictures, such as two people sitting on a bench, or two scientists working in a lab. Participants are shown four to six pictures sequentially to provide a range of scenarios for participants to interpret. They are asked to look at each picture and imagine the scene, and are then prompted to spend approximately five minutes writing about each picture by describing the characters, including what they are doing or what might happen next. The stories are then coded for the three motives (i.e., affiliation, achievement, and power) according to a detailed and comprehensive manual (Schultheiss & Pang, 2007; Winter, 1994). Coders undergo a rigorous training procedure, and assess each sentence within a story for each of the three motives according to specific criteria laid out in the widely accepted coding manual by David Winter. In coding PSE stories, coders consider only the content explicitly written in the stories, keeping inferences and assumptions about the writer's intent to a minimum (Winter, 1994). The motivational content in participants' stories reflects the degree to which participants perceive achievement-, affiliation-, or power-, related themes in the ambiguous settings presented in the pictures. Stories written by participants in

response to ambiguous pictures allow researchers insights into participants' unconscious motivation, and the degree to which they experience affective responses to certain stimuli (Pang, 2010; Schultheiss & Pang, 2007).

One of the early criticisms of implicit motivation was regarding low internal consistency of the PSE and similar measures. Indeed, there is considerable variability in an individual's motive scores between pictures (e.g., there are differences in the motive scores for a participant's story written about a picture of two people sitting on a bench compared with the story written about a picture of two scientists in a laboratory). In responding to these criticisms, Schultheiss and Schultheiss (2013) explain that this variability provides important information about how an individual responds to a given situation. The variability in motive content expressed between pictures is important as it reflects individuals' perceptions of if-then contingencies between specific types of situations (as reflected in the pictures) and their responses to those situations (as written in the stories). These if-then contingencies provide greater insight into when implicit motivations are expressed rather than just the overall degree to which a motive is relevant. They explain that it is unreasonable to expect high internal consistency between pictures when the pictures themselves represent different motivational settings. At the same time, the overall motive score is also important, since it provides information about the overall degree to which an individual is motivated by achievement, affiliation, and power across multiple settings. Both the variability and the overall score provide valuable, but different, information about an individual's implicit motivation. The present research focuses on the overall implicit motivation scores, though the score variability and if-then contingencies are available to be explored in future research. Further, this research focuses only on

achievement motivation, though affiliation and power motivation were also measured and are discussed below.

Achievement motivation. Implicit achievement motivation reflects an individual's desire for excellence or improvement, or an enjoyment of learning or mastering new skills or tasks. Specific subcategories for achievement motivation relate to positive evaluations of performance or goals, mention of competing with others or winning in competition, achieving unique or new accomplishments, and negative feelings about or concerns with failure or the possibility of failure (Winter, 1994). This conceptualization of achievement motivation includes both positive (i.e., success seeking) and negative (i.e., avoidance of failure) processes, both of which have the potential to stimulate behavior and to produce incentive learning over time (Pang, 2010). Implicit achievement motivation should be most strongly related to affective responses in academic settings, since academics focus on learning new skills, and achieving or mastering tasks (McClelland et al., 1989). If these are affectively rewarding, then individuals should be more motivated to achieve in school and should more easily engage in academic behaviors.

Indeed, a long history of research has shown that implicit achievement motivation is related to academic performance (Brunstein & Maier, 2005; McClelland, 1976; McClelland et al., 1953, 1989; Spangler, 1992). However, the educational setting is also important. These associations are strongest when teachers highlight the value of achievement in ways that appeal to the implicit achievement motivation (Rheinberg & Engeser, 2010). For example, teachers who focus on the value of the learning and who provide challenging but achievable work are more likely to have students whose implicit motivation is associated with school performance. Extrinsic rewards have the opposite effect, reducing or even

reversing the association between implicit achievement and academic performance (Pang, 2010). Students who have high implicit achievement motivation do not necessarily direct this motivation towards academic achievement if the context does not fit (e.g., they could strive for excellence in a sport or other non-academic hobby); similarly, students' academic goals may not necessarily reflect their implicit achievement motivation, as school could serve as a vehicle to achieve non-achievement-related goals like attaining a career or impressing family.

Affiliation motivation. Implicit affiliation motivation reflects an individual's desire to build or maintain close relationships with others. Specifically, implicit affiliation motivation reflects positive or warm feelings towards other individuals or groups, affiliative or nurturing activities within a warm relationship, or negative responses to the loss or disruption of a relationship (Winter, 1994). This definition includes both the desire for intimacy as well as the desire for affiliative relationships. While close relationships are thought to be a fundamental human need (Baumeister & Leary, 1995), individuals who are higher in implicit affiliation motivation are likely to experience greater emotional benefits from forming or maintaining close relationships and more frustration when they are unable to form relationships (Deci & Ryan, 2000). Individuals who are high in affiliation motivation are more likely to act to build or maintain their relationships, spend more time interacting with others, try to avoid competition, and also suffer more from rejection or being alone (Weinberger, Cotler, & Fishman, 2010), indicating that there are both positive and negative implications for individuals with high implicit affiliation motivation.

Although they are conceptually distinct, implicit motivation resulting from intimacy and affiliation scores tend to have similar correlates, and so the Winter (1994) coding

manual combines them into a single intimacy-affiliation motivation. However, that means that when evaluating implicit affiliation motivation, two types of social outcomes should be considered. Affiliation motivation should be related to both intimacy outcomes (e.g., satisfaction within close relationships) and more general affiliation outcomes (e.g., satisfaction with the number of friends). Although an individual can have multiple social goals, implicit affiliation motivation should be salient for cooperative social goals, which are related to deep affiliative connections, rather than competitive goals which reflect an opposition to others.

Power motivation. Implicit power motivation reflects the desire to have control or influence over others or on the world at large. This can be reflected in PSE stories which describe actions or emotions that have a physical or emotional impact on others, strong reactions to others' behavior, use of control, regulation or persuasion to influence others, provision of unsolicited help, or concerned with fame or impressing others (Winter, 1994). Implicit power motivation is most often studied in career or work settings among adults, since this is the domain of life in which control is most often necessary, and which affords the greatest opportunity to have power over others (Fodor, 2010). Implicit power motivation is associated with work performance and satisfaction with work in professions that require workers to exert control over others. For example, power but not affiliation or achievement motives is important for well-being in managers (Kazén & Kuhl, 2011), a profession which requires control over others. Further, implicit power motivation predicts non-verbal behavior when attempting to persuade others in an experimental task (Schultheiss & Brunstein, 2002). Among adolescents, power may be most strongly related

to competitive social goals, since these goals aim at dominance over others and concern reputation among peers.

This research assesses implicit affiliation and power motivation along with implicit achievement motivation. However, the research hypotheses will focus on implicit achievement motivation, since these reflect the normative developmental tasks of educational achievement in adolescents and for which there are more opportunities for expression, and for which there are more clear outcomes (i.e., grades).

The hot path: High implicit motivation and explicit goals. The hot path to goal pursuit occurs when pursuing a goal provides an affective reward, which further encourages the pursuit of that goal (Schultheiss et al., 2008). This occurs most strongly when the explicit goals that are being pursued are highly valued and aligned or congruent with implicit motivation. Implicit motivation and explicit goals promote different types of behavior and motivate behavior in different ways. Implicit motivation is a better predictor of spontaneous behavior while explicit motivation and goals are better predictors of controlled or planned behavior (Spangler, 1992). When implicit motivation and explicit goals are both high, they serve to reinforce each other through their impact on these different types of behavioral responses (Schultheiss et al., 2008). Implicit motivation provides affective incentives which energize behavior by reinforcing the selection of situations and behaviors in which the motive can be expressed. For example, in the academic context, implicit achievement motivation may allow students to identify learning opportunities outside of a structured classroom setting or in the absence of a teacher-driven classroom assignment.

Conversely, explicit goals are associated with more analytical and cognitive responses, and are more relevant to structured settings. As such, they serve to help the individual identify the important goal pursuit behaviors based on desired outcomes or expected consequences of the behaviors (Rheinberg & Engeser, 2010). For example, explicit achievement goals may direct students to complete a homework assignment or study for a test. Hot goal pursuit occurs when the two are both high, with implicit motivation driving the behavioral responses that are not thoughtfully considered, and explicit goals contributing to the selection of situations and behaviors when the individual is presented with a clear choice between alternatives (Brunstein & Maier, 2005). In this way, the non-conscious implicit motivation and conscious explicit goals reinforce one another to promote goal pursuit.

Pursuing explicit goals that are congruent with implicit motivation is associated with greater success in achieving those goals than pursuing goals that are incongruent with implicit motivation or those which are not highly valued. This is the case for achievement, social or affiliative goals, and power goals, and applies in a range of populations including students, who perform better academically when teachers are able to appeal to their implicit motivation (Hofer, 2007), and managers, for whom conflicts between multiple goals in different domains was related to worse performance in achieving any explicit goals (Kehr, 2003). Those with congruently high goals and motives put the most effort into their goals, as demonstrated by the number of behaviors that they perform in order to achieve their goals (Schüler, Job, Fröhlich, & Brandstätter, 2008), and are more likely to experience flow states in their goal pursuits (Schüler, Sheldon, & Fröhlich, 2010). These effects are

likely due to differences in the goal pursuit process and the resultant changes in affect and well-being that come from pursuing goals congruent with implicit motivation.

Pursuing goals that are congruent with implicit motives elicits greater effort. Individuals are more engaged in pursuing goals they value when they are congruent with their motives. This manifests itself through higher goal commitment (Schultheiss & Brunstein, 1999), greater volitional strength (Kehr, 2004b), and greater persistence in pursuing these goals (Sheldon, 2014). Interestingly, research has not found the direction of the discrepancy (i.e., if implicit motivation was high and explicit goals were low or vice versa) to predict volitional strength, although individuals with congruent high implicit motivation and explicit goals have greater volitional strength than those with congruent low implicit motivation and explicit goals (Kehr, 2004b). When both implicit motivation and explicit goals are congruently low, the individual is expected to pursue goals in a different domain of life, and as a result would not make progress toward goals in the less valued and less implicitly motivated domain.

Finally, pursuing highly valued goals that are congruent with implicit motivation has positive effects on affect and well-being, both while the goals are being pursued and once they have been achieved. This is not the case when pursuing or achieving goals not reinforced by high levels of implicit motivation (Langens, 2006). These effects exist both for short-term and long-term goal pursuits. Pursuing goals that are congruent with implicit motivation, and making progress towards achieving those goals is associated with improvements in well-being on a daily basis and over the course of a several months, while pursuit of, or progress towards goals that are incongruent with implicit motivation is not associated with changes in well-being (Brunstein, Schultheiss, & Grassmann, 1998).

In sum, the hot motivational path operates as follows: pursuing and achieving highly valued goals that are reinforced by implicit motivation is affectively rewarding, unlike goals that are not congruent with implicit motivation. These affective rewards allow the individual to better recognize opportunities to engage with these goals, and lead to greater goal engagement and volitional strength for these goals. This in turn leads to more goal-pursuit behaviors, and ultimately to greater success in pursuing these goals. Finally, successfully achieving these goals promotes greater improvements in well-being compared to achieving non-congruent goals. Given that pursuing highly valued goals that are congruent with implicit motivation results in positive affect and greater volitional control, fewer compensatory motivational strategies are likely to be required (Schultheiss et al., 2008). Specifically, SPC strategies are expected to be important, since these are the actions that one takes to pursue any goal. However, SSC and CPC strategies should be more necessary when pursuing goals that do not have the inherently rewarding qualities associated with the hot goals, or are not highly valued through explicit goals.

Predictors of congruence. To effectively pursue hot goals, individuals first must be able to identify goals that are relevant for their implicit motivation. Second, they need to be able choose to pursue those goals. Two different processing systems are involved in implicit and explicit motivation, and so congruence requires the translation between one system and the other. Implicit motivation involves experiential, non-verbal processing, while explicit goals involve cognitive, verbal processing (Schultheiss & Strasser, 2012; Spangler, 1992). One must be able to identify non-verbal responses, and translate those responses into explicit and verbal goals (Schultheiss & Strasser, 2012). That is, individuals must have self-awareness or conscious awareness of their bodily states in order to

recognize their affective responses, as well as the ability to process and verbalize these processes (Thrash, Elliot, & Schultheiss, 2007). The ability to identify and translate non-verbal information into verbal responses (for example, the speed with which individuals can name a set of colors) is associated with overall motive congruence, and with a preference for motive-congruent tasks (Schultheiss, Patalakh, Rawolle, Liening, & MacInnes, 2011). Although this is necessary for selecting motive-congruent goals, this research addresses the second requirement: the ability and freedom to choose goals based on their content.

After individuals are aware of their affective responses, they must be able to select and attribute value to their explicit goals according to their implicit motivation. Even when individuals can identify their affective response to a situation, they must also have the autonomy to select goals that match these responses. Indeed, higher self-determination and feelings of autonomy predict congruence between implicit motivation and explicit goals (Thrash & Elliot, 2002). There is much evidence that autonomy in goal selection is beneficial in other contexts as well. For example, research on Self-Determination Theory (SDT; Ryan & Deci, 2000) explains that autonomy is an important prerequisite for intrinsic motivation, which is exhibited when goals are pursued because they are interesting or enjoyable. Research on SDT shows that individuals who are intrinsically motivated have greater success in achieving goals, greater persistence in their goal pursuits, and higher levels of well-being. In laboratory, cross-sectional, and longitudinal studies, autonomy in goal selection and pursuit has been associated with better task performance and success, and greater well-being, in part because it is associated with greater intrinsic motivation (Ryan & Deci, 2006). However, there is only limited research into the role of autonomy in

congruence between implicit motivation and explicit goals. Autonomy does seem to be related to greater congruence, although these findings reflect autonomy as supported by authority figures such as coaches of student athletes (Sheldon, 2014).

Although both the ability to identify affective responses and autonomy to select goals seem to be important for hot goal pursuit, this research addresses only the importance of parental relationships for adolescents' autonomy in goal selection for congruence between implicit motivation and explicit academic and social goals. Since adolescents are at a stage in life where their autonomy is increasing, and they are gaining control over their goals (De Goede, Branje, & Meeus, 2009), having parents who support their autonomy in selecting their goals may be of particular importance for them. Parents may also hinder this through attempts to control their children or by involving themselves in their children's goal-selection processes. To date, little research has addressed the impact that adolescents' perceptions of their parents' autonomy-support or control has on congruence between implicit motivation and explicit goals, although we expect it to be associated with congruence (positively for support and negatively for control). Since parents play an important role in structuring adolescents' lives and encouraging (or discouraging) autonomy, it is possible that other aspects of their relationships, in addition to the degree to which parents support their autonomy, may contribute to (or hinder) their pursuit of goals that are congruent with their implicit motivation.

The above discussion highlights factors that may be related to pursuing hot goals, or highly valuing goals in a domain of life that is also reinforced by implicit motivation. It should also be noted that these same factors would also be expected to be related to not pursuing or valuing goals that are not reinforced by implicit motivation. That is, factors like

autonomy support are expected to be related to be having goals that are congruently high with implicit motivation, or congruently low. This is because there are multiple domains of life that can be reinforced (or not) by implicit motivation. If one domain of life is not reinforced by implicit motivation, the individual would be expected to value goals in *other* domains.

The cold path: Effortful control to achieve explicit goals. At some point, everyone must work towards goals that are not inherently rewarding. That is, although people are more effective working towards goals that are congruent with their implicit motives, they must sometimes work towards goals that are not. These goals are “cold” in that their pursuit does not provide an affective response and does not result in benefits to psychological well-being (Brunstein et al., 1998; Schultheiss et al., 2008). Nonetheless, these goals are still important for long-term developmental success. For example, even those who are not implicitly motivated towards achievement would benefit from high academic performance. That is, working towards an explicit goal of high academic achievement may be instrumental for long-term career success, even if the goal of academic achievement itself is not rewarding. Since these goals are more difficult for individuals to achieve, it is important to understand the factors related to their successful attainment, which are likely to be different from the factors associated with successful pursuit of hot goals.

Working towards goals that are incongruent with implicit motivation requires greater volitional control, is more taxing for the individual, and requires greater self-regulation (Kehr, 2004a, 2004b). Additionally, the use of domain-specific SSC strategies is expected to be useful in compensating for the lack of affective rewards associated with the pursuit of cold goals. That is, when goals are not inherently motivating due to their

affective or hedonistic quality (i.e., they are cold goals), pursuit should be improved by using motivational strategies which increase the value or perceived likelihood of achieving the goal, or decrease the attractiveness of alternative goals. Successful cold goal pursuit among adolescents, as with adults, should be more likely among those who are better able to self-regulate, and who are better able use SSC strategies to reinforce the importance of the explicit goals to compensate for the lack of implicit motivation.

Finally, it is possible that a domain of life is reinforced by implicit motivation but not valued or held highly by explicit goals. In this case, the individuals would be expected to find themselves in situations that promote that motivation, but would not actively pursue those goals. Given that goal selection is necessary for goal pursuit (e.g., Heckhausen, Wrosch, & Schulz, 2010), these individuals would not be expected to make progress toward these goals.

Importance of self-regulation for adolescents' academic goals. In educational settings, having the ability to self-regulate effectively allows students to be more proactive in seeking information and mastering educational tasks (Zimmerman, 1990) and is associated with better overall academic performance (Blair, Calkins, & Kopp, 2010). Adolescents who report being better able to work hard on a difficult assignment, allocate time for homework, and concentrate on avoiding distractions have better academic behavior and grades (Miller & Byrnes, 2001). Building adolescents' self-regulatory capacity is hypothesized to be a way to improve in-class performance, as it would allow students to maintain focus and remain on-task when in the presence of off-task incentives (Hofer, 2007). Although research indicates that self-regulation is important for academic achievement, this research typically does not consider the perceived value or difficulty of

academics as moderators of this effect. That is, self-regulation may be more relevant for academic achievement when students care about their achievement, but when their goals are difficult to attain. Self-regulatory capacity is expected to be most important for adolescents who highly value their academic goals, but who have difficulty pursuing them, in this case because they are not reinforced by implicit motivation.

Selective secondary control. Since cold goals are not inherently motivating, they require greater volition and motivational engagement. SSC strategies are most valuable under these conditions, when the goals are challenging or when alternative goals compete for motivational resources (Heckhausen, 1999). Specifically, to more effectively pursue cold goals, individuals should use SSC strategies to reinforce or increase the value of the goals and their perceived controllability, and to decrease the perceived importance of competing goals. SSC strategies are specific to the goal being pursued, so adolescents would boost their motivation for academic goals by highlighting their importance relative to other goals.

Selective secondary control strategies are important for academic success when that success is initially challenging or hard to attain. Among university students who experience difficulties, SSC is necessary in order to maintain motivation, and is associated with higher GPA and fewer voluntary withdrawals from university when combined with SPC strategies (Hall, Perry, Ruthig, Hladkyj, & Chipperfield, 2006). In this study, SSC strategies were not associated with academic outcomes among those students who initially succeeded, but only among those who suffered an initial setback, indicating that SSC strategies are critical when tasks are difficult but may be less so when tasks are easy. Similarly, when deadlines approach and goals get more difficult to achieve, use of SSC strategies increases the

probability of achieving those goals among youth who had experienced negative life events (Poulin & Heckhausen, 2007). These studies demonstrate the significance of SSC strategies for academic goals when they are difficult to achieve or when setbacks are experienced. Use of SSC strategies is therefore expected to be more important for pursuing cold goals since they are more difficult to pursue. However, because they are important primarily when goals are difficult and when the individual is struggling to attain them, cross-sectional research may fail to find these effects.

Role of parents

Across the lifespan, family relationships are important for physical and mental health, goal selection and achievement, and providing the context for overall lifespan development (Fingerman & Lang, 2004). For children and adolescents, relationships with parents are critical. Although peers increase in importance during adolescence, parental relationships more than peer relationships are associated with well-being (Weinstein, Mermelstein, Hedeker, & Hankin, 2006). Parental relationships inform the context by which adolescents understand other social relationships, such that in the context of supportive parents, adolescents are more responsive to supportive peers (Helsen, Vollebergh, & Meeus, 2000). Parental influences are especially important for adolescents' long-term plans and goals, whereas peer influences are of greater importance for short-term and often less consequential decisions like hobbies and fashion (Collins & Steinberg, 2006). Parents are likely to impact both hot and cold motivational pathways since they influence adolescents' long-term goals, although the ways in which they influence these paths may differ. Throughout this discussion of parent-child relationships, it should be noted that relationships are bi-directional. Although some categories of behavior, like

parents' overreacting, are based more on parents' personalities, others like warmth and support are equally a function of parents' and children's personalities (de Haan, Deković, & Prinzie, 2012). However, this research focuses exclusively on adolescents' perceptions of their parents, and associations between these perceptions and their own goals and behavior.

Adolescence is a time during which relationships with parents change from being largely hierarchical as they are with children, to being more egalitarian as they are between parents and adult children (De Goede et al., 2009). As a result, rates of conflict with parents are higher in young adolescents than in children, but rates of conflict decline as they move into older adolescence (Laursen, Coy, & Collins, 1998). Despite conflict, the underlying quality of the relationships is relatively consistent from childhood to adolescence (Ainsworth, 1989), although families that experienced negative life events which are related to the parental relationships, such as chronic or severe illness or death of one parent, parental divorce, or separation from one parent experience greater changes (Waters, Weinfield, & Hamilton, 2000). This research only assesses parental relationships during adolescence, although of course parents have considerable influence on their children from birth. However, with the exception of families that experience significant stressors, parent-child relationships tend to be stable (Waters et al., 2000), indicating that adolescents' relationships with their parents is likely to be reflective of earlier parent-child relationships.

