Guo, Jiesi, Marsh, Herbert W., Morin, Alexandre J. S., Parker, Philip D., & Kaur, Gurvinder. (2015). Directionality of the Associations of High School Expectancy-Value, Aspirations, and Attainment: A Longitudinal Study. *American Educational Research Journal, 52*(2), 371-402.

Directionality of the Associations of High School Expectancy-Value, Aspirations, and Attainment

Abstract

(This study examines the directionality of the associations among cognitive assets (IQ, academic achievement), motivational beliefs (academic self-concept, task values), and educational and occupational aspirations over time from late adolescence (Grade 10) into early adulthood (5 years post high school). Participants were from a nationally representative sample of U.S. boys N = 2,213). The results suggest that (a) self-concept and intrinsic value have reciprocal effects with academic achievement and predict educational attainment, (b) self-concept is consistently found to predict occupational aspirations, (c) the associations between achievement and aspirations are partially mediated by motivational beliefs, and (d) academic self-concept in high school had stronger long-term indirect effects on future occupational aspirations and educational attainment than task values and IQ.

Keywords self-concept, expectancy-value, educational attainment, educational and occupational aspiration, transition in adulthood

The post–high school transition into early adulthood marks an important developmental step in the educational and occupational career of young people. During this transition, individuals begin to make choices and engage in a variety of activities that will have a determining impact on the rest of their lives, including the decision about university or vocational study and entry into the workforce (Savickas, 2002). In the educational area, it is well documented that cognitive resources (e.g., IQ and prior academic achievement) are not the only factors that can help adolescents make a successful transition into adulthood. Indeed,

personal motivation (interest, valuing) and aspirations for education and learning and academic self-concept (competence belief, or expectations of success) also represent key determinants of educational attainment and career success (Dietrich, Parker, & Salmela-Aro, 2012; Eccles, 2009; Hauser, 2010; Sameroff, 2010; Zarrett & Eccles, 2006). These personal noncognitive assets have been widely identified in many developmental models, such as the expectancy-value theory (EVT) (Eccles, 1994; Eccles et al., 1983), the social-cognitive model of career choice (Lent, Brown, & Hackeet, 1994, 2000), the career construction model (Savickas, 2002, 2005; Super, 1957, 1990), and the phase-adequate engagement framework (Dietrich et al., 2012). Numerous empirical studies have tested and supported these positive associations between cognitive and noncognitive factors and educational attainment, perseverance, and success (Eccles, Wigfield, & Schiefele, 1998; Fouad, 2007; Hauser, 2010). However, the empirical studies that comprehensively examine the complex interplay between cognitive ability and personal noncognitive assets in influencing final educational attainment across the transition into adulthood are scarce (but see Parker et al., 2012; Parker, Marsh, Ciarrochi, Marshall, & Abduljabbar, 2013).

From a practical perspective, much attention has been given to educational achievement—typically measured by standardized test scores—by educational evaluation and policy. However, an increasing number of international studies have demonstrated that educational attainment plays a more important role than cognitive ability and achievement in long-term socioeconomic success (Bowen, Chingos, & McPherson, 2009; Hauser, 2010). For example, Hauser (2010) conducted secondary data analysis of longitudinal data over a 50-year period that showed that IQ has little influence on occupational standing and wealth after controlling levels of schooling. Indeed, many capable students do not pursue pathways of higher education (Bowen et al., 2009). Given that it is easier to alter educational attainment compared to cognitive ability, in particular for IQ, these findings imply that it is pivotal to investigate the process through which individuals develop personal noncognitive assets (motivation and aspirations) that subsequently lead to educational attainment.

On the other hand, these findings have important practical implications for countries, seeking to build economic success. To maintain internationally competitive economies, the U.S. government has recognized the need to encourage tertiary education to meet the demand for highly skilled professionals (Lacey & Wright, 2009). For example, government programs such as the Obama administration's Race to the Top (RTTT) have been implemented to improve individual educational attainment and narrow achievement gaps. It is important then

that more research is conducted to better understand exactly how motivation contributes to educational attainment.

Therefore, in the current research, we test a comprehensive model based on EVT (Eccles, 1994, 2009) to fully examine the complex interplay among cognitive variables (IQ, prior academic achievement) and motivational beliefs (expectancies and task values) and educational and occupational aspirations and their interrelationships across the transition from high school (Grade 10) into early adulthood (up to 5 years post high school).

Theory and Background Literature

Expectancy-Value Theory

The modern EVT model (Eccles, 1994; Eccles et al., 1983; Eccles & Wigfield, 2002) posits that achievement-related performance and choices are most directly influenced by the individual's expectancies of academic success and a subjective assessments of the inherent value of academic tasks; the socialization processes linked to various cultural and social settings (e.g., school and family) influence individual differences in motivational beliefs. In her extension of the model to educational and occupational choices, Eccles (2007, 2009) argued that individuals make choices based on their expectancies to meet the educational demands and success at a given career and for the value they place on that particular educational or occupational goal.

Modern EVT (e.g., Eccles, 1994, 2009) defines *expectancy of success* as a task-specific belief about the possibility of experiencing future success in that task that is directly related to individuals' evaluations of their competencies (e.g., academic self-concept; Marsh, 1986) in a given domain. Harter (1990) and Marsh (1989) have conducted extensive research on adolescent self-concept in different areas, the measures of which are highly related to expectancy construct of expectancy-value theory (Wigfield & Cambria, 2010). Although ability beliefs (i.e., self-concepts) and expectancies of success are theoretically distinct constructs, these two constructs are empirically indistinguishable and collapse into a single construct in real-life settings (Eccles & Wigfield, 2002; Wigfield & Eccles, 1992). For this reason, we use academic self-concept in the current research as a measure of expectancies of success and use these terms (i.e., self-concept and expectancies) synonymously. Also, modern EVT distinguishes between multiple components of subjective task value (Wigfield & Eccles, 1992); for the present purposes we distinguish between *intrinsic value*, referring to the enjoyment a person gains from performing an activity (in line with intrinsic motivation

and interest), and *utility value*, relating to how a specific task fits within individual future plans and objectives.

In relation to the developmental trajectory of motivational beliefs, it is well established that academic self-concept, intrinsic value, and utility values tend to be quite stable during the upper high school years (e.g., Gottfried, Fleming, & Gottfried, 2001; Marsh, Byrne, & Yeung, 1999; also see Wigfield & Cambria, 2010, for a review). However, research exploring the development of these motivational constructs during the post–high school transition has been surprisingly sparse.

Motivational Beliefs and Achievement

According to the EVT (Eccles, 2009), students' motivational beliefs as a function of prior achievement-related activities (e.g., prior academic achievement) influence subsequent academic achievement. Academic self-concept has been demonstrated as a stronger predictor of academic achievement compared to value beliefs (e.g., Marsh et al., 2013; Trautwein et al., 2012; Wigfield & Eccles, 2002). Particularly in the later high school years, academic self-concept appears to be more systematically related to academic outcomes and the relationship appears to be reciprocal (Skaalvik & Hagtvet, 1990; Wigfield, 1994; Wigfield & Karpathian, 1991). To account for this reciprocal relationship, Marsh (1990, 1993; also see Marsh & Craven, 2006, for a review) proposed a reciprocal effects model where prior self-concept influences subsequent achievement and prior achievement influences subsequent self-concept. The generalizability of this reciprocal effects model has been widely supported in numerous empirical studies based on diverse sample of adolescents (e.g., Marsh, 2007; Marsh & Craven, 2006).

The relation between intrinsic values and academic achievement was found to be reciprocal in some longitudinal studies of high school students, while the effects of intrinsic value were substantially attenuated by controlling for self-concept (Köller, Baumert, & Schnabel, 2001; Marsh et al., 2005; Pinxten, Marsh, De Fraine, Van Den Noortgate, & Van Damme, 2014). However, only little, or weak, relations between utility value and achievement have been found when controlling for self-concept and intrinsic value (Eccles & Wigfield, 2002). Although studies investigating the reciprocal effects of self-concept, intrinsic value, and utility value with achievement have been conducted within primary and high school settings, these reciprocal effects have never been explored during the post–high school transition.

Motivational Beliefs and Educational and Occupational Aspirations

According to the expectancy-value model, motivational beliefs influence engagement in different educational activities, as well as future educational and occupational choices (Eccles, 1994, 2009). People will select the achievement-related activities they think they can master and that have the highest subjective task value for them as education and career interests and choices across the set of options being considered (Eccles, 1994). Personal efficacy and self-concept in academic tasks have long been thought to be a determinant of behavioral choices by achievement theorists (Eccles, 2009), and this positive association has been supported across a diverse sample of students in numerous empirical studies (e.g., Betz & Hackett, 1983; Hackett & Betz, 1989; Lent, Lopez, & Bieschke, 1991). Although academic self-concept has typically been thought to be a crucial predictor of academic tasks selection within the school, academic self-concept has also been found to be an important predictor of educational and career choices in the recent literature (e.g., Marsh & Yeung, 1997; Nagengast & Marsh, 2012; Parker et al., 2012, 2013). For example, Parker et al. (2013) found that academic self-concept had significant effects on entrance into tertiary education at the end of high school, controlling for achievement. Further, Savickas's (2002, 2005) career construction theory, developed from the seminal work of Super (1957, 1990), proposes that self-concept is one of the determinants of how people choose their work and education trajectories and construct their careers during the school to work transition (e.g., post–high school and post-university transition).

However, positive expectancies of success are a necessary, yet not sufficient, predictor of educational and occupational aspirations (Eccles, 2009). Based on the EVT, longitudinal studies found that educational aspirations were predicted by youths' task values controlling for prior achievement (Eccles, Vida, & Barber, 2004; Watt et al., 2012). Similarly, task values were found to be significant predictors of occupational aspirations when both expectancies and values are considered along with prior achievement (Eccles, Barber, & Jozefowicz, 1999). However, these findings are only based on high school students. Given that late adolescents' aspirations substantially affect future education and career trajectories (Beal & Crockett, 2010; Mello, 2008), recent studies pertaining to directionality of the association of motivational beliefs and aspirations have placed emphasis on post–high school transition (e.g., Parker et al., 2012, 2013). However, few studies have considered both self-concept and task value simultaneously when exploring directionality of the associations between these motivational beliefs and educational and occupational aspirations across the timing of the transition into adulthood. In the current study, both

academic self-concept and task value were taken into consideration to explore the nature of the relations between motivational beliefs and aspirations, controlling for achievement during the post–high school transition.

Motivational Beliefs, Aspirations, and Educational Attainment

Educational attainment contributes significantly in shaping people's occupational trajectories (Beal & Crockett, 2010; Mello, 2008; Ou & Reynolds, 2008). It is well documented that adolescents' cognitive ability (IQ) and academic achievement in high school have substantial influence on educational attainment later on (e.g., university entry and completion; Bowen et al., 2009; Hauser, 2010; Parker et al., 2012; Sewell & Hauser, 1975; Sewell, Haller, & Protes, 1969). Further, research and theory posit that IQ and academic achievement in high school affect educational attainment and career success through a causal chain in which agency-based factors and educational and occupational aspirations each play important intervening roles (Eccles, 1994, 2009; Hauser, 2010; Parker et al., 2012; Schoon, 2008). For example, Sewell et al. (1969) found the positive causal link between ability and educational and occupational aspiration, leading to educational attainment based on Wisconsin Longitudinal Study (see Sewell, Hauser, Springer, & Hauser, 2003, for a review). Similarly, Schoon (2008)found IQ scores and academic achievement in high school predicted school motivation, which in turn influences adults' educational attainment based on a long-term British National Child Development Study. However, few studies have focused on the directionality of the associations between these personal cognitive and noncognitive assets and on how this temporal process finally influences subsequent educational attainment across the transition into early adulthood.