Parents play an important role in socializing their children, and contribute significantly to children's beliefs about the world, values, preferences, and abilities (Darling & Steinberg, 1993). Most parents recognize their importance in developing their children's

beliefs and values, and seek to instill values in their children that both represent their own values and those which reflect social norms (Tam & Lee, 2010). Parents are most effective in transmitting their beliefs to their children when relationships are warm and supportive (Mortimer, Lorence, & Kumka, 1986). Furthermore, children learn to generalize their beliefs and expectations about their relationships with their parents to their beliefs about the world. For example, adolescents who believe their parents treat them fairly and justly are more likely to believe that they will be treated fairly and justly in other domains of life (Dalbert & Stoeber, 2006). This indicates that parents' conscious efforts as well as the overall relationship quality, such as their warmth and sensitivity expressed towards their children, may be influential.

Parenting styles. Baumrind's (1966) classification of parenting styles is perhaps the most influential conceptual framework on parenting. Baumrind described three types of parenting styles. Authoritative parents encourage autonomy in their children, while also setting rules in a warm and rational way. Authoritarian parents set rules and are demanding of their children, but do not respond warmly like the authoritative parents. Permissive parents are not demanding of their children and refrain from setting rules, but are supportive and warm to their children. These parenting styles were later reclassified along their dimensions of warmth and demandingness, with the addition of a category for neglectful parents who are neither demanding nor supportive (Maccoby & Martin, 1983). Additionally, the dimension of autonomy granting was added to the parenting style classification, such that authoritative parents were those who also granted autonomy to their children (Steinberg, Elmen, & Mounts, 1989). Authoritative parenting is associated with better adjustment in adolescents, as measured by better academic performance,

greater self-reliance, and lower psychological distress and delinquency (Steinberg, Mounts, Lamborn, & Dornbusch, 1991).

Baumrind (1967) suggested that these effects were in part because the overall context of the relationship (i.e., authoritative versus authoritarian parenting) influenced the effectiveness of specific parenting behaviors so that authoritative parents were actually more effective in reinforcing behaviors and values in their children than parents of other styles. When considering adolescents' socialization, the overall context of the parent-child relationship may be more significant than any single parenting behavior (Darling & Steinberg, 1993). The warmth that children experience in these relationships makes them more open to parental efforts at socialization while the structure and support that parents provide helps children to develop self-regulatory skills (Steinberg, 2001). Adolescents' outcomes may therefore be a function of the warmth, demandingness, and autonomy support that they experience within their relationships with their parents. Although there is much evidence to support the use of parenting styles in research on parent-child relationships, there is also evidence suggesting that these aspects of the relationships have specific effects on children's behavior and attitudes, and should be considered independently rather than merely contributing to these parenting styles (Grolnik & Ryan, 1997; Niemiec, et al., 2006).

Parental relationships and academic achievement. The mechanisms by which parenting styles influence adolescents' development are complex, but it is clear that parenting style is important for academic achievement. Much research has documented the importance of parents for academic achievement. Adolescents with authoritative parents perform better academically across age, gender, family structure, parental education, and

ethnicity (Dornbusch, Ritter, Leiderman, Roberts, & Fraleigh, 1987). Both specific parenting behaviors, such as their monitoring of their children's activities (McNeal, 1999) and more general aspects of the relationship, such as the overall relationship climate are important for high school students' academic achievement (Pomerantz, Moorman, & Litwack, 2007).

Importance of parents for hot goal pursuit. While there is some evidence that warm relationships with parents at a young age (i.e., at age five) are associated with greater congruence between implicit motivation and explicit goals (Schattke, Koestner, & Kehr, 2011), little is known about the social or developmental predictors of motive congruence or implicit motivations more generally. Implicit motivation is thought to develop in early childhood and remain relatively stable throughout life (McClelland, Koestner, & Weinberger, 1992). As a result, this research does not attempt to draw conclusions about associations between parental relationships on implicit motivation. Instead in examining hot goal pursuit, this research focuses on parents' influence on explicit goals and the degree to which they reflect implicit motivation. Since motive congruence is a function of explicit goals and implicit motivation, if parents influence their children's explicit goals, this will have an impact on their motive congruence.

Much research indicates the importance of parental relationships on adolescents' explicit academic goals. Adolescents' academic goals are influenced by their parents' beliefs and values, as well as parents' behaviors and the overall context of the relationship. This is true both for specific subject areas as well as more general beliefs or values of the importance of school. For example, parents' overall beliefs about the importance of academics are reflected in their children's beliefs about the importance of academics (Garg, Kauppi, Lewko, & Urajnik, 2002), and parent's educational aspirations for their children are

reflected in their children's aspirations for achievement (Jodl, Michael, Malanchuk, Eccles, & Sameroff, 2001), as are children's perceptions of parents' warmth and involvement in their academics (Kay et al., 2016). More specifically, children's interest in math reflects the degree to which their parents believe math is important (Frenzel, Goetz, Pekrun, & Watt, 2010). In addition to parents' beliefs, parents' behaviors, for example, their involvement in their children's academics, are also associated with adolescents' educational aspirations (Hill et al., 2004).

The above discussion highlights the importance of parental relationships for adolescents' goals in that good relationships (as measured in multiple ways) tend to be associated with higher educational aspirations and outcomes as well as social outcomes. Parental relationships should also impact the hot motivational path through their influence on the youths' ability to select goals that are congruent with implicit motivation. Autonomy-support is an important characteristic of authoritative parenting. Autonomy support is associated with adolescents' psychosocial development, lower levels of psychological distress, and greater academic competence, above and beyond parental warmth and demandingness (Gray & Steinberg, 1999). Parents are effective in supporting their children's autonomy, as adolescents who perceive that their parents support their autonomy do actually feel more autonomous, which in turn leads to greater subjective well-being (Niemic et al., 2006). On the other hand, parents who exercise psychological control over their children (e.g., demanding children think or feel a certain way) may prevent children from selecting goals that are congruent with their implicit motivation, as they may feel obligated to pursue their parents' goals.

By encouraging their children to select their own goals and supporting those choices, parents may allow their children to pursue goals that are more congruent with their implicit motivation. Given the importance of autonomy for motive congruence (as discussed above), parental relationships, and specifically parents' support for their children's autonomy may allow adolescents to have goals that are more congruent with their implicit motivation. That is, one way in which parental relationships are expected to be associated with goal achievement is through their autonomy support, which is expected to be associated with greater congruence between implicit motivation and explicit goals. This congruence is ultimately expected to be associated with goal achievement.

Importance of parents for cold goal pursuit. Parental relationships may help adolescents pursue goals that are more difficult or not affectively rewarding by contributing to adolescents' self-regulatory skills and their ability to use motivational techniques to boost goal engagement. Various measures of parenting are related to adolescents' self-regulatory skills. General measures of parental involvement, engagement, and attachment are associated with adolescents' self-regulation of their attention, emotions, and behavior (Belsky & Beaver, 2011), and authoritative parenting is associated with behavioral and emotional self-regulation, both in academic and non-academic domains (Grolnick & Ryan, 1989; Moilanen et al., 2014; Purdie, Carroll, & Roche, 2004). Parents' involvement, encouragement, and responsiveness help their children to develop self-efficacy beliefs, which in turn predicts goal engagement (Schunk & Meece, 2006). At the same time, parental relationships characterized by emotional and behavioral control are associated with worse emotional regulation in adolescents (Manzeske & Dopkins Stright, 2009), indicating that both the positive and negative aspects of these relationships

are important for adolescents' ability to pursue their goals. Purdie and colleagues (2004) show that parental involvement in adolescent's lives is more strongly associated with self-regulation in adolescents than parental demandingness or autonomy-support. Parents involvement may promote self-regulatory skills by demonstrating or modeling self-regulation in themselves. This would have the greatest effect for goal attainment when pursuing goals that are not congruent with implicit motivation, since this is when self-regulation is expected to be most necessary.

Parental relationships are also associated with adolescents' engagement and use of motivational strategies. Parental involvement in adolescents' academics is associated with school engagement, motivation, perceived competence and control, and self-regulation for academic tasks (Gonzalez-Dehass et al., 2005). When parents take an active role in academics, children are more engaged in their schoolwork, invest more effort, and pay better attention, which ultimately leads to better academic performance. Adolescents with authoritative parents are better able to avoid distractions or task-irrelevant behaviors when working on academic goals, and are less passive in their goal pursuits than those with neglectful, permissive, or authoritarian parents (Aunola, Stattin, & Nurmi, 2000). Adolescents with authoritative parents use more adaptive self-motivating strategies when pursuing their academic goals, including using self-enhancing attributions about successes, and having greater beliefs about control over their goals compared to adolescents with non-authoritative parents.

Finally, although the above discussion focuses on parent-child relationships in general, it is important to note that there are often significant differences between the perceptions of the relationships from the parents' perspective from the children's

perspective (Aquilino, 1999). Although parents' perspectives are important, the adolescents' perspectives are also critical, and their interpretation of their parents' behaviors and their relationships with their parents may be a more important influence on their behavior than parents' perceptions of their own behavior (Steinberg, Lamborn, Dornbusch, & Darling, 1992).

Importance of late adolescence as a developmental period

High school is an important period for academic goals and achievement. During late adolescence, youth increasingly gain control over their goals. Older adolescents believe their parents have less power over them than do younger adolescents (De Goede et al., 2009), which allows them more freedom to identify and select goals for themselves. Overall, there is a linear decline in motivation for math, science, and reading (Gottfried, Fleming, & Gottfried, 2001) and for more general measures of the perceived importance or value of academics (Miller & Byrnes, 2001). At the same time, parents are less involved in older adolescents' lives than they are in younger adolescents' (Crosnoe, 2001), leaving older adolescents with greater flexibility in their goal pursuits. However, academic achievement in older adolescents is still critical, since it leads to post-secondary educational achievement and career potential (e.g., Kay et al., 2016; Vuolo et al., 2014, 2012). Understanding the motivational factors related to academic achievement in adolescents is important, since this may be when their motivation is of greatest significance for their achievement because there are fewer external constraints on their behavior. Given the changing academic motivation in high school students, and the increasing importance of motivation and motivational strategies, this is a developmental period that provides

insight into the importance of motivation, motivational beliefs, and strategies for goal achievement, and has significant implications for long-term successful development.

Summary

In sum, two distinct motivational pathways are important for achieving goals. These pathways depend on the degree to which a goal pursuit reflects an individual's implicit motivation, or the affective responses that an individual experiences when in certain situations. The *hot* motivational pathway is activated when an individual pursues a goal that is congruent with his or her implicit motivation. These goal pursuits, reinforced by positive affective responses, are easier to pursue, require less effortful control, and are more rewarding. The *cold* motivational pathway is activated when an individual pursues a goal that is not congruent with his or her implicit motivation. Pursuing these goals requires greater effortful control, since the pursuit behaviors are not reinforced by affective responses. Goals which are not valued are not expected to be pursued or successfully achieved, regardless of whether they are reinforced by implicit motivation.

Implicit motivation is believed to develop in early life and remain stable across the lifespan. Explicit goals, in contrast, are selected at any given time, and so may vary in the degree to which they reflect implicit motivation. Little is known about how these motivational pathways develop, particularly in adolescents. It is possible that adolescents' relationships with their parents are important correlates of these motivational pathways. By promoting and supporting adolescents' independence, parents may encourage them to select goals that are congruent with their implicit motivation, and increase the likelihood of using the hot motivational pathway. At the same time, parents may help adolescents

develop the volitional control and self-regulatory skills necessary to pursue *cold* goals that are incongruent with implicit motivation.

CHAPTER 3: The Present Study

This research explores the correlates of adolescents' pursuit of hot and cold goals for the developmentally normative task of academic achievement. Analyses assess associations between implicit motivation, explicit goals, and their interactions and success in achievement-related goals. The significance of multiple aspects of parental relationships in predicting these differences is evaluated. Further, this research examines the use of primary control strategies as a potential mediator of the effects of motive congruent goal pursuit on successful achievement of goals, as well as of the associations between relationships with parents and goal achievement. The cold motivational pathway is also examined by testing whether Ed-SSC and Ed-CPC are associated with implicit achievement motivation, explicit goals, or their congruence, as well as whether Ed-SSC or Ed-CPC are associated with achievement during cold goal pursuit (i.e., when goals are not congruent with motivation). Associations between relationships with parents and Ed-SSC and Ed-CPC are also tested, to determine whether relationships with parents could contribute to the cold motivational pathways. Finally, this research examines how achievement (or failure) in attaining hot versus cold goals is associated with changes in psychological well-being. A diagram of the overall research is shown in Figure 1.

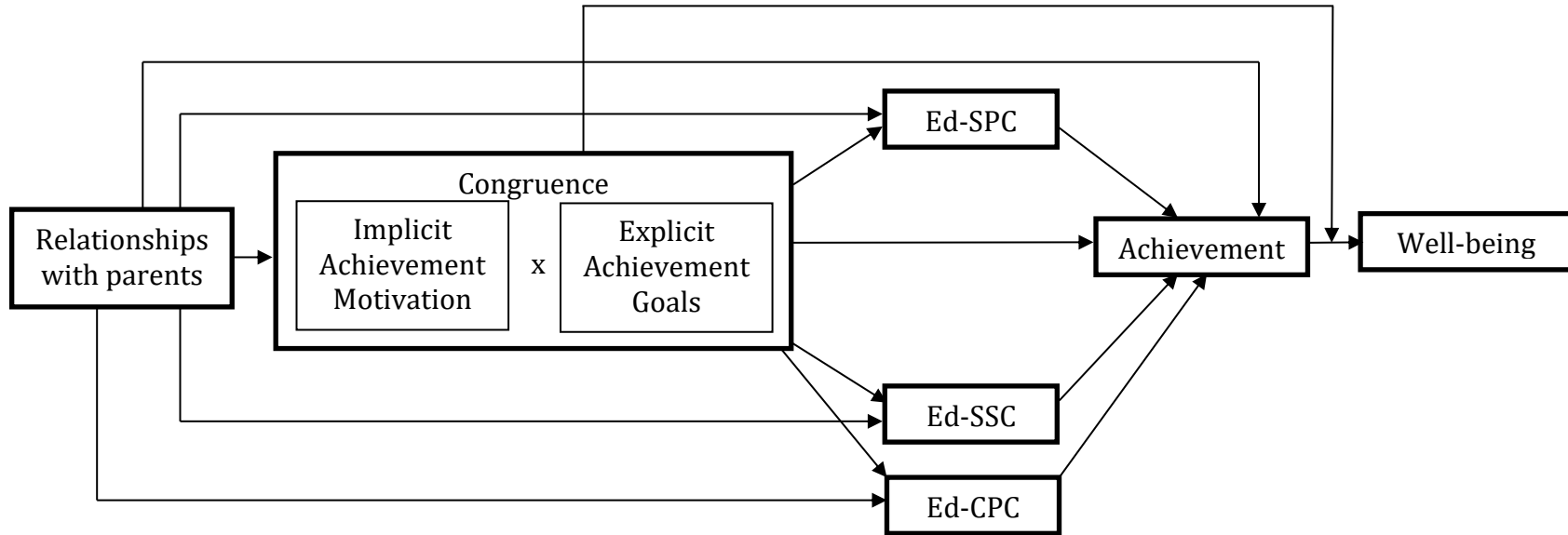


Figure 1. Conceptual diagram of the research showing relationships with parents, congruence between implicit motivation and explicit goals, Ed-SPC, Ed-SSC, and Ed-CPC, achievement, and well-being.

Research aims and hypotheses

This research has 7 specific aims, each with multiple hypotheses. Research Aim 1 pertains to the importance of implicit motivation, explicit goals, and their interactions for achievement goal success. Research Aim 2 tests indirect effects of implicit achievement motivation, explicit goals, and their interactions on achievement goal success through Ed-SPC strategies. Research Aim 3 addresses associations between relationships with parents and achievement goal success, as well as indirect effects of relationships with parents on achievement through Ed-SPC strategies. Research Aim 4 examines associations between relationships with parents and adolescents' congruence between implicit motives and explicit goals. Research Aim 5 tests associations between achievement and well-being, and whether this depends on whether achievement goals are congruent with implicit achievement motivation. Research Aim 6 explores the cold motivational pathways through Ed-SSC and Ed-CPC by examining their effects on goal attainment and whether they are associated with explicit goals, implicit motivation, or their interaction. Finally, research Aim 7 examines the cold motivational pathway by testing associations between relationships with parents and Ed-SSC and Ed-CPC strategies.

Research Aim 1: Achieving hot versus cold goals. This research aim examines main effects of implicit achievement motivation and explicit achievement goals on grades and achievement goal attainment, as well as the interaction between implicit motivation and explicit goals.

Hypothesis 1a. Both implicit achievement motivation and explicit achievement goals are associated with grades and general achievement goal attainment.

Hypothesis 1b. The interaction between implicit achievement motivation and explicit achievement goals is tested to determine whether hot goals are more successfully pursued than other goals. It is expected that goal attainment is highest when explicit goals and implicit motivation are both high; the interaction determines whether high levels of implicit motivation or explicit goals can compensate for low levels of the respective other.

Research Aim 2: Selective primary control strategies as a mediator. The second research question examines Ed-SPC as a mediator of the associations between implicit achievement motivation, explicit achievement goals, and their interaction and achievement. This research question assesses Ed-SPC as a mediator of each of the main effects of implicit achievement motivation and explicit achievement goals on the attainment of these goals, as well as a mediator of any moderated effect of the interaction between implicit achievement motivation and explicit goals on achievement.

Hypothesis 2a. Ed-SPC is significantly associated with both implicit achievement motivation and explicit achievement goals.

Hypothesis 2b. Interactions between implicit achievement motivation and explicit achievement goals significantly predict Ed-SPC such that explicit goals are less predictive of Ed-SPC when implicit achievement motivation is high; this analysis determines whether high levels of implicit achievement motivation or explicit goals compensate for low levels of the respective other.

Hypothesis 2c. There are significant indirect effects of implicit achievement motivation and explicit achievement goals on grades and general achievement goal attainment through Ed-SPC.

Hypothesis 2d. Effects of any significant interaction between implicit motivation and explicit goals predicting achievement are mediated by indirect effects through Ed-SPC.

Research Aim 3: Direct and indirect effects of parental relationships on achievement. This research question examines the associations between adolescents' perceptions of their relationships with mothers and their Ed-SPC, and their achievement, as well as the indirect effects of the relationships with their parents on achievement through Ed-SPC. Specifically, adolescents' perceptions of mothers' and fathers' warmth, involvement in their lives, support, and psychological control are included.

Hypothesis 3a. Perceptions of mothers' and fathers' involvement, warmth and support, as well as the overall relationships are positively associated with grades and general achievement goal attainment. Mothers' and fathers' psychological control are negatively associated with grades and achievement.

Hypothesis 3b. Perceptions of mothers' and fathers' involvement, warmth, and support, as well as the overall relationships are positively associated with Ed-SPC. Mothers' and fathers' psychological control are negatively associated with Ed-SPC.

Hypothesis 3c. There are significant positive indirect effects of mothers' and fathers' involvement, warmth, and support, and negative indirect effects of psychological control on achievement through Ed-SPC.

Research Aim 4: Relationships with parents and implicit x explicit congruence. The fourth research question examines whether relationships with parents are associated with congruence between implicit achievement motivation and explicit achievement goals. As with the previous research question, adolescents' perceptions of mothers' and fathers' warmth, support, involvement, and psychological control are tested.

Hypothesis 4. Adolescents' who perceive high levels of warmth and support from their mothers and fathers have explicit goals that are congruent more with their implicit motivation. That is, these adolescents are more likely to have high implicit achievement motivation and explicit achievement goals or low implicit achievement motivation and explicit achievement goals (because they would value goals in other domains), and less likely to be high in one and low in the other. Adolescents who perceive their parents to be more controlling and more involved in their lives have explicit goals that are less congruent with their implicit motivation.

Research Aim 5: Consequences of achievement. This research question investigates the associations between achievement and well-being, and the moderating effect of motive congruence for associations between achievement and well-being. That is, this research question tests whether associations between goal attainment and well-being is moderated by congruence by their implicit achievement.

Hypothesis 5a. Adolescents who report higher grades and general achievement goal attainment report greater well-being.

Hypothesis 5b. The associations between achievement goal attainment and well-being are moderated by the interaction between implicit motivation and explicit goals. Specifically, associations between achievement and well-being are strongest when adolescents have high implicit achievement motivation and high achievement goals.

Research Aim 6: Implicit motivation, explicit goals, and cold goal pursuits. To explore the cold motivational pathways, associations between implicit motivation, explicit goals, and their interactions, and Ed-SSC and Ed-CPC are examined. Further, the associations between achievement and Ed-SSC and Ed-CPC are examined when goals and

motivation are congruently high, as compared with when one or both of motivation and goals are low.

Hypothesis 6a. The highest levels of Ed-SSC and Ed-CPC use is when implicit motivation is low and explicit goals are high. That is, individuals use more Ed-SSC and Ed-CPC when pursuing cold goals, compared to pursuing hot goals or goals that are not highly valued (regardless of implicit motivation).

Hypothesis 6b. There are significant 3-way interactions between Ed-SSC and Ed-CPC, implicit motivation, and explicit goals predicting achievement such that Ed-SSC and Ed-CPC are more predictive of achievement when implicit achievement motivation and explicit goals are either incongruent or both low, as compared to when they are congruently high.

Research Aim 7: Relationships with parents and cold goal pursuits. To investigate whether relationships with parents are associated with the ability to pursue cold goals, associations between each aspect of adolescents' relationships with their parents and their education-related SSC and CSC is examined.

Hypothesis 7a. Perceptions of involvement, warmth, and support from mothers and fathers, as well as the overall relationships with mothers and fathers are positively associated with Ed-SSC. Perceptions of mothers' and fathers' psychological control are negatively associated with Ed-SSC.

Hypothesis 7b. Perceptions of involvement, warmth, and support from mothers and fathers, as well as the overall relationships with mothers and fathers are positively associated with Ed-CSC. Perceptions of mothers' and fathers' psychological control are negatively associated with Ed-CSC.