The Present Investigation

The present study is based on the EVT framework (Eccles, 1994, 2009) and focuses on the process through which individuals develop personal qualities, such as abilities, motivation, and aspirations, that subsequently lead to educational attainment during the transition into early adulthood. In this study, five waves of data, ranging from high school to five years after graduation, are used not only to provide a clear picture of the expectancy-value development process across the post–high school transition but also allow for a better understanding of how the temporal associations between motivational beliefs, achievement, and aspirations in shaping further educational attainment. Furthermore, this period is an important time for the development of the individual's aspirations as they transit from vague awareness of careers to a focused exploration and progressive narrowing of career options

(Dietrich et al., 2012; Savickas, 2002; Super, 1990). This study thus provides critical insight into the development of aspirations.

Given that motivational beliefs are of particular interest to the present study, three specific research questions are addressed:

- *Research Question 1:* What role do motivational beliefs play in shaping academic achievement and subsequent educational attainment?
- *Research Question 2:* What role do motivational beliefs play in shaping educational and occupational aspirations?
- *Research Question 3:* Taking into account all cognitive and noncognitive assets, what role do motivational beliefs play in shaping educational attainment?

In the present investigation, the hypothesized predictive model (see Figure 1) was built on the basis of the EVT framework and empirical research reviews. Academic self-concept, different components of task value, IQ, academic achievement and attainment, and educational and occupational aspirations were all assessed and included in the hypothesized model in order to provide a comprehensive test of the EVT framework. To provide a clear picture of the directionality of the associations between motivational beliefs and outcome variables, we started with Models 1 and 2, which were then extended to Model 3.

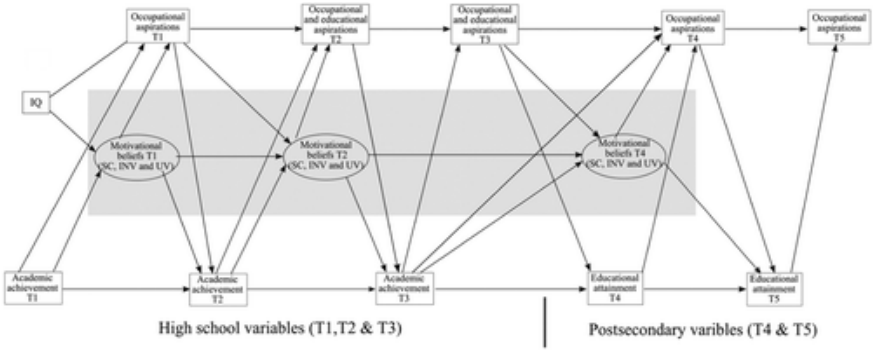

Figure 1. The hypothesized model.

Note. All variables were given a label that identifies the Time (T1 to T5). Academic achievements at T1 and T2 were measured by last year GPA at Grades 10 and 11, while achievement T3 represents current GPA. All aspirational variables were treated as prospective variables following by motivation factors within each time wave. The cross-time associations were specified as regression paths; prior outcome variables predict subsequent motivation factors and outcome variables, and then prior motivation factors predict subsequent outcome variables. Within-time associations between constructs were specified by the inclusion of time-specific covariance relationships (i.e., attainment is correlated to motivation factors at T4). In motivation constructs, the residual variances among the corresponding indicators are allowed to correlate over time. Of particular interest are motivational beliefs that are shaded in gray. Squares indicate the latent construct, while ovals indicate the manifest construct. IQ = intelligent test scores; ASC = academic self-concept; INV = intrinsic value; UV = utility value.

More specifically, in Model 1 (Figure 2), motivational beliefs were considered along with academic achievement and attainment. We hypothesized the significant reciprocal effects of academic self-concept and intrinsic value with academic achievement (e.g., Marsh & Craven, 2006; Marsh et al., 2005; Question 1). In contrast, given a relatively weak relationship between academic achievement and utility value after controlling self-concept and intrinsic value, we did not expect this relationship to be reciprocal. Furthermore, we also hypothesized that motivational beliefs (academic self-concept and intrinsic and utility values) would predict subsequent educational attainment (e.g., Parker et al., 2012, 2013; Question 1). Based on Model 2 (Figure 3), in which motivational beliefs were considered along with educational and occupational aspirations, we anticipated that academic self-concept, intrinsic value, and utility value would positively predict educational and occupational aspirations over time (e.g., Eccles et al., 1999, 2004; Question 2). However, it was unclear whether motivational beliefs and aspirations were reciprocally related during post-school transition, namely, whether aspirations would in turn predict later levels of motivational beliefs. Finally, to address Question 3, all cognitive and noncognitive variables were assessed together in Model 3 (Figure 4). We expected that the relationships between achievement, aspirations, and attainment would be partially mediated by motivational beliefs (e.g., Hauser, 2010). We also expected that motivational beliefs, in particular self-concept, would be significantly related to

long-term educational attainment when controlling for IQ, achievement, and aspirations in high school (Parker et al., 2012, 2013).

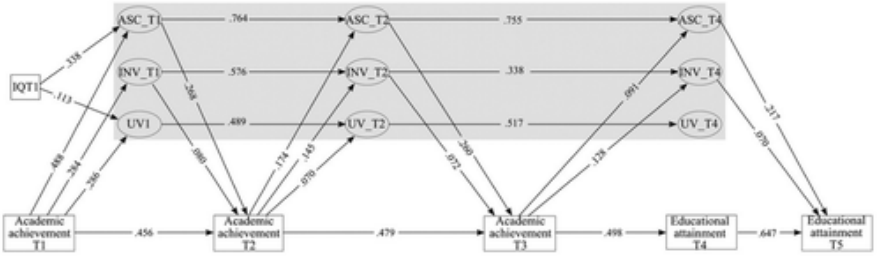

Figure 2. Structural path model of the relations between motivational beliefs, achievement, and attainment (Model 1).

Note. Only statistically significant regression paths (t value > 1.96; p < .05) were presented. All variables were given a label that identifies the Time (T1 to T5). Of particular interest are motivational beliefs that are shaded in gray. ASC = academic self-concept; INV = intrinsic value; UV = utility value.