Supplementary analyses

In addition to the six hypotheses above, three additional sets of supplementary analyses are explored regarding additional aspects of relationships with parents and assessing implicit motivation.¹ First, a second way of measuring implicit achievement motivation is examined. The above hypotheses measure implicit achievement motivation using the total number of times that implicit achievement motivation was coded in a participant's PSE stories, and controlling for the total story word-count. A second method of measuring looks at the percent of total implicit motives coded within the PSE stories which are coded for achievement motivation. This provides the percent of implicit motivation related to achievement. Supplemental analyses use this method of calculating implicit achievement motivation instead of the total number, and any notable differences are highlighted. The second set of supplemental analyses examines participants' perceptions of their family obligations as additional aspects of their relationships with their parents. Finally, supplemental analyses examine relationships with mothers and fathers in greater detail. Analyses with fathers are first duplicated including only fathers that live with the participants, and then repeated with only biological fathers who live with the participants. Analyses with mothers are duplicated with only biological mothers that live with the participants (since few participants live with non-biological mothers).²

¹ Thanks to Professor Chen for suggesting these additional analyses during my dissertation advancement meeting.

² Thanks to Professor Cauffman for this suggestion during my dissertation defense.

CHAPTER 4: Method

Participants

A total of 244 high school students were recruited from five different high school or after-school programs. A total of 138 participants were recruited from one of three non-profit after-school programs (Sites A, B, and C) which were free of charge and offered free snacks to participants. Ninety-one participants (37.3%) were recruited from an in-school elective college-readiness class aimed at by developing students' writing, reading, critical thinking, and organizational skills (Site D). Students opt into this class, and are typically those who might otherwise struggle when pursuing post-secondary education; they are encouraged to participate throughout their high school careers. The head of this program was a teacher who received training to develop teaching abilities to foster students' engagement. The program provided example lesson plans and curricula, but teacher in this program are largely allowed the flexibility to teach material they see appropriate for their students.

Finally, 15 participants (6.1%) were recruited from an all-girls for-profit after-school sports club (Site E). Because participants from this site differed from the others, all analyses were run both including them and excluding them; analyses were also run separately for participants from the in-school program (Site D). Results did not change substantively when excluding participants from the sports club or when the Site D participants were analyzed separately. Results presented throughout are from analyses run with all participants. Participant characteristics, broken down by recruitment location, are presented in Table 1.

Table 1. Participant demographics by recruitment location.

	Site A <i>n</i> (%)	Site B <i>n</i> (%)	Site C <i>n</i> (%)	Site D <i>n</i> (%)	Site E <i>n</i> (%)	Total <i>n</i> (%)
Type of program	After-school	After-school	After-school	In-school	Sports	
Total	92 (38)	22 (9)	24 (10)	91 (37)	15 (6)	244 (100)
Female	42 (46)	12 (57)	15 (62)	62 (68)	15 (100)	146 (60)
Ethnicity						
Hispanic	58 (63)	20 (91)	23 (96)	87 (96)	2 (13)	190 (78)
Caucasian	9 (10)	1 (5)	1 (4)	3 (3)	11 (73)	25 (10)
Other	25 (27)	1 (5)	0 (0)	51(1)	2 (13)	29 (12)
Grade						
9 th	20 (22)	8 (36)	8 (33)	29 (32)	8 (53)	73 (30)
10 th	32 (35)	6 (27)	10 (42)	33 (36)	4 (27)	85 (35)
11 th	26 (29)	3 (18)	2 (8)	0 (0)	2 (13)	34 (14)
12 th	13 (14)	3 (18)	4 (17)	29 (32)	1 (7)	51 (21)
Generation status						
1 st	9 (11)	5 (23)	3 (14)	11 (12)	0 (0)	28 (12)
2 nd	40 (47)	16 (72)	19 (86)	7 (8)	0 (0)	82 (35)
3 rd +	36 (42)	1 (5)	0 (0)	71 (80)	15 (100)	123 (53)
Mother's education						
< HS	17 (21)	16 (89)	17 (74)	46 (61)	0 (0)	96 (4)
HS	25 (31)	1 (6)	5 (22)	16 (21)	4 (27)	51 (24)
> HS	38 (48)	1 (6)	1 (4)	14 (18)	11 (73)	65 (31)
Father's education						
< HS	18 (25)	11 (69)	17 (81)	41 (59)	0 (0)	87 (45)
HS	27 (38)	3 (19)	2 (10)	19 (27)	3 (20)	54 (28)
> HS	27 (38)	2 (13)	2 (10)	10 (14)	12 (80)	53 (27)

Note: HS = high school.

Procedures

All research activities were conducted at the recruitment sites. After site permission was obtained from site directors or supervisors, potential participants were informed of the research study and given an information sheet and researcher contact information to take home to their parents; information sheets were also emailed directly to potential participants at Site D, and to parents of potential participants at Site E. Participants were recruited at least one day later. All participants signed an informed consent or assent (if

under 18) form. Participants completed a questionnaire that took approximately 45 minutes; participants at Site D completed the questionnaire on computers in the school library or computer lab, all other participants completed the questionnaire on paper. Participants were given a \$10 gift card upon completion. All procedures were approved by the UCI IRB.

Measures

Questionnaires included measures of implicit motivation, general achievement goals and specific grade goals, Ed-SPC, Ed-CPC, and Ed-SSC strategies, relationships with parents, psychological well-being, and demographic information. Means and standard deviations of key study variables are presented in Table 2, along with differences in these variables by demographic groups and significance values in Table 3. Bivariate correlations between key study variables are presented in Table 4.

Table 2. Means and standard deviations of key study variables, and differences by demographic groups

	Total	Gender		Ethnicity			Generation Status			Mothers' Education			Father's Education		
		Boys	Girls	Hisp	Cauc	Other	1 st	2 nd	3 rd +	< HS	HS	> HS	< HS	HS	> HS
		M	M	M	M	M	M	M	M	M	M	M	M	M	M
	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD
<i>N</i>		96	146	188	25	29	28	82	123	96	51	65	87	54	53
Grades	4.22	4.42*	3.97*	4.21	4.56	4.00	4.54*	3.85*	4.40	4.35	4.11	4.42	4.23	3.96*	4.69*
	1.50	1.45	1.57	1.50	1.53	1.46	1.37	1.64	1.39	1.51	1.51	1.43	1.52	1.62	1.38
Ach goal success	4.51	4.51	4.52	4.52	4.78	4.27	4.60	4.42	4.57	4.56	4.58	4.55	4.48	4.44	4.74
	.91	.94	.90)	.91	.83	.95	.95	1.03	.81	.98	.83	.80	.96	.82	.82
Mother inv	3.85	3.87	3.81	3.81	4.15	3.70	3.61	3.77	3.93	3.75	3.91	3.91	3.80	3.86	3.93
	.88	.71	.96	.86	.76	.92	.90	.86	.88	.89	.93	.85	.86	.84	.83
Mothers warmth	4.12	4.10	4.09	4.11	4.03	4.03	4.03	4.02	4.16	4.05	4.07	4.10	4.06	4.12	4.09
	.91	.91	.98	.93	.96	.92	.94	.92	.91	.95	1.07	.85	.95	.99	.88
Mothers support	3.58	3.64	3.54	3.59	3.43	3.66	3.37	3.59	3.61	3.50	3.61	3.63	3.59	3.56	3.61
	.87	.77	.94	.88	.88	.85	.87	.78	.95	.91	.96	.86	.88	.92	.90
Mothers control	1.76	1.72	1.76	1.74	1.83	1.69	1.74	1.80	1.73	1.81	1.70	1.73	1.77	1.76	1.73
	.53	.50	.53	.54	.58	.51	.56	.51	.56	.54	.57	.56	.52	.52	.61
Fathers inv	3.32	3.52*	3.24*	3.35	3.61	3.10	3.25	3.27	3.42	3.23	3.29	3.52	3.17*	3.51	3.63*
	.94	.88	.96	.95	.77	1.00	.77	.97	.95	.97	1.02	.90	.90	.97	.90
Fathers warmth	3.78	3.93	3.70	3.85	3.92*	3.30*	3.80	3.71	3.84	3.75	3.62	3.90	3.66	3.88	3.98
	1.02	.89	1.09	1.00	.99	1.08	.86	1.03	1.06	1.03	1.14	.96	1.02	1.06	.90
Fathers support	3.27	3.46*	3.17*	3.32	3.45	2.95	3.29	3.15	3.37	3.25	3.14	3.35	3.14	3.35	3.50
	.91	.79	.97	.90	.87	.95	.76	.92	.94	.93	.95	.94	.91	.93	.96
Fathers control	1.68	1.63	1.72	1.65	1.70	1.87	1.64	1.75	1.67	1.73	1.64	1.73	1.72	1.69	1.68
	.54	.49	.57	.52	.61	.60	.46	.55	.55	.52	.58	.56	.54	.53	.56
Family assist	3.42	3.50	3.38	3.50	3.19	3.15	3.29	3.45	3.45	3.42	3.40	3.41	3.36	3.62	3.40
	.85	.80	.87	.85	.87	.81	.74	.87	.86	.89	.77	.80	.88	.81	.93
Family respect	4.09	4.07	4.10	4.11	4.06	3.93	4.17	4.03	4.12	4.10	4.06	4.10	4.06	4.15	4.12
	.71	.78	.67	.67	.98	.76	.56	.86	.64	.71	.72	.76	.70	.60	.84
Family financial	3.46	3.49	3.43	3.48	3.40	3.36	3.50	3.50	3.41	3.52	3.33	3.39	3.35	3.44	3.45
	.81	.81	.82	.75	1.12	.92	.81	.94	.73	.80	.84	.87	.79	.72	.92
Gen ach goal	5.38	5.33	5.43	5.39	5.45	5.25	5.48	5.32	5.41	5.51	5.41	5.31	5.48	5.46	5.32
	.64	.69	.57	.65	.48	.64	.58	.70	.60	.54	.64	.60	.58	.51	.67
Goal grades	5.03	4.86*	5.14*	5.04	5.12	4.86	5.32*	4.84*	5.10	5.08	4.90	5.20	5.00	4.93	5.26
	1.00	.97	1.01	1.00	1.05	.99	.82	1.67	.93	1.04	1.08	.84	1.07	1.06	.89
Impl ach	2.15	1.93	2.31	2.00*	3.01*	2.42	1.85	1.88	2.45	2.04	2.09	2.40	1.96	2.45	2.19
	1.53	1.28	1.67	1.42	1.75	1.79	1.61	1.41	1.57	1.55	1.23	1.81	1.56	1.49	1.66
Percent impl ach	27.39	28.62	26.30	26.45	32.08	29.62	26.51	26.05	28.43	25.87	27.06	27.12	24.09	28.32	27.65
	17.28	18.18	16.55	17.92	15.14	14.04	23.06	17.92	15.56	18.10	15.06	16.82	17.61	12.45	17.98

Note. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Hisp = Hispanic or Latino/a. Cauc = Caucasian. HS = High School. Gen ach goal = general achievement goals. Impl ach = implicit achievement. Inv = Involvement

Table 3. Significance values for differences in key study variables by demographic characteristics.

	Gender			Ethnicity			Generation Status			Mothers' Education			Father's Education		
	<i>df</i>	<i>t</i>	<i>p</i>	<i>df</i>	<i>f</i>	<i>p</i>	<i>df</i>	<i>f</i>	<i>p</i>	<i>df</i>	<i>f</i>	<i>p</i>	<i>df</i>	<i>f</i>	<i>p</i>
Grades	238	2.32	.021	2, 239	.96	< .250	2, 228	4.59	.011	2, 207	.64	> .250	2, 190	3.17	.044
Ach goal success	238	-.08	> .250	2, 239	2.07	.128	2, 228	.84	< .250	2, 207	.02	> .250	2, 189	1.85	.159
Mothers'															
Inv	235	.839	> .250	2, 236	2.04	.132	2, 225	1.75	.177	2, 207	.86	> .250	2, 187	.44	> .250
Warmth	235	.075	> .250	2, 236	.15	> .250	2, 225	.63	> .250	2, 207	.05	> .250	2, 187	.06	> .250
Support	235	.834	> .250	2, 236	.47	> .250	2, 225	.82	> .250	2, 207	.65	> .250	2, 187	.05	> .250
Control	234	.630	> .250	2, 235	.48	> .250	2, 224	.41	> .250	2, 206	.80	> .250	2, 186	.08	> .250
Fathers'															
Inv	218	2.26	.025	2, 218	1.73	.180	2, 211	.70	> .250	2, 190	1.63	.200	2, 180	4.58	.012
Warmth	218	1.60	.111	2, 218	3.54	.030	2, 213	.33	> .250	2, 190	.96	> .250	2, 180	1.88	.155
Support	218	2.32	.021	2, 218	2.22	.111	2, 211	1.35	> .250	2, 190	.69	> .250	2, 180	2.42	.092
Control	214	-1.14	> .250	2, 214	1.73	.180	2, 207	.67	> .250	2, 187	.52	> .250	2, 177	.10	> .250
Obligations															
Assist	238	1.08	> .250	2, 239	3.16	.044	2, 228	.43	> .250	2, 207	.06	> .250	2, 187	.89	> .250
Respect	238	-.32	> .250	2, 239	.88	> .250	2, 228	.51	> .250	2, 207	.08	> .250	2, 187	.62	> .250
Fin	238	.45	> .250	2, 239	.39	> .250	2, 228	.39	> .250	2, 207	.82	> .250	2, 187	.23	> .250
Gen ach goal	238	-1.23	.219	2, 239	.80	> .250	2, 228	.88	> .250	2, 207	2.39	.094	2, 189	1.34	> .250
Goal grades	238	2.14	.034	2, 239	.52	> .250	2, 238	2.89	.058	2, 207	1.31	> .250	2, 190	1.69	.188
Impl ach	236	1.87	.094	2, 237	5.30	.006	2, 226	4.05	.019	2, 205	1.05	> .250	2, 188	1.61	.203
Percent Impl ach	236	1.01	> .250	2, 237	1.41	.246	2, 226	.48	> .250	2, 205	.28	> .250	2, 188	.47	> .250

Note: Gen ach goal = general achievement goals. Impl ach = implicit achievement.

Table 4. Bivariate correlations between key study variables.

	Grade	Gen Ach	Inv	Warm	Mothers		Fathers		Obligations				Fin	Gen goal	Goal Grade	Impl Ach
	<i>n</i>	<i>n</i>	<i>n</i>	<i>n</i>	Supp	Contr	Inv	Warm	Supp	Contr	Assist	Resp	<i>n</i>	<i>n</i>	<i>n</i>	<i>n</i>
Gen Ach	.30***															
242																
Mothers' Inv	.12†	.11†														
237	237															
Mothers' Warmth	.21**	.25***	.75***													
237	237	239														
Mothers' Supp	.14*	.16*	.69***	.79***												
237	237	239	239													
Mothers' Cont	-.17*	-.08	-.60***	-.69***	-.73***											
236	236	238	239	238												
Fathers' Inv	.12†	.07	.41***	.31***	.27***	-.27***										
219	219	218	218	218	217											
Fathers' Warm	.16*	.16*	.34***	.46***	.35***	-.31***	.75***									
219	216	218	218	218	217	221										
Fathers' Supp	.13†	.13*	.32***	.40***	.40***	-.33***	.75***	.81***								
219	219	218	218	218	217	221	221									
Fathers' Cont	-.18*	.07	-.36***	-.37***	-.34***	.49***	-.45***	-.54***	-.57***							
219	219	214	214	214	214	217	217	217								
Assist Obl	.17**	.18**	.22***	.26***	.22**	-.08	.32***	.28***	.26***	-.07						
240	240	239	239	239	238	221	221	221	217							
Resp Obl	.15*	.22***	.28***	.41***	.36***	-.26***	.31***	.37***	.38	.25***	.41***					
240	240	239	239	239	238	221	221	221	217	242						
Finance Obl	.04	.13*	.21**	.31***	.30***	-.20**	.24***	.28***	.29***	-.11†	.39***	.60***				
240	240	239	239	239	238	221	221	221	217	242	242					
Gen ach goal	.09	.38***	.03	.01	.07	-.02	.09	.03	.03	-.06	.02	.12†	.01			
241	242	237	237	237	236	219	219	219	215	240	240	240				
Goal grades	.70***	.31***	.09	.20**	.11†	-.23***	-.02	.16*	.14*	-.16*	.13*	.19**	.06	.12†		
242	241	237	237	237	236	219	219	219	215	240	240	240	241			
Impl ach	.14***	.15*	.15*	.13*	.10	-.10	.07	.04	.06	-.05	.05	.16*	.13*	.08	.14*	
238	238	235	235	235	234	218	218	218	218	214	238	238	238	238		
Percent Impl ach	-.09	.14*	.03	.06	-.02	.03	.10	.07	.10	-.05	.10	.18**	.20	-.04	.01	.56***
238	238	235	235	235	234	218	218	218	218	214	238	238	238	238	238	240

Note. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Gen ach = general achievement. Inv = involvement. Warm = warmth. Supp = support. Cont = psychological control. Fin = financial support. Impl ach = implicit achievement.

Implicit motivation. Implicit achievement motivation was assessed using the Picture Story Exercise (PSE) (McClelland et al., 1989). Participants were shown a series of six ambiguous pictures. Each picture included at least two people engaged in an activity. Participants were asked to spend up to five minutes writing about what they thought is happening in the picture, who was involved, what they were thinking, or what happened before or would happen next. Participants were told to use their imagination and that there was no correct answer, and were assured that their spelling and grammar would not be judged. While participants were completing this section of the survey, a researcher or research assistant observed their participation to make sure that they spent at least a minute writing each story, and were not spending more than five minutes in order to ensure that participants could complete the entire survey in the allotted time. Although all the pictures are somewhat ambiguous, three pictures more strongly appeal to the achievement motivation, and the remaining three pictures are more ambiguous or appeal to other implicit motivations.

Stories written for the PSE were then coded for implicit achievement motivation, implicit power motivation, and implicit affiliation motivation by two of five trained implicit motivation coders according to the Winter manual (1994). The training procedure took approximately 25 hours and required trainees to code practice stories from the manual and discuss explanations for each coded motive. Each coder displayed good reliability when coding sample stories from the Winter manual. Each possible combination of coders coded at least 150 stories (i.e., stories from at least 25 participants); interclass correlations between each pair of coders was also acceptable ($> .70$). When there were disagreements between the two coders of each story, the mean scores were used.

The primary way in which implicit achievement motivation was used in this research was by examining the total number of times that achievement motives were coded in all six of the stories. Scores ranged from 0 – 7 (*M* and *SD* for all key variables are presented in Table 2). This provides a between-subject comparison of implicit achievement motivation, indicating how much a participant is implicitly motivated by achievement, relative to other participants. Supplemental analyses were run using the percent of total implicit motivation was coded for achievement. This was calculated by summing the total implicit achievement, power, and affiliation scores, then calculating the percent of those scores which were achievement-related. Percentages ranged from 0 (if no implicit achievement motives were coded) – 100 (if implicit achievement motives were coded and no affiliation or achievement motives were coded). This provides a measure of a participant’s implicit achievement motivation relative to his or her implicit power and affiliation motivation.

Explicit goals. Participants general achievement goals were measured with four items from the GOALS scale (Pohlmann & Brunstein, 1997), which asked participants how important it is to *develop their abilities, improve their education continuously, learn more things, and always improve*. Due to a coding error, participants at Site D rated the importance of these goals on a 7-point scale, all others responded on a 6-point scale from *very unimportant to very important*. A linear transformation was used to combine the two scales so that all scores reflect a 6-point scale; results were substantively the same when analyses were run separately between the two groups. Reliability of the four items was good ($\alpha = .83$); scores from the four items were averaged (Range = 3 – 6). General

achievement goals were not significantly associated with implicit achievement motivation ($r = .08, p = .203$).

Additionally, participants were asked to identify goal grades, on a 6-point scale from *Mostly lower than C's, Mostly C's, B's and C's, Mostly B's, A's and B's* to *Mostly A's*. Scores ranged from 1 (i.e., *Mostly lower than C's*) to 6 (i.e., *Mostly A's*). There was a small but significant correlation between school goals and implicit achievement motivation ($r = .14, p = .032$). General achievement goals and specific academic achievement goals were only marginally correlated ($r = .12, p = .068$), so were analyzed separately.

Achievement. Success in attaining achievement goals were asked with items that paralleled the achievement goal items. General achievement attainment was measured by asking participants how successful they were in *developing their abilities, improving their education continuously, learning more things, and always improving*. As with the goals, participants at Site D rated their success on a 7-point scale, all others responded on a 6-point scale from *very unimportant* to *very important*, and a linear transformation was used so that all were on a 6-point scale. Reliability of the 4 items was good ($\alpha = .83$), so items were averaged.

Grades were also assessed with an item that paralleled the goal grades. Participants were asked for their overall grades, this year. Participants responded on a 6-point scale, from *Mostly lower than C's* to *Mostly A's*; responses ranged from 1 – 6.

Goal congruence. Goal congruence was calculated in two ways, depending on whether it was used as a predictor of achievement or well-being (i.e., Research Aims 1, 2, and 5) or as an outcome of relationships (i.e., Research Aim 4). When used as a predictor, an interaction term was created using the centered explicit achievement goal or school goal

and implicit achievement motivation. When used as an outcome, median splits of implicit motivation and of explicit goal values were used, and congruence defined as when a participant was high in both implicit achievement motivation and explicit achievement or grade goals or low in implicit achievement motivation and explicit achievement or grade goals.

Education-related primary and secondary control strategies. Participants' Ed-SPC strategy use was measured using four items which asked about the degree to which the individual uses selective primary control strategies in educational settings, such as *I will put time and effort into my education whenever I can*. These items were asked using a 5-point scale, from strongly disagree to strongly agree. The four items showed good reliability ($\alpha = .80$) and were averaged ($M = 4.17, SD = .76$).