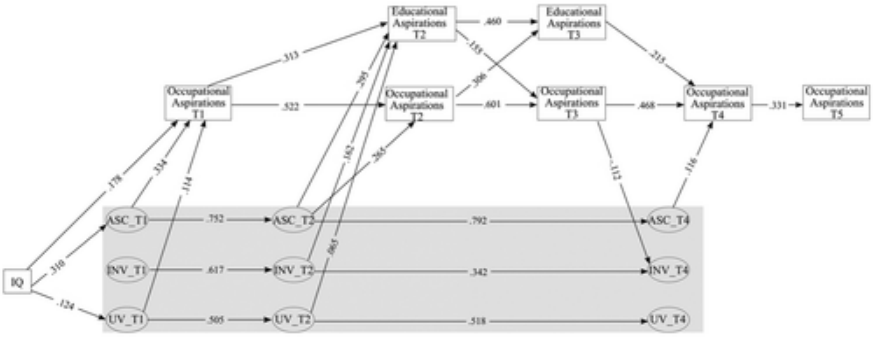

Figure 3. Structural path model of the relations between motivational beliefs and educational and occupational aspirations.

Note. Only statistically significant regression paths (t value > 1.96; p <.05) were presented. All variables were given a label that identifies the Time (T1 to T5). Of particular interest are motivational beliefs that are shaded in gray. ASC = academic self-concept; INV = intrinsic value; UV = utility value.

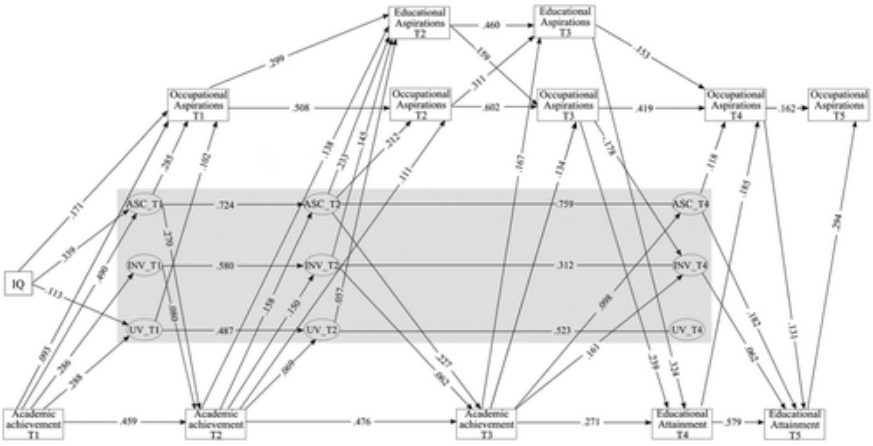

Figure 4. Structural path model of the relations between motivational beliefs, IQ, achievement, aspirations, and attainment (Model 3).

Note. Only statistically significant regression paths (*t* value > 1.96; *p* < .05) were presented. All variables were given a label that identifies the Time (T1 to T5). Of particular interest are motivational beliefs that are shaded in gray. ASC = academic self-concept; INV = intrinsic value; UV = utility value.

Method

Participants

The data used in the present study come from the Youth in Transition study (YIT; Bachman & O'Malley, 1977; also see Bachman, 2001, 2002). The YIT was a five-wave longitudinal follow-up study of a nationally representative sample of 10th-grade boys in

the U.S. public high schools. A two-stage sampling procedure was employed; the first stage comprised a random sample of 87 public high schools; the second comprised around 25 students selected randomly from each sampled school. In total, five waves of data were collected between 1966 and 1974: Time 1 (T1, early 10th grade; N = 2,213), Time 2 (T2, late 11th grade; N = 1,886; 15% missing data), Time 3 (T3, late 12th grade; N = 1,799; 19% missing data), Time 4 (T4, one year after normal high school graduation; N = 1,620; 27% missing data), and Time 5 (T5, five years after normal high school graduation; N = 1,608; 27% missing data).

Measures

All variables used here are from the publicly available longitudinal data file from the Youth in Transition study (Bachman, 2001, 2002). It should be noted that not all observed outcome variables and motivational constructs are measured across five waves in the Youth in Transition data set (see Appendix 1 in the online journal for more details). For instance, the measure of latent constructs of students' self-concept and task values were available only for T1, T2, and T4. In addition, the number of items assessing motivation was not entirely consistent across these three occasions. All motivation items were coded on Likert scales, and scores used in this study were systematically recoded so that higher values consistently reflect higher levels of motivation (see Appendix 1 in the online journal for more detail regarding latent variables used; see also Bachman, 2001, 2002, for all item wordings and response frequencies). All outcome variables were standardized (M = 0, SD= 1) to ensure consistent responses scales across time waves.

Self-Concept

The scale consisted of three items measuring students' perception of their competencies in overall school ability, reading ability, and IQ compared with others of their age at T1 and T2 but only two items relative to reading ability and IQ at T4 (e.g., "How do you rate in school ability compared to others?").

Value

The scale of students' positive school attitude was used to assess the effect students experienced when studying in school (e.g., "How interesting are most of your courses to you?"), in line with the notion of *intrinsic value* in the modern EVT (Eccles et al., 1983).

The *utility value* scale that assesses how important studying hard in school was used (e.g., "Are you studying hard to get good grades in school?").

IQ

IQ was measured using the quick test (Ammous & Ammons, 1962) at T1, an easily administered measure of intelligence based on visual-perceptual vocabulary performance. For each item, participants are given a card with four pictures and are asked to select the picture corresponding to a specific test word. This word-matching test has been found to be highly correlated with Wechsler Adult Intelligence Scale (WAIS) across diverse populations (Mortimer & Bowen, 1999).

Academic Achievement

Students' academic achievement used in the present study was derived from their overall grade point average (GPA) on the basis of a single self-report item at T1 (Grade 10) and T2 (Grade 11)., GPA was collected in an individually administered personal interview in which participants were asked to report their GPA for the previous year, whereas at T3 (Grade 12), the GPA for the current year was requested in a self-administered questionnaire at T3. Reported GPA was recorded into 1 of 13 categories from A+ to F (or E), which also was recorded into numeric values (from 1 to 13, with 13 reflecting the highest possible grades) for the analysis, and then standardized.

Educational Attainment

Participants were asked a series of questions regarding the level of education they had attained or were in the process of attaining. These were used to construct a composite variable at T4 and T5. In line with recommendations from previous research (e.g., Bachman & O'Malley, 1977, 1986; Marsh & O'Mara, 2008, 2010), items regarding high/vocational school and college enrollment status are included in this outcome variable.[1] At T4 the scale was composed of (1) no high school diploma or other formal educational qualifications, (2) currently at high school, (3) completed high school diploma, (4) currently attending vocational school after high school, (5) currently undertaking two-year college degree program, and (6) currently undertaking four-year college degree or university degree program. At T5, the scale consisted of nine categories and the first four categories were the same as categories 1 to 4 at T4; (5) graduate of vocational school, (6) currently undertaking two-year college degree, (7) graduate of two-year college degree program, (8) currently

undertaking four-year college degree program, and (9) graduate of four-year college degree program. If more than one category was chosen by participants, only the highest category was used to represent the highest level of educational attainment.

Educational Aspirations

Participants were asked a series of questions regarding the level of education that they hoped to attain. These were used to construct a composite variable with the response scale ranging from (1) no high school diploma; plans to drop out of high school to (4) postgraduate or professional school after college/university.

Occupational Aspirations

A single item was used in all of five waves of data to assess participants' occupational aspirations ("What sort of work do you think you might do for a living?"). The responses were then coded on rankings developed by Otis Duncan (1961) in terms of combination among reputation rating, education level required, and income (see Bachman, 2002, for further discussion). In the Duncan occupation scale, 100 indicated the highest occupational aspirations while 1 indicated the lowest.

Analysis

Estimation and Missing Data

Structural equation models (SEMs) used in data analysis were estimated in Mplus 7 (Muthén & Muthén, 2012). The nesting of the students into classes was treated as a clustering variable to take into account the non-independence of the scores for students from the same school. The YIT weighting variable was applied throughout the data analysis in order to obtain population estimates (Bachman, O'Malley, & Johnston, 1978). SEMs were estimated using the Mplus robust maximum likelihood (MLR) estimator, which is robust to the nesting of the students within schools and to the Likert nature of items including four or more answer categories (Mplus's complex design option; Muthén & Muthén, 2012; e.g., Beauducel & Herzberg, 2006; Distefano & Motl, 2006). The MLR estimator was used in conjunction with full information maximum likelihood (FIML) estimation in order to cope with the inevitable missing data present in longitudinal studies. In FIML, the parameters of a statistical model are estimated in the presence of missing data, and all of the information of the observed data is used to inform the parameters' values and standard errors. Studies show that FIML tends to perform as well as more computer-intensive multiple imputation procedures, even in the

presence of elevated rates of missing responses or time waves (for additional details, see Enders, 2010).

Indirect Effect

Bootstrap confidence intervals with 1,000 bootstrap draws were used to test the significance of indirect path coefficients (Preacher & Hayes, 2008; Shrout & Bolger, 2002). If the confidence interval excludes zero, the indirect effect can be considered to be statistically significant. For present purposes, we report the 95% confidence interval that corresponds to the $p < .05$ alpha level using Mplus 7 (see Muthén & Muthén, 2012). Specifically, we presented the total indirect effect that is the sum of all of the indirect pathways by which the predictor exerts its influence on outcome variables via an indirect pathway through intervening variables. For example, in Figure 1, the paths from achievement to occupational aspirations via motivational factors at T1 are indirect paths, in which the T1 self-concept and intrinsic and utility value, respectively, mediate the effects of achievement on occupational aspirations at T1. The total indirect effect is then the sum of these three indirect effects. For clarity, we only present statistical significant direct effect based on Models 1 to 3 and indirect effects based on final Model (i.e., Model 3). Total effects is simply the sum of direct effect and total indirect effects between two variables (see Appendices 2-4 in the online journal for more details regarding direct, indirect, and total effects).

Goodness of Fit

In recent applied SEM research, there is a predominant focus on indices that are sample size independent (Marsh, Wen, & Hau, 2004), such as the root mean square error of approximation (RMSEA), the Tucker-Lewis Index (TLI), and the Comparative Fit Index (CFI) rather than chi-square tests of statistical significance because of oversensitivity to sample size and minor model misspecifications. Values greater than .90 and .95 for TLI and CFI, respectively, typically are acceptable and provide excellent fit to the data. RMSEA values of less than .06 and .08, respectively, are considered to reflect good and acceptable fit to the data.

Tests of Invariance

In order to ensure that the constructs remained the same across time points, we tested the longitudinal invariance of the factor loadings. Although additional tests of invariance are possible, in a model like the one used in the present study that focuses on only the covariance

between constructs, the only real prerequisite to valid longitudinal comparisons is the invariance of the factors loadings over time (Millsap, 2011). Other more stringent tests would have been necessary in order to support the test of latent mean differences over time or models based on the use of manifest, rather than latent, scale scores, which is not the case in the present study. For the comparison of the two models, the chi-square difference test suffers from more problems than that for single models (see Marsh, Hau, Balla, & Grayson, 1998). Other fit indices like the CFI and the RMSEA perform well for judging the adequacy of the invariance assumption (Morin, Marsh, & Nagengast, 2013). Cheung and Rensvold (2002) and Chen (2007) suggested that if the change in CFI is not more than .01 and the RMSEA increases by less than .015 for the more parsimonious model, the assumption of variance is tenable.

Results

Descriptive and Correlations

Descriptive results for the variables were presented in Table 1. All multi-item scales demonstrated acceptable internal reliability at all waves of data. All of the scales are approximately normally distributed.