Participants' Ed-CPC strategy use was measured using three items which asked about the degree to which the individual uses compensatory primary control strategies in educational settings, such as *If I run into obstacles with my educational plans, I will ask others for advice*. These items were asked using a 5-point scale, from strongly disagree to strongly agree. The three items showed adequate reliability ($\alpha = .67$) and were averaged ($M = 4.03, SD = .76$).

Participants' Ed-SSC strategy use was measured with four items which asked about the degree to which the individual uses selective secondary control strategies in educational settings, such as *I often remind myself how important it is for my future to have a good education*. These items were asked using a 5-point scale, from strongly disagree to strongly agree. The four items showed adequate reliability ($\alpha = .68$) and were averaged ($M = 3.94, SD = .66$).

Relationships with family. Adolescents' perceptions of their relationships with their parents were assessed using two scales. First, the Perceptions of Parents – College Student Scales (POP-CSS) (Niemiec et al., 2006) measured perceptions of mothers and fathers separately. Specifically, POP-CSS measured perceptions of mothers' and fathers' warmth (6 items each for mothers and fathers, e.g., *My mother/father typically is happy to see me*), parents' involvement in adolescents' lives (6 items each for mothers and fathers, e.g., *My mother/father puts time and energy into helping me*), and parents' support for adolescents' autonomy (9 items each for mothers and fathers, e.g., *My mother/father allows me to decide things for myself*). These scales are designed for older adolescents or college students. Items are rated on a scale of 1 (*not at all true*) to 5 (*very true*). Items were asked separately for mothers and fathers, resulting in six scales (i.e., warmth from mothers, warmth from fathers, etc.) and then averaged. Reliability within each scale was good (mothers' warmth: $\alpha = .85$, support: $\alpha = .85$, involvement $\alpha = .77$; fathers' warmth: $\alpha = .83$, support: $\alpha = .85$, involvement: $\alpha = .78$), so items were averaged for each scale.

Adolescents' perceptions of their parents' attempts at psychological control was measured with the Psychological Control Scale – Youth Report (PCS-YR) (Barber, 1996). The PCS-YR is an 8-item measure of mothers' and fathers' use of psychological control to influence their children's behavior or psychological well-being with specific items for invalidating feelings (e.g., *is always trying to change how I feel or think about things*), constraining verbal expressions (e.g., *often interrupts me*), personal attacks (e.g., *blames me for other family members' problems*). Items were rated on a scale of 1 (*not like her/him*) to 3 (*a lot like her/him*). Reliability was good for mothers ($\alpha = .84$) and fathers ($\alpha = .85$) so each was averaged.

Finally, because there were significant correlations between perceptions of warmth, support, involvement, and psychological control (negatively correlated with the others), an additional set of analyses used the composite measure of each relationship. Psychological control was first reverse coded, then a linear transformation was used so that it was on the same scale as the others. The mean of participants' perceptions of warmth, support, involvement and psychological control was taken for mothers ($\alpha = .90$, $M = 3.50$, $SD = .45$) and fathers ($\alpha = .88$, $M = 3.20$, $SD = .56$).

Family obligations were assessed through participants' perceptions of the degree to which they felt they needed to provide assistance in daily tasks (11 items such as "*Run errands that the family needs done*"), respect their family (7 items such as "*Treat your parents with great respect*") and provide support to their family in the future (6 items such as "*Help your parents financially in the future*") (Fulgini & Pedersen, 2002). Items were measured on a 5-point scale from *Almost never* to *Almost always*. Each scale showed good reliability ($\alpha > .76$), so means of the component items were taken to create each scale. These measures are included in supplementary analyses of relationships with parents.

Well-being and life satisfaction. Well-being was measured using the 10-item Positive and Negative Affect Schedule for Children (PANAS-C) (Ebesutani et al., 2012; Watson, Clark, & Tellegen, 1988). The PANAS-C includes five items of participants' positive mood (e.g., *enthusiastic* and *proud*) and five items of their negative mood (e.g., *irritable* and *upset*) experienced over the previous week. Items are assessed on a 5-point scale from *Very slightly or not at all* to *Extremely*. Reliability was good for both PA ($\alpha = .91$) and NA ($\alpha = .83$). PA and NA were significantly, but only small-moderately, negatively correlated ($r = -.18$, $p = .006$), so were analyzed separately.

Demographic information. Participants' gender, grade in school, ethnicity (coded as Hispanic, Caucasian, or other), mother's and fathers' education (coded as less than high school, high school completion, and more than high school), and generation status (coded as 1st generation if they were born outside of the United States, 2nd generation if they were born in the United States but both parents were born elsewhere, or 3rd generation, if they and at least one parent were born in the United States) were gathered through self-reports.

Finally, 22 participants (9%) reported they were not living with their biological mother. Fifty-seven (23%) reported they were not living with a father or stepfather, and 77 (32%) participants reported they were not living with their biological father. Additional supplementary analyses examined whether findings about relationships with mothers and fathers are specific to biological mothers, biological fathers with whom the participants live, or father and stepfathers with whom participants live.

Statistical Analyses

All analyses were conducted in Stata/IC 13.1 (StataCorp, 2013). Preliminary analyses examined whether there were any differences in key study variables by demographic characteristics (i.e., gender, grade-level, ethnicity, generation status, and parents' education). Bivariate correlations, independent samples *t*-tests and one-way ANOVAs were used for these analyses. These results were used to inform hypothesis testing models.

Hypothesis testing. Participant characteristics, predictor, and outcome variables differed by recruitment site. Recruitment site explained a significant amount of variance in the primary outcome of grades (ICC = .13, LR $\chi^2 = 14.68$, $p < .001$) after controlling for demographic information. Because of this, multilevel modeling (MLM) was used for all

hypothesis testing, with participants nested within recruitment sites. All models include gender, grade level, ethnicity, father's education (with mother's education as a proxy if participants did not know their father's education), and generation status as covariates, since each of these was significantly associated with at least one key study variable. The specific hypotheses are tested as follows:

Hypothesis 1a. This hypothesis predicts that implicit achievement motivation and explicit goals are associated with achievement. Model 1.1 tests the associations of implicit achievement motivation scores and goal grades with grades. Model 1.2 tests the associations of implicit achievement motivation and general achievement goals with grades. Models 1.3 and 1.4 test repeat these models but examine associations with general achievement attainment instead of grades.

Hypothesis 1b. This hypothesis predicts that the interaction between implicit achievement motivation and explicit achievement goals is associated with achievement. Two interactions were created using centered variables: the interaction between implicit achievement motivation and goal grades, and the interaction between implicit achievement motivation and general achievement goals. These interactions are added to Models 1.1-1.4 run in Hypothesis 1a (i.e., Models 1.5-1.8 are created). Significant interactions are plotted and displayed in figures.

Hypothesis 2a. This hypothesis predicts that implicit motivation and explicit goals are associated with Ed-SPC. Model 2.1 tests these associations with implicit motivation and goal grades. Model 2.2 tests these associations with general achievement goals instead of goal grades.

Hypothesis 2b. This hypothesis predicts that the interactions between implicit motivation and explicit goals are associated with Ed-SPC. To test this, the two interaction terms created for Hypothesis 1b are added to Models 2.1 and 2.2. That is, Model 2.3 tests associations of implicit achievement motivation, explicit goal grades, and their interaction with Ed-SPC, and Model 2.4 tests associations of implicit achievement motivation, general achievement goals, and their interaction with Ed-SPC.

Hypotheses 2c and 2d. These hypotheses predict significant indirect effects of implicit achievement motivation and explicit achievement goals and their interaction on achievement through Ed-SPC. Ed-SPC is added to each of the models tested in Hypothesis 1, creating Models 2.5-2.12. Subsequently, the indirect effect of each is tested with the Stata `ml_mediation` command, which provides the indirect effect as a product of coefficients for multilevel models as well as the total effect of a predictor variable on an outcome through the mediator. Indirect and total effects of implicit achievement motivation, explicit goals, and their interactions are examined for each model.

Hypothesis 3a. This hypothesis predicts achievement to be associated with relationships with mothers and fathers. Relationships with mothers and fathers are tested in separate models. Model 3.1 tests associations between each aspect of the relationship with mothers (i.e., mothers' warmth, involvement, support, and psychological control) and grades. Since aspects of the relationship are correlated and may explain similar variance in the outcomes, the associations between the composite mothers' relationship is tested in Model 3.2. Parallel models are then tested for relationships with fathers: Model 3.3 includes each aspect of the relationship with fathers, and Model 3.4 includes the composite fathers'

relationship. Next, each of these models is duplicated (i.e., models 3.5-3.8 are tested) to test associations with general achievement attainment in place of grades.

Hypothesis 3b. This hypothesis predicts Ed-SPC to be associated with relationships with mothers and fathers. To test whether relationships with mothers and fathers are associated with Ed-SPC, each of models 3.1-3.4 are duplicated (creating Models 3.9-3.12) with Ed-SPC as the outcome instead of achievement.

Hypothesis 3c. This hypothesis examines indirect and total effects of each aspect of each relationship on grades and general achievement through Ed-SPC. Ed-SPC is added to each of Models 3.1-3.8, then indirect and total effects for each aspect of the relationships as well as the composite relationship measures are computed within each model using the same `ml_mediation` command used in Hypothesis 2c and 2d.

Hypothesis 4. This hypothesis predicts that family relationships are associated with congruence between implicit motivation and explicit goals. For these models, congruence is coded as a binary variable. Participants who are above median in both implicit achievement motivation and explicit achievement goals, or below the median in both, are categorized as motive-congruent, while those who are above the median in one and below the median in the other are categorized as motive-incongruent. Multi-level logistic models test these hypotheses. Model 4.1 tests associations between different aspects of mothers' relationship and congruence between implicit motivation and goal grades, and Model 4.2 test their associations with congruence between implicit motivation and general achievement goals. Models 4.3 and 4.4 repeat these analyses with relationships with fathers instead of with mothers. Because there are specific and different hypotheses for the

different aspects of the relationships, the composite measures of relationships with mothers and with fathers is not be tested.

Hypothesis 5a. This hypothesis predicts associations between implicit motivation, explicit goals, achievement and well-being. Model 5.1 tests whether PA is associated with implicit achievement motivation, goal grades, and actual grades. Model 5.2 tests whether PA is associated with implicit achievement motivation, general achievement goals and grades. Models 5.3 and 5.4 repeat those models but replacing grades with general achievement success. Finally, Models 5.5-5.8 repeat each of the previous models, using NA as an outcome instead of PA.

Hypothesis 5b. This hypothesis predicts associations between well-being and the interactions between implicit achievement motivation, explicit goals, and achievement attainment. Four different 3-way interactions are examined, according to the predictor variables used in Models 5.1-5.4 and 5.5-5.8. These interactions are added to Models 5.1-5.8, creating Models 5.9-5.16. Any significant 3-way interactions are plotted.

Hypothesis 6a. This hypothesis predicts that adolescents use more Ed-SSC and Ed-CPC strategies when implicit achievement motivation and explicit achievement goals are incongruent or both low. Main effects of implicit achievement motivation and explicit school goals are tested on Ed-SSC are tested first, in Model 6.1, followed main effects of implicit achievement motivation and explicit general achievement goals in Model 6.2. Interactions between implicit achievement motivation and explicit school goals and general achievement goals are tested in Models 6.3 and 6.4 respectively. These analyses are repeated in Models 6.5-6.8 with Ed-CPC as the outcome in place of Ed-SSC.

Hypothesis 6b. Three-way interactions between Ed-SSC, implicit achievement motivation, and explicit school goals or explicit general achievement goals are created, as are 3-way interactions with Ed-CPC. Associations between grades and the interaction between Ed-SSC, implicit achievement motivation and explicit goal grades or general achievement goals are tested in Models 6.9 and 6.10, respectively, while these associations with general achievement attainment are tested in Models 6.11 and 6.12. Subsequently, these associations with Ed-CPC instead of Ed-SSC are tested in Models 6.13-6.16.

Hypothesis 7a and 7b. These hypotheses predict relationships with mothers and fathers are associated with Ed-SSC and Ed-CPC. To test these hypotheses, the analyses used in Hypothesis 3b are duplicated with Ed-SSC as the outcome in Models 7.1-7.4 (for Hypothesis 7a), followed by Ed-CPC as the outcome in Models 7.5-7.8 (for Hypothesis 7b).

Supplemental analyses. To identify effects of the percent of implicit motivation that reflects achievement, each of the above analyses that includes implicit achievement motivation is duplicated using the percent of implicit motivation that that reflects achievement, replacing the overall achievement motivation scores. To determine whether perceptions of family obligations are associated with achievement, Ed-SPC, Ed-SSC, or Ed-CPC, all models which involve perceptions of relationships with parents are repeated with perceptions of obligations in place of relationships with mothers or fathers. Finally, each of the analyses which includes relationships with mothers and fathers is duplicated including only those participants living with their biological mother or father, respectively, and also those living with a biological father or step-father. Each of these supplemental analyses is discussed following the research aim that it pertains to.

CHAPTER 5: Results

Preliminary results

Preliminary analyses examined differences in participants' grades, general achievement attainment, perceptions of relationships with mothers and fathers, explicit achievement goals and implicit achievement motivation, and education-related primary and secondary control strategies by gender, ethnicity, generation status, and highest level of mothers' and fathers' education, and grade-level. Means and standard deviations for the different groups are presented above in Table 2; significance values are presented in Table 3. Grade-level was treated as a continuous variable; correlations are reported in the text below.

Grades. Girls reported significantly higher grades than boys. Generation status was significantly associated with grades; post-hoc comparisons showed that 1st generation students reported higher grades than 2nd generation students ($p < .05$) while 3rd generation students were not significantly different from either of the other groups ($p > .05$). Fathers' education was associated with grades such that students with fathers who completed at least some post-secondary education reported higher grades than those whose parents completed high school ($p < .05$); grades reported by students whose parents did not complete high school were not significantly different from other groups ($p > .05$). No significant differences were found in grades by ethnicity, mothers' education, or grade-level ($r = .06, p > .250$).

General achievement attainment. No significant differences were found in general achievement attainment by gender, ethnicity, generation status, mothers' education, fathers' education, or grade-level ($r = -.06, p > .250$).

Relationships with parents. Overall, mothers were perceived to be more involved than fathers [$t(217) = 7.49, p < .001$], warmer than fathers [$t(218) = 5.04, p < .001$], more supportive than fathers [$t(217) = 4.69, p < .001$], and marginally more controlling than fathers [$t(213) = 1.86, p = .065$].

Gender. Boys perceived fathers to be more involved and more supportive than girls. However, there were no differences in perceptions of fathers' warmth or psychological control by gender, nor were there gender differences in perceptions of mothers' involvement, warmth, support, or psychological control.

Ethnic differences. There were significant ethnic differences in perceptions of fathers' warmth such that Caucasians perceived more warmth from fathers than other ethnic groups ($p < .05$); neither group was significantly different from Hispanics ($p > .05$). However, there were no significant ethnic differences in perceptions of fathers' involvement, support, or psychological control. There are also no significant ethnic differences in perceptions of mothers' involvement, warmth, support, or psychological control. Perceptions of the need to assist family members was significantly associated with ethnicity, though there were no significant pair-wise comparisons ($ps < .05$), and there were no differences in perceptions of the need to respect or help financially.

Grade-level. Older participants perceived mothers to be less involved ($r = -.17, p = .009$), warm ($r = -.15, p = .024$), and supportive ($r = -.18, p = .005$) and more psychologically controlling ($r = .14, p = .030$). Similarly, older participants perceived fathers to be less involved ($r = -.21, p = .002$), warm ($r = -.15, p = .025$), and supportive ($r = -.20, p = .003$) and more psychologically controlling ($r = .14, p = .047$). Older participants were more likely to feel obligated to respect family ($r = .41, p < .001$) and to help financially ($r = .39, p < .001$),

but grade level was not associated with perceptions of the need to assist family ($r = -.05, p > .250$).

Generation status. Generation status was not associated with any aspect of relationships with mothers or with fathers, nor was it associated with perceptions of obligations toward family.

Parents' education. Mothers' education was not associated with perceptions of any measures of relationships with mothers or with fathers. Fathers' education was associated with perceptions of fathers' involvement such that participants whose fathers completed at least some post-secondary school perceived greater involvement from their fathers than students whose fathers completed less than high school ($p < .05$). Fathers' education was not associated with perceptions of fathers' warmth, or psychological control, and was marginally associated with perceptions of fathers' support, though there were no significantly different pair-wise contrasts ($ps > .05$). Fathers' education was not associated with perceptions of any aspect of relationships with mothers. Neither mothers' nor fathers' education were associated with any perceptions of family obligations.

Explicit goal grades and general achievement goals. Boys had lower goal grades than girls, and generation status was marginally associated with goal grades. Post-hoc tests revealed that 1st generation participants had higher goals than 2nd generation participants ($p < .05$). There were no differences in goal grades by ethnicity, mothers' education or fathers' education. Mothers' education was marginally associated with general achievement goals, but no pairwise contrasts were significantly different. General achievement goals were not associated with gender, ethnicity, generation status, or fathers' education.

Implicit achievement motives. The number of achievement motive codes was associated with ethnicity and generation status, and girls included marginally more achievement motives than boys. Post-hoc tests showed that Caucasian participants included more implicit achievement motives than Hispanic participants ($p < .05$), but neither was significantly different from other participants ($ps > .05$). Despite the overall effect of generation status, post-hoc tests revealed no significant pairwise differences. The number of implicit achievement motives coded was not associated with mothers' education, fathers' education, or grade level ($r = -.01, p > .250$). The percent of implicit motives coded for achievement was not associated with gender, ethnicity, generation status, mothers' education or fathers' education, or grade level ($r = -.04, p > .250$).

Congruence between implicit and explicit. Participants with mothers with less than a high school education were less likely to have congruent implicit achievement motivation and general achievement goals [$\chi^2 (2) = 6.513, p = .039$]. There were no other group differences in congruence between implicit achievement motivation and general achievement goals [gender: $\chi^2 (2) = .002, p > .250$; ethnicity: $\chi^2 (2) = 1.790, p > .250$; generation status: $\chi^2 (2) = .487, p > .250$; fathers' education: $\chi^2 (2) = 1.381, p > .250$], nor was it associated with grade level ($r_{pb} = -.03, p > .250$). Similarly, congruence between implicit achievement motivation and explicit school goals was not associated with any group differences [gender: $\chi^2 (2) = 1.858, p = .173$; ethnicity: $\chi^2 (2) = 3.871, p = .144$; generation status: $\chi^2 (2) = 4.371, p = .112$; mother's education: $\chi^2 (2) = 2.840, p = .242$; fathers' education: $\chi^2 (2) = 1.381, p > .250$] or grade level ($r_{pb} = -.03, p > .250$).

Hypothesis testing

Because preliminary analyses showed that gender, grade level, ethnicity, generation status, and fathers' education were all significantly associated with outcome or predictor variables, these were included as covariates for all hypothesis testing. Mothers' education was largely unrelated to any key variables, so was not included in any of the following analyses. The total word-count of PSE stories written was associated with implicit achievement motivation, as well as implicit power and affiliation motivations, so was included as a covariate for all analyses that included implicit achievement motivation, as recommended by Schultheiss and Pang in their guidelines for measuring and analyzing implicit motivation (2007).

Hypothesis 1a. Results for Hypothesis 1a, that implicit achievement motivation and explicit achievement goals are associated with grades and general achievement attainment, are presented in Table 5. As predicted, explicit school goals were positively associated with grades (Model 1.1), although general achievement goals were not (Model 1.2). Explicit school goals were also associated with general achievement attainment (Model 1.3), as were general achievement goals (Model 1.4). Contrary to predictions, implicit achievement motivation was not associated with grades (Models 1.1 and 1.2) and only marginally associated with general achievement goals (Models 1.3 and 1.4).

Table 5. Multilevel modeling results for Research Aim 1: Associations between implicit motivation and explicit goals and achievement

	Grades		General Achievement	
	Model 1.1 B [95% CI]	Model 1.2 B [95% CI]	Model 1.3 B [95% CI]	Model 1.4 B [95% CI]
Fixed effects				
Female	-.01 [-.31, .30]	.10 [-.32, .52]	-.21 [-.47, .04]	-.14 [.39, .11]
Grade in school	.02 [-.11, .16]	.02 [-.17, .20]	-.04 [-.15, .07]	-.04 [-.15, .07]
Ethnicity				
Caucasian	.16 [-.36, .67]	-.20 [-.94, .54]	.25 [-.18, .67]	.07 [-.34, .49]
Other	-.06 [-.53, .42]	.12 [-.56, .79]	-.21 [-.60, .18]	-.24 [-.62, .14]
Generation				
2 nd	-.04 [-.50, .42]	-.27 [-.89, .36]	-.14 [-.52, .24]	-.17 [-.54, .21]
3 rd +	.21 [-.23, .65]	-.06 [-.67, .55]	-.13 [-.49, .24]	-.12 [-.48, .24]
Father's education				
High school	-.20 [-.56, .16]	-.18 [-.67, .32]	.02 [-.28, .31]	-.02 [-.31, .27]
> High school	.04 [-.36, .45]	.46 [-.11, 1.03]	.08 [-.25, .41]	.29 [-.04, .62]†
PSE word-count	.01 [.00, .01]*	.01 [.00, .01]***	.00 [-.00, .00]	.00 [-.00, .00]
Impl ach	-.01 [-.10, .09]	.03 [-.09, .16]	.07 [-.01, .15]†	.08 [-.00, .15]†
Goal grades	.99 [.85, 1.13]***		.26 [.14, .39]***	
Gen ach goal		.22 [-.12, .55]		.49 [.28, .69]***
Constant	-1.57 [-2.57, -.57]**	1.97 [-.23, 4.18]†	3.49 [2.66, 4.32]***	1.94 [.63, 3.26]**
Random				
Intercept	.01 [.00, 4.70]	.14 [.02, .98]	.00 [.00, 1.70]	.00 [.00, .00]
Residual	.97 [.79, 1.18]	1.75 [1.44, 2.13]	.66 [.55, .81]	.65 [.54, .79]

Notes. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Impl ach = Implicit achievement motivation. Gen ach goal = general achievement goals.