Table 1
Estimated Correlation Matrix for the Latent Variables Across Occasions

	Time 1 (T1)						Time 2 (T2)				Time 3 (T3)					Time 4 (T4)				Time 5 (T5)		
Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1. IQ T1	—																					
2. Achievement T1	0.353*	—																				
3. Self-concept T1	0.485*	0.598*	—																			
4. Intrinsic value T1	0.019	0.273*	0.273*	—																		
5. Utility value T1	0.211*	0.301*	0.335*	0.497*	—																	
6. Occupational aspirations T1	0.372*	0.346*	0.431*	0.202*	0.266*	—																
7. Self-concept T2	0.477*	0.543*	0.844*	0.228*	0.254*	0.384*	—															
8. Intrinsic value T2	0.027	0.225*	0.232*	0.632*	0.311*	0.155*	0.229*	—														
9. Utility value T2	0.053	0.186*	0.163*	0.334*	0.464*	0.161*	0.142*	0.511*	—													
10. Achievement T2	0.310*	0.656*	0.585*	0.285*	0.290*	0.314*	0.598*	0.307*	0.209*	—												
11. Occupational aspirations T2	0.352*	0.385*	0.458*	0.176*	0.244*	0.626*	0.464*	0.200*	0.174*	0.401*	—											
12. Educational aspirations T2	0.233*	0.396*	0.451*	0.281*	0.265*	0.459*	0.447*	0.309*	0.243*	0.419*	0.567*	—										
13. Achievement T3	0.309*	0.588*	0.504*	0.236*	0.278*	0.285*	0.545*	0.281*	0.188*	0.652*	0.362*	0.328*	—									
14. Occupational aspirations T3	0.373*	0.403*	0.486*	0.167*	0.222*	0.548*	0.477*	0.148*	0.144*	0.389*	0.680*	0.488*	0.377*	—								
15. Educational aspirations T3	0.287*	0.431*	0.481*	0.240*	0.248*	0.452*	0.444*	0.268*	0.240*	0.393*	0.563*	0.627*	0.407*	0.604*	—							
16. Self-concept T4	0.355*	0.450*	0.714*	0.270*	0.270*	0.286*	0.779*	0.237*	0.142*	0.490*	0.374*	0.389*	0.471*	0.383*	0.388*	—						
17. Intrinsic value T4	−0.046	0.038	0.039	0.255*	0.123*	−0.058	0.043	0.352*	0.136*	0.106*	0.037	0.086	0.212*	−0.033	0.065	0.131*	—					
18. Utility value T4	0.054	0.002	0.049	0.172*	0.278*	0.014	0.055	0.326*	0.465*	0.014	0.030	0.005	0.034	0.040	0.011	0.003	0.297*	—				
19. Occupational aspirations T4	0.348*	0.401*	0.458*	0.151*	0.238*	0.499*	0.440*	0.164*	0.165*	0.383*	0.597*	0.482*	0.375*	0.640*	0.550*	0.383*	0.095*	0.021	—			
20. Educational attainment T4	0.324*	0.465*	0.475*	0.220*	0.303*	0.397*	0.466*	0.238*	0.216*	0.475*	0.481*	0.490*	0.483*	0.527*	0.565*	0.339*	0.078*	−0.017	0.535*	—		
21. Occupational aspirations T5	0.221*	0.313*	0.281*	0.117*	0.174*	0.245*	0.248*	0.063*	0.106*	0.290*	0.276*	0.242*	0.301*	0.297*	0.287*	0.225*	0.101*	0.053	0.306*	0.708*	—	
22. Educational attainment T5	0.357*	0.478*	0.452*	0.203*	0.260*	0.417*	0.462*	0.184*	0.154*	0.470*	0.489*	0.475*	0.475*	0.506*	0.541*	0.380*	0.123*	−0.024	0.510*	0.329*	0.384*	—
M	108.64	39.97	4.15	3.16	5.15	61.21	4.23	3.1	5.06	40.02	58.92	3.92	7.81	58.03	3.88	4.13	3.47	4.84	4.20	57.72	5.76	36.7
SD	12.29	7.24	0.73	0.62	0.80	26.21	0.75	0.62	0.74	6.99	24.83	1.07	2.12	24.55	1.12	0.75	0.83	0.74	1.47	24.43	2.37	23.0
Skewness	−0.66	−0.16	−0.03	−0.55	−1.18	−0.58	0.10	−0.48	−0.73	−0.12	−0.43	−0.79	0.02	−0.44	−0.75	0.10	−0.52	−0.38	−0.35	−0.41	−0.14	0.4
Kurtosis	1.57	0.53	0.10	0.30	2.10	−1.01	−0.07	0.27	0.68	0.51	−1.03	−0.32	−0.23	−0.97	−0.49	0.02	0.34	0.34	−0.78	−0.93	−1.06	−.9
Alpha	—	—	0.743	0.767	0.800	—	0.711	0.760	0.775	—	—	—	—	—	—	0.649	0.760[a]	0.739	—	—	—	—

[a]Intrinsic value at T4 is treated as a latent construct by fixing the standardized measurement error of the single indicator to a predetermined value of .240 (reflecting a conservative estimate of reliability of .760, which is the same as that at T2) (for additional details on this procedure, see e.g., Bollen, 1989; Jöreskog, 1979).
*$p < .05$.

To examine the factor structure of academic self-concept and task value, confirmatory factor analysis (CFA) was employed. The configurally invariant CFA model where no constraints are placed on any of the parameter estimates fit the data well (see Table 2). Testing for weak measurement invariance involves constraining each corresponding factor loading to be equal across time. The change in model fit between the configural and weak models was negligible (equivalent RMSEAs and CFIs and only slight decreases in TLIs).

Table 2 Model Fit Statistics for the Longitudinal Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) Models

Table 2
Model Fit Statistics for the Longitudinal Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) Models

Model	χ^2	*df*	Comparative Fit Index	Tucker-Lewis Index	Root Mean Square Error of Approximation
CFA					
Configural	612.187	268	.974	.966	.024
Factor loading invariance	634.114	278	.974	.965	.024
SEM					
Model 1 (motivation, achievement, and attainment)	1,027.802	415	.966	.959	.026
Model 2 (motivation and educational and occupational aspirations)	1,212.002	473	.967	.961	.027
Model 3 (final hypothesized model)	1,388.491	613	.967	.960	.024

Before testing the hypothesized model, intercorrelations among motivational factors and outcome variables were evaluated across time (see Table 1). These results showed that academic self-concept was significantly correlated with intrinsic (r = .303, p < .001) and utility values (r = .335, p < .001), while intrinsic value was also significantly correlated with utility value at T1 (r = .497, p < .001). Nonetheless, the pattern of correlations between academic self-concept and values decreased over time. Self-concept was more highly correlated with achievement and educational and occupational aspirations compared to intrinsic value and utility value. At each occasion, self-concept, academic achievement, and aspirations significantly correlated with educational attainment at T4 and T5 (r = .339-.565, p < .001), whereas the pattern of correlations between task value and attainment were less pronounced (r = .078-.238, p < .05, for intrinsic value; r = .154-.260, p < .01, for utility value at T1 and T2). However, it is noted that the correlation between utility value at T4 and attainment was not statistically significant.

In relation to SEM, the hypothesized models were found to provide excellent fit: CFI and TLI were above .95 and RMSEA was less than .027 (see Table 2). The final model (Model 3), in which all cognitive and noncognitive variables were assessed together, respectively, accounted for 40%, 8%, and 11% of the variance in academic self-concept; intrinsic value and utility value at T1, 75%, 51%, and 34% at T2 and 67%, 38%, and 47% at T4. The final model accounted for a large portion of the variance in academic achievement (50% at T2, 47% at T3), educational attainment (43% at T4, 55% at Time 5), educational aspirations (36% at T2, 47% at T3), and occupational aspirations (24% at T1, 48% at T2, 50% at T3, 50% at T4, 16% at T5). Detailed results from these models are reported in Appendix 2 available in the online journal. Figures 2 through 4 present the standardized path coefficients for the hypothesized models.

Research Question 1: What Roles Do Motivational Beliefs Play in Shaping Academic Achievement and Subsequent Educational Attainment?

As can be seen in Figure 2 (Model 1), autoregressive paths of academic self-concept were extremely stable across time (β = .755-.764, $p < .001$). The patterns of autoregressive paths of intrinsic value (β = .338-.576, $p < .001$) and utility value (β = .489-.517, $p < .001$) are smaller than those of self-concept across time. Similarly, autoregressive stability coefficients relating to the measures of academic achievement and educational attainment on different occasions are all significant and positive.

The estimated cross-lagged effects reflect the unique direct effects of a variable on another variable measured at later time points controlling for the autoregressive effects, whereby each variable predicts itself over time. In other words, these cross-lagged paths reflect the relations between one variable and changes in another variable over time. T1 students' achievement (i.e., GPA from the previous year collected at T1) had stronger effects on T1 self-concept (β = .488, $p = .037$), intrinsic value (β = .284, $p = .033$), and utility value (β = .286, $p = .030$) compared to T1 IQ scores. In particular, IQ did not significantly predict intrinsic value. The effect of T2 achievement (i.e., GPA from the previous year collected at T2) on all of T2 motivational factors were somewhat weaker compared to the corresponding path coefficient at T1. However, T3 achievement had a positive and significant effect on T4 self-concept (β = .091, $p = .034$) and intrinsic value (β = .128, $p = .026$) but not on utility value. The effect of T1 self-concept on subsequent achievement is statistically significant (β = .268, $p= .034$) and similar in magnitude to the cross-time relation between T2 self-concept and T3 achievement (β = .260, $p = .031$). Controlling for self-concept, the effects of prior

intrinsic value on subsequent achievement were rather small (β = .080-.072, $p < .05$), whereas corresponding paths relating utility value and achievement were not statistically significant. Similarly, at T4, self-concept more strongly predicted T5 educational attainment (β = .217, $p = .029$) than intrinsic value (β = .072, $p = .026$), whereas the path from utility value to educational attainment was not statistically significant. In addition, controlling for motivational beliefs and prior achievement, the path from IQ to T2 achievement was not statistically significant.

Research Question 2: What Roles Do Motivational Beliefs Play in Shaping Educational and Occupational Aspirations?

The results showed that the coefficients of autoregressive paths involving motivation are similar between Model 1 (see Figure 2) and Model 2 (see Figure 3). The stability of occupational aspirations decreased after post-school transition (i.e., T4 and T5; β = .331, $p = .026$).

As we hypothesized, prior self-concept significantly predicted subsequent occupational aspirations (β = .334-.265, $p < .05$) while the magnitudes of path coefficients decreased across post-school transition. No paths from intrinsic value to occupational aspirations were statistically significant, whereas utility value only has a small and positive effect on occupational aspirations at T1 (β = .114, $p = .031$). T2 self-concept, intrinsic value, and utility value exerted positive effects on T2 educational aspirations (β = .295, $p = .011$, for self-concept; β = .145, $p = .014$ for intrinsic value; β = .065, $p = .029$, for utility value). However, there was no significant path from occupational and educational aspirations to subsequent motivational beliefs over time, except for a somewhat small and negative path from T3 occupational aspirations to T4 intrinsic value (β = –.112, $p = .042$). In addition, prior occupational aspirations positively predicted subsequent educational aspirations (β = .306, $p = .021$) while the effects of prior educational aspirations on subsequent occupational aspirations were relatively small (β = .159, $p = .026$).

Research Question 3: Taking Into Account All Cognitive and Noncognitive Assets, What Roles Do Motivational Beliefs Play in Shaping Individuals' Educational Attainment?

To explore the complex interplay of motivational beliefs, aspirations, achievement, and attainment, all of variables were added in the final model (see Figure 4). Controlling for other variables, the corresponding path coefficients involving motivation are similar across the three models (Models 1, 2, and 3).

While academic achievement predicted positively subsequent occupational (β = .093-.134, $p < .05$) and educational aspirations, occupational and educational aspirations did not significantly predict subsequent achievement. Achievement and educational and occupational aspirations at T3 predicted educational attainment at T4 (β = .239-.324, $p < .05$). The reciprocal relations were found between occupational aspirations and educational attainment (i.e., from attainment to occupational aspirations at T4 and T5, from T4 occupational aspirations to T5 attainment; β = .162-.294, $p < .05$).