Hypothesis 1b. Results for Hypothesis 1b, that the interactions between implicit achievement motivation and explicit achievement goals are associated with grades and general achievement attainment, are presented in Table 6. The interaction between goal grades and implicit achievement motivation was only marginally associated with grades (Model 1.5), and contrary to predictions, the interaction between implicit achievement motivation and general achievement goals was not associated with grades (Model 1.6) or with general achievement attainment (Model 1.8). As predicted by Hypothesis 1b, the interaction between implicit achievement motivation and explicit goal grades was significantly associated with general achievement attainment (Model 1.7), and is plotted in

Figure 2. Rather than indicating that pursuing hot goals is most related to achievement, this interaction shows that when either implicit achievement motivation or explicit goal grades are high, participants had high levels of general achievement attainment, but suggest that there was limited added value if both were high. These findings suggest that although the interactions between implicit achievement motivation and explicit achievement goals may be important, as predicted by Hypothesis 1b, implicit motivation and explicit goals may have compensatory effects, rather than additive effects.

Table 6. Multilevel models for Hypothesis 1b: Testing interactions between implicit and explicit motives predicting grades and general achievement.

	Grades		General Achievement	
	Model 1.5 B [95% CI]	Model 1.6 B [95% CI]	Model 1.7 B [95% CI]	Model 1.8 B [95% CI]
Fixed effects				
Female	-.03 [-.33, .28]	.11 [-.31, .53]	-.18 [-.43, .07]	-.14 [-.40, .11]
Grade in school	.01 [-.12, .15]	.02 [-.17, .20]	-.03 [-.14, .08]	-.04 [-.15, .07]
Ethnicity				
Caucasian	.13 [-.49, .43]	-.20 [-.94, .53]	.29 [-.12, .71]	.08 [-.34, .50]
Other	-.03 [-.50, .45]	.12 [-.55, .80]	-.25 [-.64, .13]	-.24 [-.63, .14]
Generation				
2 nd	-.03 [-.49, .43]	-.27 [-.90, .36]	-.16 [-.53, .21]	-.17 [-.54, .21]
3 rd +	.23 [-.21, .67]	-.05 [-.66, .55]	-.15 [-.51, .21]	-.12 [-.48, .24]
Father's education				
High school	-.20 [-.55, .16]	-.18 [-.68, .32]	.01 [-.27, .31]	-.02 [-.31, .27]
> High school	.04 [-.36, .4]	.46 [-.11, 1.03]	.08 [-.24, .41]	.29 [-.04, .62]†
PSE word-count	.01 [.00, .01]***	.00 [.00, .00]***	.00 [-.00, .00]	.00 [-.00, .00]
Impl ach	-.03 [-.13, .07]	-.03 [-.11, .16]	.10 [.02, .18]*	.08 [.00, .16]*
Goal grade	1.01 [.87, 1.16]***		.23 [.11, .35]***	
Gen ach goal		.23 [-.11, .58]		.48 [.27, .69]***
Implicit x Explicit	.08 [-.01, .18]†	.06 [-.18, .29]	-.12 [-.20, -.04]**	-.03 [-.18, .11]
Constant	3.40 [2.65, 4.16]***	3.19 [2.08, 4.29]	4.94 [4.33, 5.56]***	4.75 [4.12, 5.37]***
Random				
Intercept	.00 [.00, 2.97]	.14 [.02, .95]	.00 [.00, .00]	.00 [.00, .00]
Residual	.95 [.78, 1.16]	1.75 [1.43, 2.13]	.64 [.52, .77]	.65 [.54, .79]

Notes. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Impl ach = Implicit achievement motivation. Gen ach goal = general achievement goals.

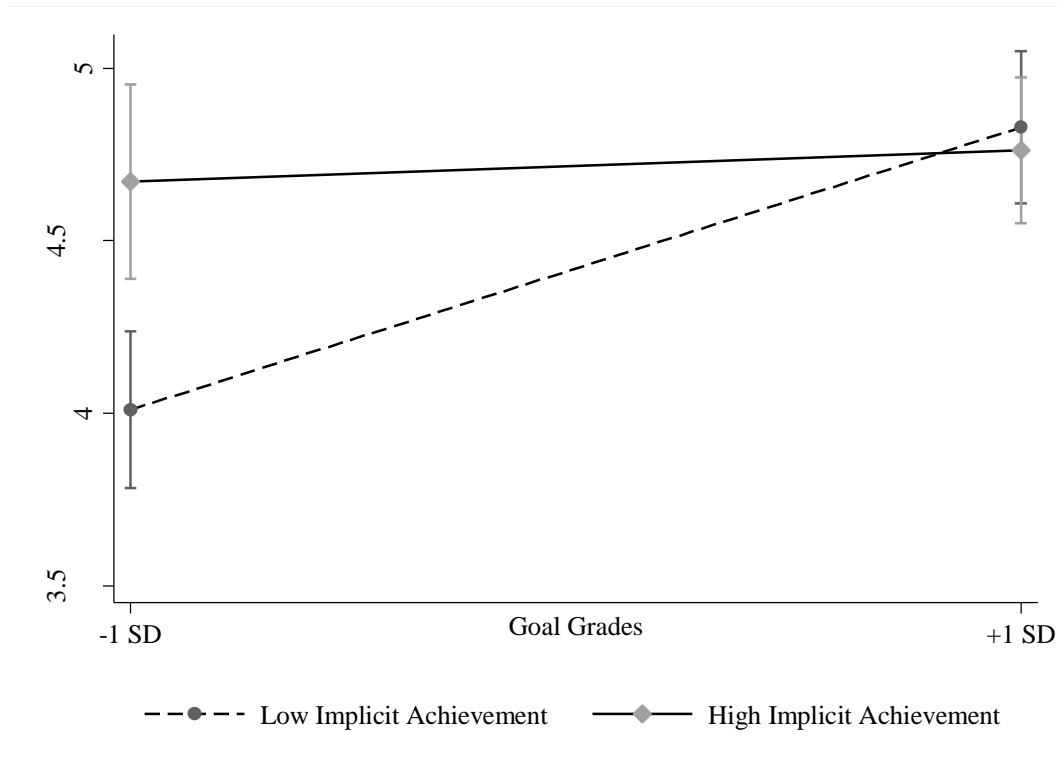


Figure 2. Interaction between implicit achievement motivation and explicit goals predicting general goal attainment. Implicit achievement motivation and explicit goal grades are plotted at +/-1 SD from their respective means.

Supplementary analyses for Research Aim 1. Supplemental analyses revealed that the percent of implicit motivation had similar associations with achievement as the overall number of achievement-scores. The percent of implicit motivation related to achievement was significantly positively associated with general achievement success when controlling for school goals ($B = .73$, 95% CI [.06, 1.42], $p = .032$) or general achievement goals ($B = .87$, 95% CI [.20, 1.54], $p = .011$), but not with grades ($ps > .05$), like the results with total implicit achievement scores (Hypothesis 1a). There were no significant associations between interactions of percent of implicit achievement motives by explicit goals with achievement ($ps > .05$), contrary to Hypothesis 1b.

Hypothesis 2a. Results for Hypothesis 2a, that implicit achievement motivation and explicit goals are associated Ed-SPC, are presented in Models 2.1 and 2.2 in Table 7. As predicted by Hypothesis 2a, explicit school goals (Model 2.1) and general achievement goals (Model 2.2) were associated with Ed-SPC. However, contrary to Hypothesis 2a, implicit achievement motivation was not associated with Ed-SPC in either model, suggesting that the main effects of explicit goals are more important than those of implicit motivation for Ed-SPC.

Table 7. Multilevel models for Hypothesis 2a and 2b: Testing associations between implicit motivation, explicit goals, and their interactions and Ed-SPC.

	Hypothesis 2a: Main effects		Hypothesis 2b: Interactions	
	Model 2.1 B [95% CI]	Model 2.2 B [95% CI]	Model 2.3 B [95% CI]	Model 2.4 B [95% CI]
Fixed effects				
Female	-.11 [-.31, .08]	-.07 [-.27, .14]	-.09 [-.28, .10]	-.06 [-.27, .14]
Grade in school	.01 [-.08, .10]	.02 [-.06, .12]	.02 [-.06, .10]	.03 [-.06, .12]
Ethnicity				
Caucasian	.16 [-.18, .50]	.05 [-.30, .41]	.16 [-.17, .49]	.05 [-.31, .41]
Other	-.29 [-.61, .02]†	-.22 [-.4, .11]	-.35 [-.65, -.04]*	-.21 [-.53, .12]
Generation				
2 nd	-.08 [-.37, .21]	-.11 [-.41, .19]	-.10 [-.39, .18]	-.11 [-.41, .20]
3 rd +	-.05 [-.34, .23]	-.09 [-.39, .20]	-.07 [-.34, .21]	-.09 [-.38, .20]
Father's education				
High school	-.06 [-.29, .17]	-.06 [-.30, .18]	-.07 [-.29, .16]	-.05 [-.30, .19]
> High school	-.08 [-.34, .18]	.12 [-.16, .40]	-.09 [-.34, .17]	.12 [-.15, .40]
PSE word-count	.00 [-.00, .00]	.00 [-.00, .00]†	.00 [-.00, .00]	.00 [-.00, .00]†
Impl ach	.04 [-.12, .10]	.04 [-.02, .11]	.06 [.00, .13]*	.04 [-.03, .10]
Goal grade	.30 [.21, .39]***		.27 [.18, .36]***	
Gen ach goal		.40 [.24, .57]***		.42 [.25, .59]***
Implicit x Explicit			-.09 [-.15, -.03]**	.06 [-.05, .17]
Constant	2.66 [2.01, 3.31]	1.80 [.73, 2.87]**	4.27 [3.79, 4.76]***	4.05 [3.51, 4.58]***
Random				
Intercept	.02 [.00, .15]	.03 [.01, .16]	.01 [.00, .13]	.03 [.01, .16]
Residual	.38 [.31, .46]	.42 [.34, .50]	.37 [.30, .45]	.41 [.34, .50]

Notes. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Impl ach = Implicit achievement motivation. Gen ach goal = general achievement goals.

Hypothesis 2b. Results for Hypothesis 2b, that the interactions between implicit achievement motivation and explicit goals are associated with Ed-SPC are presented above in Models 2.3 and 2.4 in Table 7. The interaction between implicit achievement motivation and goal grades was significantly associated with Ed-SPC (Model 2.3) as predicted by Hypothesis 2b and is plotted in Figure 3. This interaction, like the interaction predicting achievement attainment, suggests that high levels of either implicit achievement motivation or goal grades is sufficient for higher Ed-SPC but that there may be limited additive value of both being high. However, as with Hypothesis 1b, the interaction between implicit achievement motivation and the more general achievement goals was not associated with Ed-SPC (Model 2.4), suggesting that the compensatory effects of implicit motivation and explicit goals are stronger for school goals than for general achievement goals.

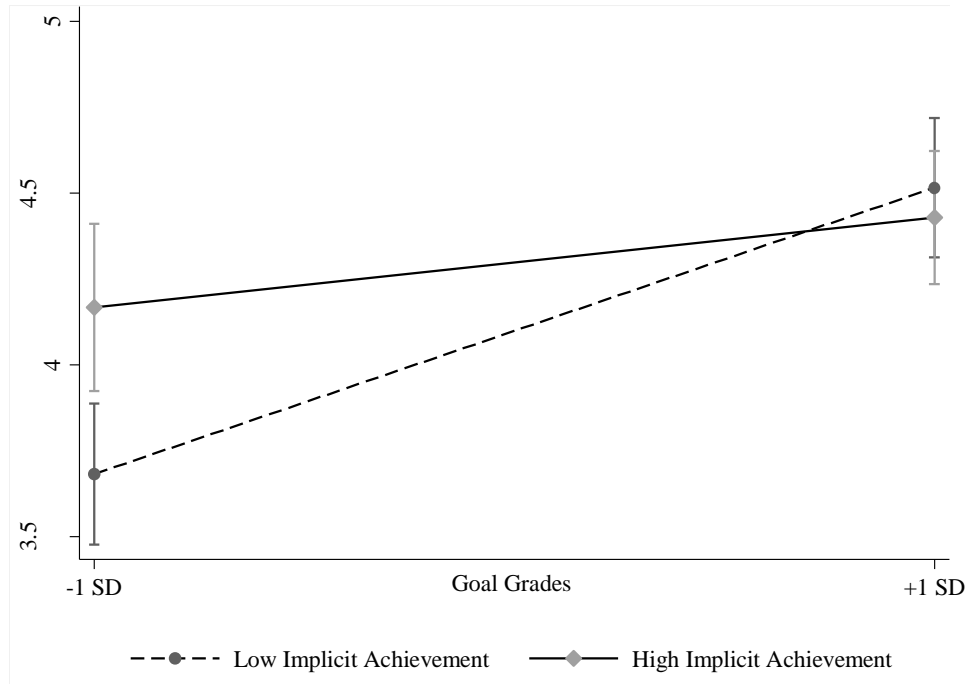


Figure 3 . Interaction between implicit achievement motivation and explicit goals predicting Ed-SPC. Implicit achievement motivation and explicit goal grades are plotted at +/- 1 SD from their respective means.

Hypothesis 2c. Results from the multilevel models for Hypothesis 2c, that there are significant indirect effects of implicit achievement motivation and explicit achievement goals on achievement, are presented in Table 8. Overall, there was only limited support for Hypothesis 2c. First, Ed-SPC was largely associated with both grades and general achievement goals, with the exception of when goal grades were included in the model (Model 2.5). Ed-SPC was associated with grades when general achievement goals were in the model (Model 2.6) and was associated general achievement when either goal grades (Model 2.7) or general achievement goals (Model 2.8) were included in the model. Indirect and total effects for Hypothesis 2c are presented below in Table 9. Contrary to our predictions, there were no indirect or total effects of implicit achievement motivation on grades through Ed-SPC when controlling for school goals (Model 2.5) or general

achievement goals (Model 2.6). Although there were no indirect effects of implicit achievement motivation on general achievement when controlling for school goals (Model 2.7), or general achievement goals (Model 2.8), there were significant total effects of implicit achievement motivation in these models, suggesting that implicit achievement motivation is a significant predictor of general achievement goal attainment, though possibly not through Ed-SPC.

The indirect and total effects of explicit goals on achievement were more closely aligned with predictions. There were significant total but not indirect effects of goal grades on grades (Model 2.5) and significant indirect but not total effects of general achievement goals on grades (Model 2.6). There were both indirect and total effects of goal grades and general achievement goals on general achievement attainment (Models 2.7 and 2.8) suggesting that explicit goals are associated with general achievement success through their associations with Ed-SPC. This suggests that although explicit goals are relevant predictors, there may be other factors that have larger associations with grades.

Table 8. Multilevel models for Hypothesis 2c: Implicit achievement motivation, explicit goals, and Ed-SPC predicting grades and general achievement success.

	Grades		General achievement	
	Model 2.5 B [95% CI]	Model 2.6 B [95% CI]	Model 2.7 B [95% CI]	Model 2.8 B [95% CI]
Fixed effects				
Female	.01 [-.30, .32]	.15 [-.25, .55]	-.15 [-.38, .09]	-.11 [-.35, .12]
Grade in school	.02 [-.12, .15]	-.00 [-.18, .17]	-.04 [-.15, .06]	-.04 [-.14, .06]
Ethnicity				
Caucasian	.15 [-.37, .67]	-.20 [-.90, .50]	.16 [-.25, .57]	.05 [-.34, .45]
Other	-.04 [-.53, .44]	.24 [-.40, .89]	-.10 [-.48, .28]	-.10 [-.47, .27]
Generation				
2 nd	-.03 [-.49, .43]	-.20 [-.80, .40]	-.13 [-.48, .23]	-.13 [-.48, .22]
3 rd +	.22 [-.22, .66]	.01 [-.57, .59]	-.08 [-.42, .27]	-.07 [-.41, .27]
Father's education				
High school	-.21 [-.56, .15]	-.15 [-.63, .32]	.04 [-.24, .32]	.04 [-.23, .32]
> High school	.04 [-.36, .45]	.37 [-.17, .91]	.12 [-.20, .43]	.27 [-.04, .58]†
PSE word-count	.00 [.00, .00]***	.00 [.00, .00]**	.00 [-.00, .00]	.00 [-.00, .00]
Impl ach	-.01 [-.11, .09]	.01 [-.12, .13]	.05 [-.02, .12]	.05 [-.02, .13]
Goal grade	.96 [.88, 1.12]***		.12 [-.01, .24]†	
Gen ach goal		-.03 [-.38, .31]		.31 [.11, .51]**
Ed-SPC	.09 [-.12, .31]	.63 [.36, .89]***	.49 [.32, .66]***	.47 [.31, .63]***
Constant	-1.84 [-2.99, -.69]***	.81 [-1.34, 2.97]	2.18 [1.28, 3.09]***	1.05 [-.21, 2.31]
Random				
Intercept	.00 [.00, 296.47]	.10 [.01, 1.12]	.01 [.00, .24]	.11 [.00, .45]
Residual	.97 [.79, 1.18]	1.59 [1.31, 1.94]	.57 [.47, .69]	.56 [.46, .68]

Notes. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Impl ach = Implicit achievement motivation. Gen ach goal = general achievement goals.

Table 9. Results for Hypothesis 2c and 2d: Indirect effects of implicit achievement and explicit goals on grades and general achievement goals through Ed-SPC.

	Grades				General Achievement Success			
	Main Effects		Interactions		Main Effects		Interactions	
	Model 2.5 B [95% CI]	Model 2.6 B [95% CI]	Model 2.9 B [95% CI]	Model 2.10 B [95% CI]	Model 2.7 B [95% CI]	Model 2.8 B [95% CI]	Model 2.11 B [95% CI]	Model 2.12 B [95% CI]
Indirect Effects								
Impl ach	.01 [-.01, .02]	.03 [-.01, .07]			.02 [-.01, .05]	.02 [-.01, .05]		
Goal grade	.03 [-.04, .09]				.15 [.06, .24]**			
Gen ach goal		.25 [.08, .43]**				.19 [.08, .31]**		
Implicit x Explicit			-.01 [-.04, .01]	.04 [-.06, .13]			-.02 [-.05, -.00]*	.03 [-.05, .11]
Total Effects								
Impl ach	-.01 [-.10, .08]	.03 [-.10, .16]			.07 [.00, .14]*	.07 [.00, .14]*		
Goal grade	.97 [.82, 1.27]***				.27 [.12, .41]***			
Gen ach goal		.22 [-.22, .67]				.51 [.29, .72]***		
Implicit x Explicit			.08 [-.02, .18]†	.06 [-.25, .36]			.00 [-.06, .06]	-.03 [-.19, .13]

Notes. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Impl ach = Implicit achievement motivation. Gen ach goal = general achievement goals.

Hypothesis 2d. Results from multilevel models for Hypothesis 2d, that the interactions between implicit and explicit goals have indirect effects on grades and general goal attainment through Ed-SPC, are presented in Table 10. Indirect and total effects of the interactions on grades and general achievement goal attainment are presented above in Table 9. Contrary to predictions, there were only marginally significant total effects of the interaction of implicit achievement motivation by explicit school goals on grades (Model 2.9), and significant indirect effects of the interaction of implicit achievement motivation x explicit school goals on general achievement attainment (Model 2.11). The interaction between implicit achievement motivation and general achievement goals had no significant indirect or total effects on grades (Model 2.10) or general achievement (Model 2.12). In sum, there was only limited support for Hypothesis 2d, that there are significant indirect effects of the interactions between implicit achievement motivation and explicit achievement goals through Ed-SPC.

Supplemental analyses for Research Aim 2. As with results from Hypothesis 2a and 2b, percent of implicit achievement motivation was not associated with Ed-SPC ($ps > .05$), but the interaction with school goals was significantly associated with Ed-SPC in the same manner. Again, as with Hypothesis 2c and 2d, there were no significant indirect or total effects of the percent of implicit achievement motivation on grades through Ed-SPC ($ps > .05$), but there were significant total effects on general achievement goal success when controlling for school goals ($B = .74$, 95% CI [.10, 1.37], $p = .023$) or general achievement goals ($B = .85$, 95% CI [.20, 1.50], $p = .010$). Finally, unlike results for Hypothesis 2d, there were no significant indirect or total effects of the interaction between

percent of implicit achievement motivation and explicit goals on grades or general achievement success through Ed-SPC ($ps > .05$).

Table 10. Multilevel models for Hypothesis 2d: Interactions between implicit achievement motivation and explicit goals, and Ed-SPC predicting grades and general achievement success.

	Grades		General achievement	
	Model 2.9 B [95% CI]	Model 2.10 B [95% CI]	Model 2.11 B [95% CI]	Model 2.12 B [95% CI]
Fixed effects				
Female	-.01 [-.31, .30]	.16 [-.25, .56]	.00 [-.16, .17]	-.12 [-.35, .11]
Grade in school	.01 [-.13, .14]	-.00 [-.18, .18]	-.06 [-.13, .01]	-.04 [-.15, .06]
Ethnicity				
Caucasian	.11 [-.39, .63]	-.20 [-.90, .50]	.14 [-.13, .41]	.06 [-.34, .46]
Other	-.00 [.48, .48]	.24 [-.40, .89]	.01 [-.24, .27]	-.11 [-.48, .27]
Generation				
2 nd	-.01 [-.47, .44]	-.20 [-.80, .39]	-.07 [.31, .17]	-.13 [-.48, .22]
3 rd +	.25 [-.19, .69]	.01 [-.57, .59]	-.08 [.31, .15]	-.07 [-.41, .27]
Father's education				
High school	-.21 [-.56, .15]	.15 [-.63, .32]	-.00 [-.19, .18]	.04 [-.24, .32]
> High school	.04 [-.36, .44]	.37 [-.17, .91]	-.29 [-.50, -.07]**	.27 [-.05, .58]†
PSE word-count	.00 [.00, .00]	.00 [.00, .00]**	.00 [-.00, .00]	.00 [-.00, .00]
Impl ach	-.04 [-.14, .06]	.00 [-.12, .13]	.00 [-.05, .05]	.06 [-.01, .14]
Goal grade	.98 [.82, 1.13]***		-.01 [-.10, .07]	
Gen ach goal		-.02 [-.38, .33]		.29 [.09, .50]**
Ed-SPC	.14 [-.07, .36]	.62 [.35, .89]	.26 [.15, .38]***	.48 [.32, .62]***
Implicit x Explicit	.10 [.00, .20]*	.03 [-.20, .25]	.03 [-.02, .08]	-.06 [-.19, .07]
Constant	2.78 [1.57, 3.98]***	.64 [-.87, 2.15]	4.58 [3.95, 5.21]***	2.83 [1.96, 3.70]
Random				
Intercept	.00 [.00, 50.88]	.10 [.01, 1.11]	.01 [.00, .26]	.01 [.00, .37]
Residual	.95 [.77, 1.16]	1.59 [1.31, 1.94]	.26 [.21, .31]	.55 [.45, .67]

Notes. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Impl ach = Implicit achievement motivation. Gen ach goal = general achievement goals.

Hypothesis 3a. Results for Hypothesis 3a, that mothers' and fathers' warmth, support, involvement, and psychological control, as well as the composite relationship with mothers and with fathers, are associated with grades and general achievement attainment are presented in Tables 11 (for grades) and 12 (for general achievement attainment). As expected, grades were significantly positively associated with perceptions of mothers' warmth (Model 3.1), as was general goal attainment (Model 3.5). The overall composite

measure of relationships with mothers was not associated with grades (Model 3.2) but was with general achievement attainment (Model 3.6); mothers' support and control were not associated with grades or general goal success, and contrary to predictions, perceptions of mothers' involvement was negatively associated with both measures of achievement. As expected, perceptions of fathers' warmth were positively associated with general goal success, though as with mothers, fathers' involvement was negatively associated with general goal success (Model 3.7). Only perceptions of psychological control were negatively associated with grades, and only marginally (Model 3.3). The composite measure of relationships with fathers was not associated with grades (Model 3.4) or general achievement attainment (Model 3.8). These results suggest that warmth and involvement from both parents were most associated with general achievement though contrary to predictions, involvement was negatively associated with outcomes. Further, these analyses suggest that relationships with mothers more than fathers were related to grades.

Table 11. Multilevel models for Hypothesis 3a: Associations between relationships with mothers and relationships with fathers and grades.

	Model 3.1 B [95% CI]	Model 3.2 B [95% CI]	Model 3.3 B [95% CI]	Model 3.4 B [95% CI]
Fixed effects				
Female	.43 [.02, .83]*	.44 [.03, .85]*	.33 [-.10, .75]	.28 [-.14, .70]†
Grade in school	.15 [-.02, .33]†	.16 [-.02, .33]†	.06 [-.12, .25]	.07 [-.11, .25]
Ethnicity				
Caucasian	.27 [-.47, 1.01]	.13 [-.62, .87]	-.05 [-.70, .80]	.00 [-.76, .76]
Other	.27 [-.40, .94]	.28 [-.40, .97]	.37 [-.32, 1.10]	.26 [-.44, .97]
Generation				
2 nd	-.01 [-.68, .65]	-.16 [-.82, .51]	-.48 [-1.16, .20]	-.54 [-1.21, .13]
3 rd +	-.17 [-.80, .46]	-.31 [-.94, .32]	-.45 [-1.10, .19]	-.42 [-1.16, .12]
Father's Education				
High school	.10 [-.39, .58]	.14 [-.36, .63]	.01 [-.50, .52]	-.03 [-.54, .47]
> High school	.62 [.07, 1.17]*	.69 [.13, 1.25]*	.73 [.15, 1.30]*	.70 [.13, 1.26]*
Mothers (composite)				
Involvement	-.36 [-.71, -.02]*			
Warmth	.41 [-.01, .80]*			
Support	-.02 [-.37, .41]			
Control	-.29 [-.81, .24]			
Fathers (composite)				
Involvement			.05 [-.28, .38]	
Warmth			.12 [-.23, .47]	
Support			-.19 [-.57, .20]	
Control			-.38 [-.84, .07]†	
Constant	3.36 [1.02, 5.69]***	2.10 [-.22, 3.99]	4.59 [2.60, 6.57]***	3.86 [2.08, 5.63]***
Random				
Intercept	.28 [.05, 1.54]	.26 [.05, 1.38]	.21 [.04, 1.08]	.22 [.04, 1.17]
Residual	1.75 [1.44, 2.14]	1.84 [1.51, 2.24]	1.75 [1.43, 2.14]	1.78 [1.45, 2.18]

Note. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 12. Multilevel models for Hypothesis 3a: Associations between relationships with mothers and relationships with fathers and general achievement success.

	Model 3.5 B [95% CI]	Model 3.6 B [95% CI]	Model 3.7 B [95% CI]	Model 3.8 B [95% CI]
Fixed effects				
Female	-.05 [-.30, .19]*	-.04 [-.29, .21]	.00 [-.25, .25]	.03 [-.23, .29]
Grade in school	-.03 [-.14, .08]	.01 [-.12, .10]	-.09 [-.20, .02]	-.05 [-.17, .06]
Ethnicity				
Caucasian	.35 [-.06, .77]†	.20 [-.22, .62]	.23 [-.19, .64]	.21 [-.22, .63]
Other	-.19 [-.58, .19]	.23 [-.63, .17]	-.20 [-.62, .20]	-.21 [-.63, .20]
Generation				
2 nd	-.18 [-.58, .22]	-.30 [-.70, .10]	-.15 [-.55, .25]	-.20 [-.61, .20]
3 rd +	-.10 [-.49, .28]	-.20 [-.59, .19]	-.09 [-.47, .30]	-.13 [-.52, .26]
Father's Education				
High school	.05 [-.25, .33]	.07 [-.23, .37]	-.01 [-.31, .29]	-.05 [-.35, .26]
> High school	.19 [-.13, .52]	.22 [-.12, .55]	.24 [-.09, .57]	.17 [-.16, .51]
Mothers (composite)				
Involvement	-.29 [-.50, -.08]**			
Warmth	.49 [.26, .73]***			
Support	-.04 [-.20, .28]			
Control	.27 [-.06, .59]			
Fathers (composite)				
Involvement			-.22 [-.42, .02]*	
Warmth			.25 [.03, .46]*	
Support			-.06 [-.18, .29]	
Control			-.17 [-.10, .44]	
Constant	3.27 [1.87, 4.67]***	3.54 [2.41, 4.68]*	4.14 [2.99, 5.29]***	4.24 [3.21, 5.27]***
Random				
Intercept	.00 [.00, .00]	.00 [.00, .00]	.00 [.00, .64.53]	.00 [.00, .00]
Residual	.67 [.55, .82]	.73 [.60, .89]	.65 [.53, .79]	.69 [.57, .85]

Note. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Hypothesis 3b. Results for Hypothesis 3b, that relationships with mothers and fathers are associated with Ed-SPC, are presented in Table 13. Perceptions of mothers' warmth and involvement but not support or psychological control were significantly associated with Ed-SPC, though again contrary to predictions, this association was negative for involvement (Model 3.9); The composite measure of relationships with mothers was positively associated with Ed-SPC, as expected (Model 3.10). Contrary to Hypothesis 3b, none of the none of the individual components of the relationship with fathers were significantly associated with Ed-SPC (Model 3.11) and the composite measure of

relationships with fathers was only marginally associated with Ed-SPC (positively; Model 3.12).

Table 13. Multilevel models for Hypothesis 3b: Associations between relationships with mothers and relationships with fathers and Education-related Selective Primary Control Strategies.

	Model 3.9 B [95% CI]	Model 3.10 B [95% CI]	Model 3.11 B [95% CI]	Model 3.12 B [95% CI]
Fixed effects				
Female	.01 [-.19, .21]	.03 [-.17, .23]	.00 [-.21, .22]	.04 [-.18, .25]
Grade in school	.06 [-.03, .14]	.05 [-.04, .14]	.02 [-.08, .12]	.02 [-.07, .12]
Ethnicity				
Caucasian	.27 [-.09, .62]	.17 [-.20, .53]	.25 [-.13, .63]	.21 [-.17, .59]
Other	-.22 [-.55, .11]	-.19 [-.53, .15]	-.12 [-.48, .25]	-.17 [-.53, .18]
Generation				
2 nd	-.15 [-.48, .18]	-.17 [-.50, .16]	-.13 [-.47, .22]	-.12 [-.46, .22]
3 rd +	-.11 [-.42, .20]	-.16 [-.48, .15]	-.21 [-.54, .12]	-.18 [-.50, .15]
Father's Education				
High school	-.05 [-.29, .19]	-.02 [-.26, .23]	-.01 [-.27, .25]	-.02 [-.28, .24]
> High school	.00 [-.26, .27]	.05 [-.22, .33]	-.00 [-.30, .29]	.03 [-.26, .31]
Mothers (composite)				
Involvement	-.20 [-.37, -.03]*			
Warmth	.24 [.05, .43]*			
Support	.10 [-.10, .29]			
Control	-.09 [-.35, .17]			
Fathers (composite)				
Involvement			-.05 [-.22, .12]	
Warmth			.13 [-.05, .31]	
Support			.06 [-.14, .26]	
Control			.07 [-.16, .30]	
Constant	3.76 [2.61, 4.90]***	3.54 [2.41, 4.68]*	3.66 [2.65, 4.66]***	3.73 [2.84, 4.63]***
Random				
Intercept	.02 [.00, .14]	.00 [.00, .00]	.03 [.01, .19]	.03 [.01, .19]
Residual	.44 [.36, .53]	.73 [.60, .89]	.46 [.38, .57]	.47 [.38, .57]

Note. † p < .10, * p < .05, ** p < .01, *** p < .001

Hypothesis 3c. Hypothesis 3c predicted that relationships with parents have indirect effects on grades and general achievement attainment through Ed-SPC. Models showing associations between relationships with mothers, fathers, and Ed-SPC, and grades and general achievement attainment used to calculate indirect effects are presented in Tables 14 and 15, respectively. As expected, Ed-SPC was significantly associated with both

grades and general achievement goal attainment. When Ed-SPC was added to the models from Hypothesis 3a (i.e., Models 3.1-3.8), no aspect of the relationships with mothers was associated with grades (Model 3.13), nor was the composite mothers' relationship associated with grades (Model 3.14) or general achievement attainment (Model 3.18). General achievement attainment was still significantly associated with warmth in the expected direction, but it was also significantly associated with involvement (negatively), psychological control (positively) in unexpected directions (Model 3.17). Only fathers' psychological control was associated with grades (again, negatively) (Model 3.15) and fathers' involvement was negatively associated with general achievement success, and warmth was marginally positively associated with general achievement success (Model 3.19); composite relationships with fathers were not associated with grades (Model 3.16) or general goal attainment (Model 3.20).

Table 14. Multilevel models for Hypothesis 3c: Associations between relationships with mothers, fathers, Ed-SPC, and grades.

	Model 3.13 B [95% CI]	Model 3.14 B [95% CI]	Model 3.15 B [95% CI]	Model 3.16 B [95% CI]
Fixed effects				
Female	.42 [.03, .81]*	.42 [.03, .81]*	.33 [-.07, .73]	.25 [-.14, .65]
Grade in school	.12 [-.05, .29]	.12 [-.05, .29]	.05 [-.13, .22]	.05 [-.12, .23]
Ethnicity				
Caucasian	.13 [-.57, .84]	.04 [-.66, .74]	-.10 [-.80, .61]	-.12 [-.84, .59]
Other	.37 [-.27, 1.15]	.39 [-.26, 1.03]	.45 [-.22, 1.11]	.37 [-.30, 1.03]
Generation				
2 nd	.05 [-.58, .69]	.06 [-.68, .56]	-.41 [-1.04, .23]	-.47 [-1.10, .17]
3 rd +	-.09 [-.69, .52]	-.18 [-.78, .41]	-.30 [-.91, .31]	-.40 [-1.00, .21]
Father's Education				
High school	.11 [-.35, .58]	.13 [-.33, .60]	.00 [-.48, .48]	-.03 [-.51, .45]
> High school	.61 [.08, 1.13]*	.64 [.11, 1.17]*	.70 [.16, 1.24]*	.66 [.13, 1.20]*
Mothers (composite)				
Involvement	-.25 [-.59, .09]			
Warmth	.26 [-.12, .64]			
Support	-.03 [-.40, .35]			
Control	-.23 [-.73, .27]			
Fathers (composite)				
Involvement			.08 [-.23, .40]	
Warmth			.03 [-.30, .37]	
Support			-.22 [-.58, .14]	
Control			-.44 [-.86, -.01]*	
Ed-SPC	.60 [.33, .86]***	.67 [.41, .93]***	.67 [.41, .93]***	.66 [.40, .92]***
Constant	1.11 [-1.32, 3.55]	.01 [-1.93, 1.95]	2.12 [.04, 4.20]*	1.40 [.52, 3.33]
Random				
Intercept	.20 [.03, 1.35]	.18 [.03, 1.17]	.14 [.02, .94]	.17 [.02, 1.12]
Residual	1.61 [1.32, 1.96]	1.65 [1.35, 2.00]	1.55 [1.26, 1.90]	1.59 [1.29, 1.94]

Note. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 15. Multilevel models for Hypothesis 3c: Associations between relationships with mothers, fathers, Ed-SPC, and general achievement success.

	Model 3.17 B [95% CI]	Model 3.18 B [95% CI]	Model 3.19 B [95% CI]	Model 3.20 B [95% CI]
Fixed effects				
Female	-.08 [-.30, .14]	-.07 [-.30, .16]	-.03 [-.24, .21]	-.01 [-.24, .22]
Grade in school	-.06 [-.16, .03]	-.04 [-.14, .06]	-.10 [-.20, .00]†	-.06 [-.16, .04]
Ethnicity				
Caucasian	.09 [-.31, .49]	.09 [-.31, .49]	.17 [-.20, .54]	.13 [-.27, .52]
Other	-.16 [-.53, .21]	-.11 [-.49, .27]	-.04 [-.41, .33]	-.06 [-.45, .32]
Generation				
2 nd	-.17 [-.54, .19]	-.22 [-.59, .15]	-.02 [-.38, .34]	-.12 [-.49, .24]
3 rd +	-.03 [-.37, .32]	-.12 [-.47, .23]	-.02 [-.37, .32]	-.05 [-.40, .30]
Father's Education				
High school	.06 [-.21, .32]	.08 [-.19, .36]	.04 [-.23, .31]	-.01 [-.29, .27]
> High school	.17 [-.13, .46]	.20 [-.11, .51]	.29 [-.01, .57]†	.19 [-.11, .50]
Mothers (composite)				
Involvement	-.22 [-.41, -.02]*			
Warmth	.40 [.19, .62]***			
Support	.02 [-.23, .20]			
Control	.34 [.05, .63]*			
Fathers (composite)				
Involvement			-.18 [-.36, -.00]*	.08 [-.12, .28]
Warmth			.18 [-.01, .37]†	
Support			.02 [-.19, .23]	
Control			.14 [-.10, -.39]	
Ed-SPC	.55 [.40, .70]***	.56 [.41, .71]***	.51 [.36, .65]***	.53 [.38, .68]***
Constant	1.22 [-.16, 2.61]†	1.84 [.72, 2.97]**	2.24 [1.07, 3.40]*	2.30 [1.20, 3.40]***
Random				
Intercept	.04 [.01, .29]	.02 [.00, .25]	.00 [.00, .24.07]	.01 [.00, .75]
Residual	.53 [.43, .64]	.58 [.47, .70]	.52 [.43, .64]	.56 [.45, .68]

Note. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Indirect and total effects of relationships with mothers and fathers on grades and general achievement success are presented in Table 16. Hypothesis 3c was partially supported for relationships with mothers. Mothers' warmth had positive indirect and total effects on grades (Model 3.13) and general achievement (Model 3.17) as predicted. The composite relationship with mothers had significant or marginal positive indirect and total effects on grades (Model 3.14) and general achievement attainment (Model 3.18), as expected. Contrary to predictions, involvement had significant negative indirect or total effects. Perceptions of mothers' support and psychological control did not have indirect or

total effects on grades or general achievement success. This suggests that although relationships with mothers are associated with achievement through Ed-SPC as predicted, it is specifically the warmth (positively) and involvement (negatively) that are related to achievement.

Results for fathers generally did not support Hypothesis 3c. Contrary to predictions, there were no significant total or indirect effects of father's involvement, warmth, support, or psychological control on grades (Model 3.15), nor were there for the composite measure of relationships with fathers on grades (Model 3.16) or general achievement attainment (Model 3.20). There was a significant total effect of fathers' warmth on general achievement attainment (Model 3.19); no other total effects or indirect effects for relationships with fathers was significant. This suggests that relationships with fathers may be less related to grades and general achievement success; only fathers' warmth was associated with general achievement success, and this effect was not through Ed-SPC.

Table 16. Results for Hypothesis 3c: Indirect effects of relationships with parents on grades and general achievement attainment through Ed-SPC.

	Effects on Grades				Effects on General Achievement Attainment			
	Model 3.13 B [95% CI]	Model 3.14 B [95% CI]	Model 3.15 B [95% CI]	Model 3.16 B [95% CI]	Model 3.17 B [95% CI]	Model 3.18 B [95% CI]	Model 3.19 B [95% CI]	Model 3.20 B [95% CI]
Indirect Effects								
Mothers (composite)		.19 [.02, .37]*				.16 [.01, .31]*		
Involve	-.12 [-.24, .01]†				.11 [-.22, -.00]*			
Warmth	.14 [-.03, .31]				.13 [-.02, .28]†			
Support	.03 [-.35, .42]				.05 [-.06, .17]			
Control	-.28 [-.87, .32]				-.05 [-.20, .09]			
Fathers (composite)				.10 [-.03, .23]				.08 [-.03, .19]
Involve			-.03 [-.16, .09]				-.03 [-.16, .09]	
Warmth			.08 [-.07, .24]				.07 [-.05, .19]	
Support			.04 [-.10, .19]				.03 [-.09, .15]	
Control			.05 [-.13, .22]				.04 [-.11, .18]	
Total Effects								
Mothers (composite)		.33 [-.06, .72]†				.35 [.08, .62]*		
Involve	-.37 [-.70, -.04]*				-.33 [-.55, -.11]**			
Warmth	.41 [.00, .81]*				.54 [.24, .84]***			
Support	.06 [-.07, .18]				.04 [-.22, .29]			
Control	-.05 [-.20, .09]				.30 [-.07, .66]			
Fathers (composite)				.07 [-.29, .43]				.15 [-.08, .38]
Involve			.04 [-.34, .42]				.04 [-.32, .41]	
Warmth			.12 [-.25, .49]				.24 [.00, .49]*	
Support			-.18 [-.63, .26]				.06 [-.21, .32]	
Control			-.38 [-.90, .13]				.17 [-.12, .47]	

Note. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Supplemental analyses for Research Aim 3. Supplemental analyses revealed that participants' perceptions of their obligation to provide assistance was positively associated with grades ($B = .27$, 95% CI [.04, .53], $p = .022$); the obligations to respect or provide financial assistance were not associated with grades, and no aspect of family obligations was associated with general achievement success. Perceptions of the obligation to respect family was positively associated with Ed-SPC ($B = .32$, 95% CI [.16, .49], $p < .001$), and there were significant indirect effects of the need to respect family on grades ($B = .21$, 95% CI [.08, .34], $p = .002$) and general achievement success ($B = .18$, 95% CI [.07, .30], $p = .001$). However, other obligations were not associated with Ed-SPC, and there were no other indirect or total effects of perceptions of obligations on grades or general achievement success.

No substantive differences emerged when examining associations between relationships with biological mothers and fathers with whom participants live only and grades. However, in addition to the findings described above, biological mothers' psychological control was marginally positively associated with general achievement. When including only fathers or stepfathers with whom participants live, or when including only biological fathers with whom they live, warmth was positively associated with general achievement, as was the composite measure of the relationship (significantly for all father-figures present and marginally for only biological fathers present), findings which were not present among the full sample. Warmth from all father-figures and from biological fathers who live with participants was significantly positively associated with Ed-SPC, as was the composite relationship with all fathers or all father-figures. No substantive differences

emerged when examining only relationships with biological mothers with whom participants live.

There were no substantive differences in indirect or total effects of mothers when examining only biological mothers with whom participants live. Among participants who live with father figures or with biological fathers, warmth and the composite relationships had positive indirect effects on grades. Among these participants, fathers' warmth also had significant positive indirect and total effects on general achievement. The composite relationship with fathers also had significant positive indirect effects on general achievement.

Hypothesis 4. Results for Hypothesis 4, that relationships with parents are associated with congruence between implicit motivation and explicit goals, are presented in Table 17. Contrary to predictions, no aspect of relationships with mothers or with fathers was associated with the congruence between implicit achievement motivation and explicit school goals (Models 4.1 and 4.2) or explicit general achievement goals (Models 4.3 and 4.4).

Supplemental analyses for Hypothesis 4. Although Hypothesis 4 was not supported, supplemental analyses show that relationships with mothers were associated with congruence between percent of achievement-related implicit motivation and school goals, in expected directions. Participants who perceived their mothers' to be warmer were more likely to have goals congruent with implicit motivation (OR = 2.28, 95% CI [1.11, 4.68], $p = .025$), while participants were less likely to have goals congruent with implicit motivation when mothers were perceived to be psychologically controlling (OR = .33, 95% CI [.14, .81], $p = .015$) or more involved (OR = .58, 95% CI [.32, 1.06], $p = .078$). Mothers'

support was not associated with congruence with school goals, no aspect of relationships with mother were related to congruence with general achievement goals; no aspect of relationships with fathers was associated with either measure of congruence, nor were perceptions of family obligations associated with any measures of congruence between implicit achievement motivation and explicit goals.

Table 17. Multilevel logistic models for Hypothesis 4: Associations between relationships with mothers, fathers and congruence between implicit achievement motivation and school goals, general achievement goals

	Congruence with School Goals		Congruence with General Achievement Goals	
	Model 4.1 OR [95% CI]	Model 4.2 OR [95% CI]	Model 4.3 OR [95% CI]	Model 4.4 OR [95% CI]
Fixed effects				
Female	1.77 [.96, 3.26]†	1.37 [.73, 2.58]	.70 [.38, 1.29]	.60 [.31, 1.13]
Grade in school	.95 [.72, 1.24]	.97 [.73, 1.29]	.97 [.74, 1.26]	.89 [.67, 1.18]
Ethnicity				
Caucasian	.57 [.53, 4.62]	1.43 [.49, 4.23]	2.48 [.83, 7.40]	3.40 [1.09, 10.61]*
Other	.72 [.28, 1.88]	.70 [.25, 1.96]	1.03 [.40, 2.68]	.95 [.34, 2.67]
Generation				
2 nd	.91 [.33, 2.45]	.86 [.31, 2.37]	1.67 [.61, 4.55]	1.13 [.40, 3.16]
3 rd +	.66 [.25, 1.71]	1.80 [.78, 4.15]	1.53 [.58, 4.00]	1.05 [.39, 2.82]
Father's Education				
High school	1.23 [.60, 2.55]	1.39 [.66, 2.93]	1.04 [.51, 2.14]	1.06 [.50, 2.25]
> High school	1.95 [.87, 4.38]	1.80 [.78, 4.15]	.85 [.38, 1.89]	1.01 [.44, 2.32]
Mothers				
Involvement	.86 [.51, 1.46]		1.13 [.67, 1.92]	
Warmth	.96 [.54, 1.73]		1.32 [.74, 2.37]	
Support	1.15 [.63, 2.08]		.67 [.37, 1.23]	
Control	1.29 [.58, 2.86]		.86 [.39, 1.90]	
Fathers				
Involvement		1.06 [.64, 1.75]		1.10 [.66, 1.83]
Warmth		.93 [.54, 1.59]		1.05 [.61, 1.80]
Support		.84 [.47, 1.52]		.70 [.39, 1.27]
Control		.71 [.36, 1.39]		.85 [.43, 1.68]
Constant	.43 [.01, 17.79]	2.63 [.15, 46.35]	1.22 [.04, 39.90]	5.84 [.32, 107.42]
Random				
Intercept (SE)	.00 (.04)	.00 (.05)	.00 (.02)	.00 (.06)
Residual (SE)	.00 (.00)	.00 (.00)	.00 (.00)	.00 (.00)

Note. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

No significant effects were found when examining only the relationships of participants who live with their biological mothers. However, among participants who live with their biological fathers, perceptions of fathers' support (OR = .44, 95% CI [.20, .96], $p = .040$) and psychological control (marginally; OR = .46, 95% CI [.19, 1.10], $p = .079$) were associated with a lower likelihood of congruence between implicit motivation and explicit general goals, as was the composite relationship with fathers (marginally; OR = .50, 95% CI = .25, 1.03], $p = .061$). These relationships were not associated with congruence with goal grades. These were also not present when including step-fathers with whom participants live.

Hypothesis 5a. Results for Hypothesis 5a, which predicted main effects of grades and general achievement attainment on positive and negative affect, are presented in Table 18 (for PA) and Table 19 (for NA). As expected, grades and general achievement attainment were associated with positive affect (Models 5.1 – 5.4); neither implicit achievement motivation nor explicit achievement goals were significantly related to PA. Grades were associated with NA only when general achievement goals were included in the model (Model 5.6). Goal grades were associated with NA only when grades themselves were not included in the model (Model 5.7). General achievement attainment and general achievement goals, and implicit achievement motivation were not significantly associated with NA.

Table 18. Multilevel models for Hypothesis 5a: Associations between implicit achievement motivation, explicit goals, achievement, and positive affect.

	Model 5.1 B [95% CI]	Model 5.2 B [95% CI]	Model 5.3 B [95% CI]	Model 5.4 B [95% CI]
Fixed effects				
Female	-.34 [-.61, -.08]*	-.34 [-.61, -.08]*	-.27 [-.53, -.02]*	-.23 [-.48, .02]†
Grade in school	-.09 [-.20, .03]	-.09 [-.20, .03]	-.07 [-.18, .04]	-.07 [-.18, .04]
Ethnicity				
Caucasian	.25 [-.22, .72]	.23 [-.24, .70]	.21 [-.25, .66]	.18 [-.27, .63]
Other	.09 [-.33, .51]	.10 [-.33, .52]	.15 [-.26, .56]	.14 [-.27, .55]
Generation				
2 nd	.17 [-.24, .59]	.17 [-.24, .58]	.22 [-.18, .62]	.18 [-.22, .58]
3 rd +	.19 [-.21, .59]	.18 [-.22, .58]	.25 [-.14, .63]	.22 [-.16, .61]
Father's Education				
High school	-.15 [-.46, .16]	-.15 [-.46, .16]	-.18 [-.47, .13]	-.18 [-.48, .12]
> High school	-.17 [-.53, .19]	-.15 [-.51, .22]	-.19 [-.54, .16]	-.19 [-.54, .17]
Implicit achievement	.02 [-.06, .11]	.02 [-.06, .11]	.00 [-.08, .09]	.01 [-.07, .09]
Goal grade	.07 [-.10, .24]		.11 [-.02, .24]	
Gen ach goal		.06 [-.17, .28]		-.10 [-.33, .13]
Grades	.11 [-.02, .22]†		.31 [.17, .45]***	
General achievement		.14 [.05, .22]**		.36 [.22, .51]***
Constant	3.30 [2.39, 4.21]***	3.32 [1.76, 4.68]***	2.00 [.99, 3.00]***	2.80 [1.37, 4.23]***
Random				
Intercept	.00 [.00, .01]	.00 [.00, .13.49]	.00 [.00, .00]	.00 [.00, .00]
Residual	.79 [.65, .96]	.79 [.65, .96]	.74 [.61, .89]	.74 [.61, .90]

Notes. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Impl ach = Implicit achievement motivation. Gen ach goal = general achievement goals.

Hypothesis 5b. Contrary to hypothesis 5b, that PA and NA are associated with 3-way interactions between implicit motivation, explicit goals, and achievement, none of the 3-way interactions were significantly associated with positive or negative affect (not shown in a table). These results suggest that the association between goal success and affect did not depend on congruence between those goals and implicit achievement. Finally, as with Hypotheses 5a and 5b, supplemental analyses indicated that the percent of implicit motivation that was achievement-related was not associated with PA or NA, nor were its interactions with goals and achievement.

Table 19. Multilevel models for Hypothesis 5a: Associations between implicit achievement motivation, explicit goals, achievement, and negative affect.

	Model 5.5 B [95% CI]	Model 5.6 B [95% CI]	Model 5.7 B [95% CI]	Model 5.8 B [95% CI]
Fixed effects				
Female	.14 [-.13, .42]	.15 [-.12, .43]	.14 [-.13, .42]	.07 [-.21, .35]
Grade in school	.07 [-.05, .18]	.07 [-.05, .18]	.05 [-.06, .17]	.05 [-.07, .17]
Ethnicity				
Caucasian	-.04 [-.52, .45]	-.00 [-.49, .48]	-.07 [-.56, .42]	-.00 [-.50, .49]
Other	.46 [.02, .90]*	.44 [-.00, .88]†	.45 [.00, .89]*	.45 [.01, .90]*
Generation				
2 nd	.03 [-.40, .46]	.03 [-.40, .46]	.02 [-.41, .45]	.07 [-.36, .51]
3 rd +	-.19 [-.60, .23]	-.17 [-.59, .24]	-.20 [-.61, .22]	-.17 [-.60, .25]
Father's Education				
High school	.09 [-.23, .41]	.11 [-.22, .43]	.12 [-.21, .44]	.13 [-.20, .46]
> High school	-.04 [-.42, .33]	-.08 [-.46, .30]	-.04 [-.41, .34]	-.12 [-.50, .27]
Implicit achievement	-.01 [-.10, .08]	-.01 [-.10, .08]	-.01 [-.10, .08]	-.02 [-.11, .07]
Goal grade	-.11 [-.21, .04]		-.22 [-.36, -.08]**	
Gen ach goal		-.12 [-.36, .12]		-.12 [-.37, .14]
Grades	-.09 [-.21, .04]	-.14 [-.23, -.05]**		
General achievement			-.03 [-.18, .13]	-.08 [-.23, .08]
Constant	3.00 [2.06, 3.95]***	3.34 [1.82, 4.85]***	3.37 [2.28, 4.45]***	3.20 [1.64, 4.77]***
Random				
Intercept	.00 [.00, .02]	.00 [.00, .00]	.00 [.00, .00]	.00 [.00, .02]
Residual	.85 [.70, 1.03]	.85 [.70, 1.03]	.85 [.70, 1.04]	.89 [.73, 1.07]

Notes. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Impl ach = Implicit achievement motivation. Gen ach goal = general achievement goals.

Hypothesis 6a. Results for Hypothesis 6a, that implicit achievement motivation, explicit achievement goals, and their interactions, are associated with Ed-SSC, are shown in Table 20. Ed-SSC was not associated with implicit achievement motivation, but was associated with goal grades (Model 6.1) and general achievement goals (Model 6.2). There was a significant interaction between implicit achievement motivation and goal grades predicting Ed-SSC (Model 6.3), plotted in Figure 4. However, contrary to predictions, this interaction resembled the interaction predicting Ed-SPC, whereby low levels of both implicit achievement motivation and explicit school goals appear worse for Ed-SSC and high levels of either implicit achievement motivation or explicit goals (or both) appear to be associated with higher levels of Ed-SSC. Finally, contrary to predictions, the interaction

between general achievement goals and implicit achievement motivation (Model 6.4) was not associated with Ed-SSC.

Results are similar for Ed-CPC and are shown in Table 21. Implicit achievement motivation was not associated with Ed-CPC in any of the models. However, Ed-CPC was positively associated with explicit school grades (Model 6.5) and marginally with general achievement goals (Model 6.6). As with results for Ed-SSC, the interaction between implicit achievement motivation and goal grades was associated with Ed-CPC (Model 6.7) and is plotted in Figure 5. As with the results for Ed-SSC, these results are in the opposite direction from what was predicted. Participants reported higher Ed-CPC when either implicit motivation or explicit goals were high as compared with when both were low. The interaction between implicit achievement motivation and general achievement goals was not significantly associated with Ed-CPC (Model 6.8).

Hypothesis 6b. This hypothesis predicted that the 3-way interactions of implicit achievement motivation, and explicit goals, and Ed-SSC or Ed-CPC are significantly associated with grades and general achievement. However, this was not supported; none of the 3-way interactions was significantly associated with grades or general achievement attainment.

Supplemental analyses for Research Aim 6. Supplemental analyses examining the percent of motives coded for achievement revealed similar results as the main analyses. The percent of motives coded for achievement was not significantly associated with either measure of achievement. However, its interaction with goal grades was significantly associated with Ed-SSC in a manner similar to the overall number of achievement codes, shown in Figure 5. Additionally, none of the 3-way interactions with percent of implicit

motives coded for achievement, Ed-SSC, and grade goals or general achievement goals was significantly associated with grades or with general achievement attainment, similar to the results for Hypothesis 6b.

Table 20. Multilevel models for Hypothesis 6a: Main effects of and interactions between implicit achievement motivation and explicit goals, predicting Ed-SSC.

	Main Effects		Interactions	
	Model 6.1 B [95% CI]	Model 6.2 B [95% CI]	Model 6.3 B [95% CI]	Model 6.4 B [95% CI]
Fixed effects				
Female	-.04 [-.23, .14]	.01 [-.18, .20]	-.02 [-.20, .14]	-.00 [-.19, .19]
Grade in school	.01 [-.07, .10]	.01 [-.07, .10]	.02 [-.06, .10]	.01 [-.08, .09]
Ethnicity				
Caucasian	.00 [-.31, .32]	-.11 [-.43, .21]	.04 [-.27, .34]	-.11 [-.43, .21]
Other	-.25 [-.54, .03]†	-.25 [-.56, .04]†	-.29 [-.57, -.01]*	-.29 [-.58, .00]†
Generation				
2 nd	-.15 [-.43, .13]	-.18 [-.46, .11]	-.16 [-.44, .11]	-.18 [-.47, .10]
3 rd +	.01 [-.26, .28]	.00 [-.28, .28]	-.01 [-.28, .25]	.00 [-.27, .28]
Father's education				
High school	-.14 [-.36, .08]	-.17 [-.46, .11]	-.14 [-.35, .07]	-.18 [-.40, .04]
> High school	-.14 [-.39, .10]	.02 [-.24, .27]	-.14 [-.38, .10]	.01 [-.25, .26]
PSE word-count	-.00 [-.00, .00]	-.00 [-.00, .00]	.00 [-.00, .00]	-.00 [-.00, .00]
Impl ach	.02 [-.03, .08]	.03 [-.03, .09]	.05 [-.01, .11]	.05 [-.02, .11]
Goal grade	.22 [.13, .30]***		.19 [.10, .27]***	
Gen ach goal		.31 [.15, .46]***		.28 [.12, .44]**
Implicit x Explicit			-.10 [-.16, -.04]**	-.09 [-.20, .02]
Constant	3.06 [2.46, 3.67]***	2.32 [1.32, 3.33]***	4.19 [3.74, 4.64]***	4.08 [3.06, 4.46]***
Random				
Intercept	.00 [.00, .00]	.00 [.00, .00]	.01 [.00, .00]	.01 [.00, .00]
Residual	.36 [.30, .44]	.38 [.31, .46]	.34 [.28, .42]	.38 [.31, .46]

Notes. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Impl ach = Implicit achievement motivation. Gen ach goal = general achievement goals.

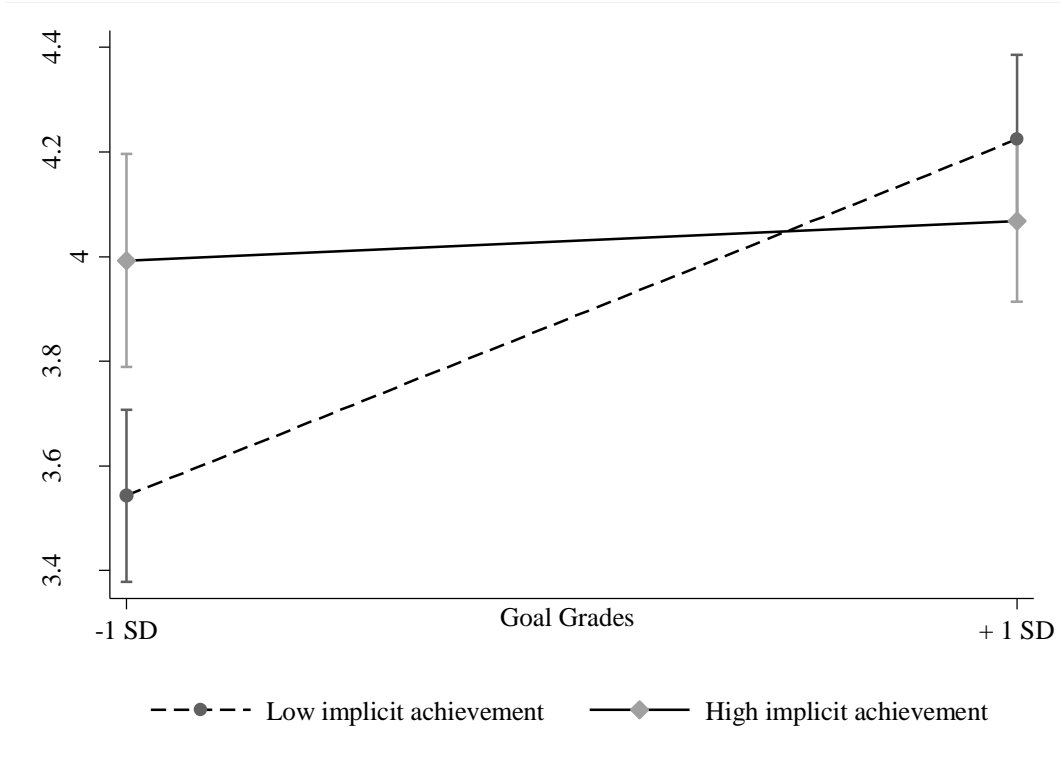


Figure 4. Interaction between implicit achievement motivation and explicit goals predicting Ed-SSC. Implicit achievement motivation and explicit goal grades are plotted at +/- 1 SD from their respective means.

Table 21. Multilevel models for Hypothesis 6b: Main effects of and interactions between implicit achievement motivation and explicit goals, predicting Ed-CPC.

	Main Effects		Interactions	
	Model 6.5 B [95% CI]	Model 6.6 B [95% CI]	Model 6.7 B [95% CI]	Model 6.8 B [95% CI]
Fixed effects				
Female	-.08 [-.30, .14]	-.04 [-.26, .18]	-.05 [-.27, .16]	-.04 [-.26, .18]
Grade in school	.04 [-.05, .14]	.05 [-.05, .14]	.05 [-.04, .15]	.04 [-.05, .15]
Ethnicity				
Caucasian	.20 [-.16, .57]	.16 [-.22, .53]	.24 [-.12, .60]	.15 [-.22, .53]
Other	-.14 [-.48, .19]	-.11 [-.46, .24]	-.18 [-.51, .15]	-.12 [-.47, .23]
Generation				
2 nd	-.32 [-.65, .00]†	-.35 [-.68, -.02]*	-.33 [-.65, -.01]*	-.35 [-.68, -.02]*
3 rd +	-.06 [-.38, .25]	-.07 [-.40, .25]	-.08 [-.39, .23]	-.07 [-.40, .25]
Father's education				
High school	-.10 [-.35, .15]	-.09 [-.35, .17]	-.10 [-.35, .15]	-.09 [-.35, .17]
> High school	-.28 [-.57, .00]†	-.16 [-.46, .14]	-.28 [-.56, -.00]*	-.17 [-.46, .13]
PSE word-count	.00 [-.00, .00]	.00 [-.00, .00]	.00 [-.00, .00]	-.00 [-.00, .00]
Impl ach	.04 [-.03, .11]	.05 [-.02, .12]	.07 [-.00, .14]†	.05 [-.02, .12]
Goal grade	.18 [.08, .28]***		.15 [.05, .25]**	
Gen ach goal		.18 [-.00, .36]†		.17 [-.01, .36]†
Implicit x Explicit			-.10 [-.17, -.03]**	-.02 [-.14, .11]
Constant	3.24 [2.54, 3.94]***	3.05 [1.89, 4.21]***	4.20 [3.68, 4.73]***	4.11 [3.56, 4.67]***
Random				
Intercept	.00 [.00, .18]	.01 [.00, .33.63]	.01 [.00, 1.61]	.01 [.00, .97.54]
Residual	.49 [.40, .60]	.50 [.41, .62]	.47 [.39, .57]	.50 [.41, .62]

Notes. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Impl ach = Implicit achievement motivation. Gen ach goal = general achievement goals.

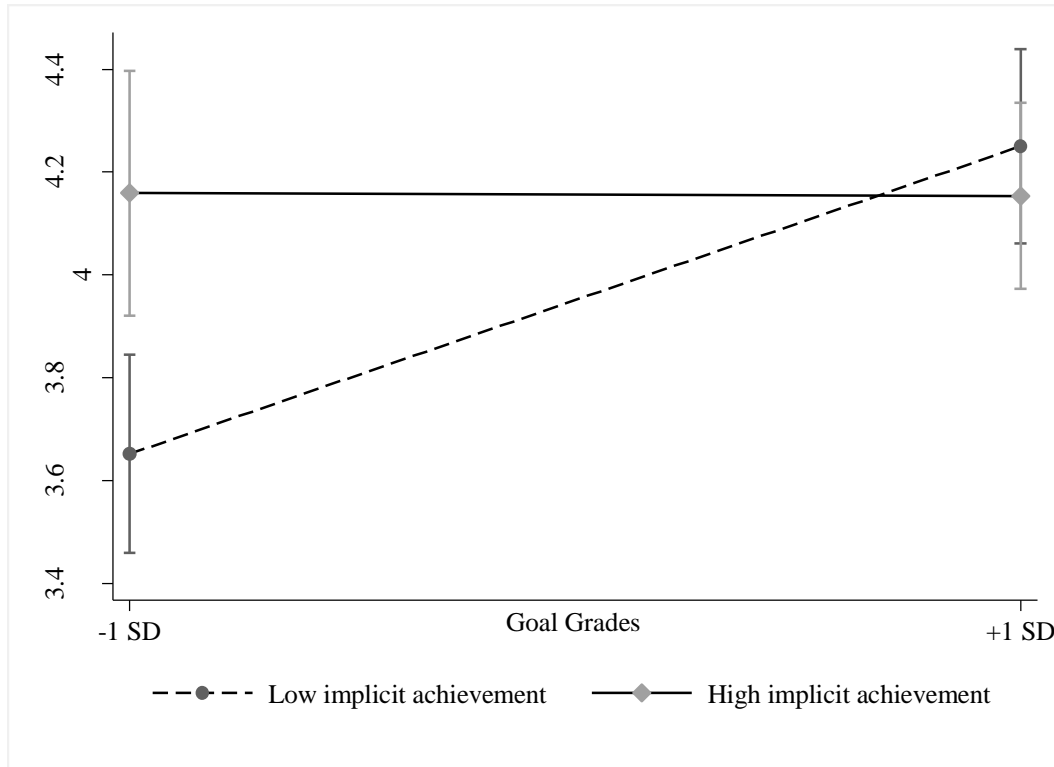


Figure 5. Interaction between implicit achievement motivation and explicit goals predicting Ed-CPC. Implicit achievement motivation and explicit goal grades are plotted at +/- 1 SD from their respective means.

Hypothesis 7a. Results for Hypothesis 7a, that relationships with mothers and fathers are associated with Ed-SSC, are shown in Table 22. As expected, mothers' warmth was positively associated with Ed-SSC, though contrary to predictions, involvement was negatively associated with Ed-SSC (Model 7.1). Fathers' warmth was positively associated with Ed-SSC as expected, but psychological control was also positively associated with Ed-SSC (Model 7.2). Perceptions of support from either parent, mothers' psychological control and fathers' involvement were not significantly associated with Ed-SSC.

Hypothesis 7b. Only perceptions of mothers' and fathers' warmth were associated Ed-CPC, shown in Table 22 (Models 7.3 and 7.4). Although these associations were

predicted by Hypothesis 7b, no other aspect of perceptions of relationships with mothers or fathers were associated with Ed-CPC in either direction, thus limiting the support for this hypothesis.

Table 22. Results for Hypothesis 7: Associations between relationships with mothers, fathers, and Ed-SSC (Hypothesis 7a) and Ed-CPC (Hypothesis 7b).

	Hypothesis 7a: Selective Secondary Control		Hypothesis 7b: Compensatory Primary Control	
	Model 6.1 B [95% CI]	Model 6.2 B [95% CI]	Model 6.3 B [95% CI]	Model 6.4 B [95% CI]
Fixed effects				
Female	.03 [-.15, .20]	.06 [-.13, .25]	.00 [-.20, .21]	.04 [-.17, .26]
Grade in school	.01 [-.06, .09]	-.01 [.10, .07]	.08 [-.01, .17]†	.06 [-.04, .16]
Ethnicity				
Caucasian	.17 [-.13, .47]	.04 [-.28, .36]	.21 [-.14, .57]	.21 [-.16, .58]
Other	-.28 [-.56, -.00]*	-.26 [-.58, .05]	-.15 [-.48, .18]	-.07 [-.43, .29]
Generation				
2 nd	-.20 [-.48, .09]	-.16 [-.45, .16]	-.38 [-.72, -.04]*	-.29 [-.64, .07]
3 rd +	-.06 [-.34, .22]	-.04 [-.33, .25]	-.14 [-.48, .18]	-.09 [-.43, .25]
Father's Education				
High school	-.13 [-.34, .08]	-.18 [-.41, .04]	-.07 [-.31, .18]	-.16 [-.42, .10]
> High school	-.05 [-.28, .18]	-.04 [-.33, .25]	-.15 [-.48, .18]	-.25 [-.54, .04]†
Mothers				
Involvement	-.24 [-.39, -.09]**		-.01 [-.19, .17]	
Warmth	.30 [.13, .47]**		.25 [.06, .13]*	
Support	.08 [-.10, .25]		.02 [-.19, .22]	
Control	.01 [-.23, .24]		.09 [-.18, .36]	
Fathers				
Involvement		-.08 [.23, .07]		.11 [-.06, .29]
Warmth		.19 [.03, .35]*		.21 [.02, .40]*
Support		.01 [-.16, .19]		-.07 [-.28, .14]
Control		.21 [.01, .42]*		.14 [-.10, .38]
Constant	3.47 [2.46, 4.48]***	3.17 [2.30, 4.04]***	2.86 [1.66, 4.05]***	3.93 [1.93, 3.93]***
Random				
Intercept (SE)	.00 [.00, .01]	.01 [.00, 1.17]	.00 [.00, .00]	.01 [.00, .00]
Residual (SE)	.35 [.29, .43]	.37 [.30, .45]	.49 [.40, .60]	.50 [.41, .62]

Note. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Supplemental analyses for Research Aim 7. Analyses of participants' perceptions of their family obligations indicated that their obligation to respect their family, but not to assist or to help financially was associated with Ed-SSC ($B = .23$, 95% CI [.08, .38], $p = .002$). Ed-CPC was positively associated with both the obligation to assist ($B = .22$, 95% CI [.10, .34], $p < .001$) and to respect family ($B = .21$, 95% CI [.04, .38], $p = .015$) but again, not with the obligation to help financially. Finally, no substantive differences emerged when examining only relationships with biological mothers. When including only biological fathers with whom participants live, or all father-figures with whom they live, perceptions of psychological control was positively associated with Ed-CPC, as it was among the full sample with Ed-SSC.

CHAPTER 6: Discussion

This dissertation examined associations between high school students' implicit achievement motivation, explicit school and general achievement goals, motivational strategies, perceptions of their relationships with their mothers and fathers, achievement, and well-being. Data was collected from 244 high school students recruited from elective school and after-school programs. This research distinguished implicit achievement motivation, or the unconscious affective response resulting from being in position to develop skills or demonstrate excellence, from explicit achievement goals, or the conscious and cognitive values and opinions about achievement-related tasks. Relationships between the two were explored as they relate to motivational strategies and achievement. This research highlights factors associated with motivational pathways that are hot (when implicit motivation and explicit goals are both high) and cold (when implicit motivation is low and explicit goals are high) and their importance for achievement.

Summary of Findings

In general, achievement and use of Ed-SPC were more strongly associated with explicit achievement goals than with implicit achievement motivation. Although there was limited evidence for the main effects of implicit achievement motivation on achievement or motivational strategies, there was evidence to suggest that the interactions between implicit motivation and explicit goals were associated with achievement and with motivational strategies. These interactions suggest that high explicit goals or high implicit achievement motivation are sufficient for higher levels of motivational strategy use and achievement, but there may be limited additive power when both are high. That is, rather than congruence being important, each can compensate for low levels of the other. We

found no evidence to support our hypothesis that well-being is related to the congruence between implicit achievement motivation and explicit goals and actual goal achievement.

Results showed consistent support for the hypotheses regarding adolescents' mothers' warmth and their achievement, as well as their Ed-SPC, Ed-CPC, and Ed-SSC. Perceptions of mothers' warmth had consistently positive associations with key outcomes. Contrary to predictions, mothers' involvement in their children's lives had consistently negative associations; perceptions of mothers' support and psychological control were largely unrelated to outcomes. There was less consistent evidence regarding perceptions of relationships with fathers, though results were more similar to mothers' when examining only biological fathers with whom participants live. Although perceptions of fathers' warmth generally had positive associations with outcomes, involvement was generally negative, and there were frequently no significant associations. Overall, these findings suggest that high school students' perceptions of their relationships with their mothers and biological fathers with whom they live may be indicative of both hot and cold goal pursuits and achievement, and specifically the warmth and involvement (negatively) within these relationships is critical.

Implicit Motivation and Explicit Goals

Explicit goals were largely associated with achievement, as well as with education-related primary and secondary control strategies necessary for hot and cold achievement goal pursuits. Implicit motivation, in contrast, largely was not associated with achievement or motivational strategies. This suggests that goal setting in academic settings may be more important than unconscious affective responses for achievement. Although effort and performance on individual academic tasks is typically associated with implicit achievement

motivation (Brunstein & Heckhausen, 2010), this does not always translate to broader or more general measures of long-term performance like grades. When implicit achievement motivation is associated with long-term performance outcomes, it is often only associated indirectly through self-regulatory capacity and goal setting (Brunstein & Heckhausen, 2010). In order to more consistently connect implicit achievement motivation to academic performance, teachers or parents are encouraged to evaluate students' performance against their own individual abilities rather than group norms and allow more flexibility in academic goal selections (Brunstein, 2010; Rheinberg & Engeser, 2010).

Although there were not significant main effects of implicit achievement motivation, there was evidence to support the hypothesis that the interaction between implicit motivation and explicit goals is important (Schultheiss et al., 2008). However, these findings were not in exactly the manner predicted by previous research. Rather than needing high implicit motivation *and* high explicit goals for the most positive outcomes as predicted, our findings suggest that high implicit motivation *or* high explicit achievement goals are sufficient for the most positive outcomes. Students reported investing time and effort into their school goals and ultimately were more successful when they enjoyed learning and demonstrating excellence (i.e., when implicit achievement motivation was high) *or* when they explicitly valued academic or achievement success (i.e., when explicit achievement goals were high). This suggests that high levels of implicit motivation, as well as high explicit goals can each compensate for low levels of the other. Although previous research has shown that effort and goal attainment are maximized when both implicit motivation and explicit goals are both high (Brunstein, 2010; Brunstein & Maier, 2005; Kehr, 2003, 2004b), these findings typically come from longitudinal research and from

settings where goal pursuit behaviors must occur in both structured and unstructured environments.

Implicit motivations are most relevant for the unstructured environments where they serve to orient the individual to opportunities for goal pursuits (Boyatzis & Kelner, 2010), which may explain differences with the current research. The present research, in contrast, was cross-sectional and focused on achievement-related motivation, goals, and attainment among high school students, for whom time and opportunities are more structured. Explicit goals may be sufficient for higher achievement because it may be easier to invest effort in achievement-related goals while in school. High schools are inherently structured, allowing less flexibility for goal pursuits. Achievement opportunities may be more obvious (e.g., classes assign homework, extra-curricular clubs make announcements, etc.) than in the settings where implicit motivation has been studied previously (e.g., in work settings). That is, implicit and explicit may not need to be congruently high among high school students since the opportunities and behaviors needed to achieve success are more obvious and transparent, allowing explicit goals to be more impactful. Implicit achievement motivation may be more important for academic success in post-secondary settings, where students have more flexibility and opportunities to choose between competing goals and activities.

The interactions suggesting that either implicit motivation or explicit goals are sufficient for higher achievement were specific to interactions with goal grades (rather than general achievement goals). Grades may be more salient for high school students than the broader general achievement goals. It may be more obvious when a student is able to address these goals than the more general achievement goals. General achievement goals

may also be less relevant to students in a school context, as they may apply to non-academic pursuits like athletics or hobbies. Indeed, the specific goal content and situational context are important moderators of the effects of implicit achievement motivation on achievement, with implicit motivation only predicting achievement when they are channeled into goal-pursuit efforts by achievement-related contexts and goals (Lang, Zettler, Ewen, & Hulsheger, 2012). School goals may more effectively channel implicit achievement motivation than general achievement goals since goal pursuit behaviors are more academic-focused when in high school.

That there was stronger evidence of main effects of explicit goals than implicit motivation on achievement and motivational strategy use suggests that the cold motivational pathway may be more attainable for high school students' achievement goals than expected. This is important to know since explicit goals are more malleable than implicit motivation, and thus also more accessible for intervention. The importance of explicit goals echoes previous research about the value of high academic goals (e.g., Eccles & Roeser, 2009; Eccles & Wigfield, 2002; Kay, Shane, & Heckhausen, 2016) and research showing that high goals are beneficial even if they are not ultimately attained (Heckhausen, Chang, Greenberger, & Chen, 2012; Villarreal et al., 2015). This also supports some recent college-for-all policy initiatives which push high schools to prepare students for college, and students to set college as a goal for themselves. This research suggests that high goal-setting may bring about positive outcomes.

One additional explanation for the limited associations between implicit achievement motivation and achievement attainment may be found in negative associations between parents' involvement and both achievement and Ed-SPC. Implicit

achievement motivation propels action in unstructured environments. When students are struggling or not performing up to their expectations, parents may step in and become involved, creating a more structured environment for their children to pursue achievement goals. Implicit motivation may be more important for behavior when there are few cues prompting action, but parents may take steps to ensure that their children's academic behavior is not unstructured, especially when they are struggling.

Finally, there were few differences between results using the number of achievement motives compared to the percent of implicit motives coded for achievement versus affiliation or power motives. Having high levels of competing implicit motivations may be similar to having low levels of implicit achievement motivation in that they would direct energy and attention away from achievement-related goals. However, given the overall limited main effects found for implicit achievement motivation, this is a question that may be better studied in other areas or among older individuals where implicit motivation is more impactful.

Relationships with Parents

Overall, mothers' and fathers' warmth had generally positive associations with motivational strategy use and achievement; involvement in their children's lives generally had negative associations with motivational strategies and achievement. Support and psychological control were largely unrelated to these outcomes. These findings were largely consistent for achievement and primary and secondary control strategies, suggesting that relationships with parents help adolescents pursue both hot and cold goals. Previous research has shown that the overall characteristics of parent-child relationships may be as important or more for children's academic motivation and achievement than

specific parents' behaviors for academic achievement (e.g., Kay, Shane, & Heckhausen, 2016; Pomerantz, Cheung, & Qin, 2012; Pomerantz, Moorman, & Litwack, 2007). Warmth within these relationships may more closely reflect the overall characteristics of the relationships, which leads to increased motivational strategy use and achievement. Support and psychological control may refer to more specific actions or behaviors, and may therefore be overshadowed by the overall context of the relationship.

The unexpected negative associations between parents' involvement and achievement may be due to the cross-sectional nature of this research. This finding is inconsistent with meta-analyses that show parental involvement is beneficial for children's achievement (Fan & Chen, 2001; Wilder, 2014). Rather, this finding is consistent with the reactive hypothesis of parental involvement, which explains that parents become more involved in their children's education as a reaction to poor performance (e.g., Epstein, 1987; McNeal, 2014; Sui-Chu & Willms, 1996), and research showing that the most effective way to encourage parents to become more involved in their children's education is through explicit invitations from teachers (Anderson & Minke, 2007), which more often occur when teachers believe there is room for children to improve. The negative associations found in this research may be due to parents' response to the poor performance as opposed to the struggles being caused by parents' involvement. Additionally, it should be noted that mothers' and fathers' involvement was positively correlated with warmth and support, and negatively with psychological control, suggesting that greater involvement is part of an overall context of a positive relationship.

Further, the negative associations with achievement and motivational strategy use found in our research are from models that also include the other measures of the

relationships. Involvement had negative associations with achievement and strategy use when holding the other aspects of the relationships constant, that is, only when there was no commensurate increase in warmth and support. These aspects of the relationship might be better examined together rather than as independent constructs. Considering the different aspects of these relationships as dimensions of warmth and behavioral control as suggested by Baumrind's literature on parenting styles (1966; 1967) may better capture the interactions between these aspects of the relationships.

Relationships with mothers more were more consistently associated with achievement and motivational strategy use than relationships with fathers, suggesting that relationships with mothers may be more important. This finding is consistent with evidence that suggests that mothers have a larger influence on their children's academic self-regulation and competence (e.g., Grolnick & Ryan, 1989; Kim & Hill, 2015). Adolescents typically spend more time with their mothers than with their fathers (Lam, McHale, & Crouter, 2012), so these results may reflect greater opportunities for mothers to influence their children, though this was not explored in the current research. There were fewer differences between mothers and fathers when examining only adolescents' relationships with biological mothers and fathers with whom they live. This suggests that both relationships are important, and that the degree to which parents are present in the lives of their children is critical.

Relationships with parents were generally not associated with congruence between implicit achievement motivation and explicit achievement goals. This may be because implicit motivation develops earlier in life and is relatively stable (McClelland et al., 1989, 1992) and there is little room for adolescents to be flexible in their goal selections while in

high school. Additionally, adolescents' relationships with parents influence their goals in other ways. For example, adolescents choose goals that are more similar to their parents' goals for them when their relationships are characterized by warmth (Mortimer et al., 1986). Better relationships with parents may lead youth to pursue their parents' goals rather than the goals that are congruent with their own motivation.

Finally, perceptions of family obligations were generally positively associated with achievement and motivational strategy use. Children who feel obligations toward their family place more value on academic success and believe it is more important to go to college, and also believe that their academic pursuits will be more useful to them (Fulgini, 2001). Feelings of obligations may increase the perceived value of achievement if achievement is seen as a way to meet those obligations, or if achievement is a goal that parents have for their children.

Well-being

There were few findings in this research regarding well-being. Goal attainment was largely related to PA, but mostly not with NA. These different associations, as well as the low (albeit significant) correlations between PA and NA support research suggesting they are different constructs (e.g., Ebesutani, Okamura, Higa-McMillan, & Chorpita, 2011; Waatson, Clark, & Tellegen, 1988). Positive affect may be more closely related to achievement goal success than negative affect. Neither positive nor negative affect was significantly associated with the three-way interactions between goal attainment, goals, and implicit motivation. This may be because of how salient education and achievement goals are for youth in high school. Students' own goals and implicit motivation may be less relevant when responding to achievement successes or failures.

Limitations

Though this research has valuable implications for theory and practice, there are still several limitations that must be acknowledged. Perhaps most significant of these limitations is the cross-sectional nature of the data, which prohibits any conclusions about causality. The directions of the associations that were predicted in the hypotheses are based on theory and causal relationships found in previous research, but our own data do not allow such conclusions. We assumed the directions of the results in describing them, but they could be reversed, or there could be bi-directional relationships or third variables that we could not test in this research. For example, students may raise their goals when they do better, rather than higher goals leading to better performance; parents may show more warmth because students do well and are more invested in their goals, rather than the opposite. Longitudinal research is necessary to identify the direction of the associations found in these results.

A second limitation is that this research was conducted with a unique population of high school students and might not generalize to other populations of high school students or non-student populations. Most of the participants were Hispanic and from low-income areas. Although ethnicity and fathers' education were included as covariates in all hypothesis testing, exploring differences in the associations by ethnicity or parents' education was beyond the scope of this investigation. This is a limitation because not only do relationships with parents differ by ethnicity (e.g., Chung, Chen, Greenberger, & Heckhausen, 2009; Fuligni & Pedersen, 2002), the effects of these relationships may also differ by ethnicity (e.g., Spera, 2005). Further research with more diverse samples is necessary before conclusions can be drawn about the generalizability of these findings.

However, given the long-term value of education and the lower levels of achievement attained by minority and low-income students (e.g., OECD, 2010, 2014; Stetser & Stillwell, 2014), the population recruited for this research is of particular importance and these results are valuable even if not generalizable to other populations.

Additionally, participants in this study were recruited from elective after-school or in-school activities, some of which were at least in part academic-focused. Because of this, participants may have been more motivated than typical high school students, and may have had higher academic goals and achievement than average. Results found in this research may reflect associations among these variables among high-achieving and highly motivated students. It would be valuable to ask these same research questions among students who are less motivated or lower-achieving.

Finally, this research included only the participants' perspectives of their motivation, goals, relationships with parents, achievement, and well-being. Given the focus on relationships with parents, this is noteworthy for two reasons. First, associations between parents and children are often bi-directional. This research assumes the direction of the effects are from the parents to the children, but the opposite also occurs. Second, children's reports of their parents and parents' own reports of themselves are often different (Aquilino, 1999; Mandemakers & Dykstra, 2008), though children's impressions of their parents' behaviors and relationships with their parents are critical and may be more important than parents' reports of their own behavior (Steinberg et al., 1992). Although children's perspectives are valuable, it is important to extend this research by including external reports of the relationships from parents. Furthermore, grades and motivational strategy use are obtained only from the children and may be influenced by

reporting biases. Obtaining reports from others may lead to more reliable measures of children's motivation and achievement.

Implications and Future Directions

Although results are not all consistent, this research highlights the importance of both implicit achievement motivation and explicit goals for students' academic achievement and general goal attainment, as well as the role that parents may play in their children's goal pursuits. The significant interactions between implicit motivation and explicit goals suggests that there could be value in tailoring the classroom environments or lesson plans to students' implicit motivation, particularly among those who have lower academic goals. Additional research should also examine the importance of other implicit motivations (i.e., power and affiliation motivation), and whether these could be directed toward school-based activities. Classroom activities could appeal to each of these motivations, for example by finding areas in which a struggling student can excel to appeal to achievement motivation, allowing students to learn by building relationships with others to appeal to affiliation motivation, or assign students to lead discussions to appeal to power motivation. Using activities that appeal to the other types of motivation may be most beneficial for students with low implicit achievement motivation and low explicit school goals, since these are students who have the lowest grades.

This research also showed the role that parents play in children's goal pursuits. Warmth appears to be most consistently positively associated with achievement and primary and secondary control strategies. Although parents' involvement was negatively associated with outcomes, prior research suggests that this may be due to parents becoming more involved in reaction to low achievement or motivation. Furthermore, these

associations were only significant when the other aspects of the relationships were included in the same models; additional longitudinal research may be necessary to isolate these effects; it may also be the interactions between these factors that is important, rather than their independent effects. Relationships with parents were generally not associated with whether children's goals were congruent with their implicit motivation. However, these relationships were associated with education-related primary and secondary control strategies used by their children. Positive relationships with parents may help children work towards easy and challenging explicit goals, whether they are reinforced by implicit motivation or not. It is possible that improving relationships with parents may help students achieve their goals; this is a subject that needs additional research.

Conclusion

This research asked: Why do some high school students do better than others? How much is due to an inherent enjoyment of learning compared to the goals that they set for themselves, how much can parents contribute, and what is the role of volitional self-regulation? Results showed that high school students' explicit goals and implicit achievement motivation may both be valuable for achievement; high explicit goals or inherent enjoyment of learning may be sufficient to bolster their use of motivational strategies and may ultimately lead to higher achievement, and each may compensate for low levels of the other. Furthermore, this research showed that high school students' relationships with their parents may help them to pursue their achievement-related goals in the context of a structured school setting, whether the goals are easy or hard to attain, driven by an implicit motivation or not. Overall, this research helps us to understand why some students are better able to achieve their goals and are more successful in school than others, and the role that parents play in students' achievement. This has the potential

to inform individual- and family-level interventions to improve adolescents' achievement by understanding how they select goals, helping them to select rewarding goals, and better work towards even those goals that are not inherently rewarding.

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