In relation to indirect effect (see Table 3 for the standardized path coefficients), the effects of achievement on occupational aspirations were partially mediated only by self-concept over time, whereas the effects of achievement on educational aspirations were partially mediated by all three motivational beliefs (i.e., self-concept, intrinsic value, and utility value). In addition, T1 and T2 academic self-concept had positive indirect effect on long-term T5 educational attainment (.288, .264; 95% CIs [.045, .332], [.210, 319], respectively), which is similar in size to the indirect effects of T1 achievement (last year GPA at T1) on T5 attainment (.276; 95% CI [.146, .306]). The magnitudes of these paths were larger than those of IQ (.081, 95% CI [.063, .099]). The paths of T2 and T3 educational aspirations on T5 educational attainment were positive and significant (.129, .227; 95% CIs [.101, .157], [.188, .266], respectively). Similarly, T1, T2, and T3 occupational aspirations had significant and positive indirect effects on T5 educational attainment (.141, .197, .191; 95% CIs [.116, .166], [.166, .229], [.148, .234], respectively). Academic achievement and self-concept at T1 and T2 had significant and positive, albeit weaker indirect effects on T5 occupational aspirations, compared to the corresponding indirect effects on T5 academic achievement. The indirect effects of T1 and T2 intrinsic value on T4 and T5 outcome variables were significant but marginal, whereas the corresponding effects of utility value were not statistically significant.

Table 3

Indirect Effects From the Hypothesized Model

	IQ	AchT1	ASCT1	INVT1	UVT1	OaspT1	AchT2	ASCT2	INVT2	UVT2	OaspT2	EdaspT2	AchT3	OaspT3	EdaspT3	ASCT4	INVT4	UVT4	AttT4	OaspT4
Outcome																				
AchT2	.089*	.180*																		
OaspT1	.085*	.202*																		
ASCT2	.279*	.529*	.046*	.013*	.005															
INVT2	−.027	.258*	.037*	.011*	.002															
UVT2	.063*	.181*	.021*	.006*	.003															
OaspT2	.187*	.342*	.346*	.043*	.070*	.003	.038*													
EdaspT2	.140*	.341*	.308*	.113*	.016*	.001	.061*													
AchT3	.107*	.454*	.327*	.077*	.022	.026	.050*	.007	−.003	.000										
OaspT3	.112*	.260*	.257*	.044*	.052*	.355*	.121*	.163*	.032	.028										
EdaspT3	.130*	.263*	.249*	.066*	.050*	.297*	.138*	.168*	.071*	.036*										
ASCT4	.224*	.440*	.643*	.017*	.006	.019	.156*	.018	.006	.002	.010	.016								
INVT4	−.007	.125*	.036	.129*	−.002	−.040	.119*	.020	.007	.000	−.062	−.015								
UVT4	.004	.049*	−.031	−.006	.238*	−.041	.007	−.028	−.008	−.005	−.067	−.039								
AttT4	.082*	.270*	.230*	.053*	.035*	.118*	.216*	.157*	.047*	.023	.262*	.179*								
OaspT4	.091*	.256*	.264*	.045*	.045*	.229*	.134*	.216*	.042*	.040*	.346*	.170*	.058*	.037*	.063*					
AttT5	.081*	.276*	.288*	.054*	.018	.141*	.178*	.264*	.054*	−.001	.197*	.129*	.186*	.191*	.227*	.015*	.003	.005	.024*	
OaspT5	.039*	.123*	.128*	.023*	.013*	.079*	.074*	.113*	.023*	.006	.114*	.066*	.065*	.130*	.102*	.077*	.024	−.004	.208*	.039*

Note. All variables were given a label that identifies the Time (T1 to T5). ASC = academic self-concept; INV = intrinsic value; UV = utility value; Ach = educational achievement; Att = educational attainment; Oasp = occupational aspirations; Eduasp = educational aspirations.
*Presents 95% bootstrap percentile confidence interval failed to include 0, which corresponds to p value < .05 alpha level.

Discussion

This is one of the few studies that applied the modern EVT to explore the longitudinal temporal associations between personal cognitive abilities, motivational beliefs, and educational/occupational aspirations as well as the impact of these constructs on educational attainment during the transition from late adolescence to adulthood over eight years. Our findings suggest that academic self-concept is not only a key determinant of educational achievement but also a stronger predictor of aspirations when task values and prior achievement are taken into account. Moreover, motivational beliefs play a mediating role in the relationship between achievement and subsequent aspirations. Self-concept and achievement in early high school were found to contribute more to the prediction of long-term occupational aspirations and educational attainment than task values and IQ.

Stability of Motivational Beliefs and Achievement

Academic self-concept and task values were stable from T1 to T2 (Grade 10 to Grade 11). However, during the transition period from T2 to T4 (Grade 11 to one year after high school graduation), high stability coefficients were shown for self-concept and utility value but not for intrinsic value. Köller et al. (2001) argued that the transition from school to higher education exerts pressure on students to select and reinforce specific fields of interest while focusing less on others. Further, the field of experience in college or vocational school broadens substantially, providing competing opportunities for interest development (Wigfield, Tonks, & Klauda, 2009; discussed in more detail in the following).

It was interesting to note that individuals' occupational aspirations stabilized during post–high school transition. However, it was much less stable from T4 to T5 (five years after

normal high school graduation), and during this period most of participants finished vocational or college study and entered the labor market. This result was consistent with the motivational theory of life span development developed by Heckhausen, Wrosch, and Schulz (2010). They posit action cycles of setting, striving for, and disengaging from developmental goals as recurring cycles throughout an individual's life, and the transition from school to work easily triggers goal disengagement (see Dietrich et al., 2012, for a review).

The Interplay Among Motivational Beliefs, Achievement, Aspirations, and Attainment

Consistent with previous findings (e.g., Marsh & Craven, 2006; Marsh et al., 2005), our results provide clear evidence about significant reciprocal effect between academic self-concept and academic achievement as well as between intrinsic value and achievement during post-school transition. The reciprocal effects relating to self-concept are stronger than those relating to intrinsic value, which was also in line with our expectation of stronger relationship between academic self-concept and achievement (Marsh et al., 2005). Furthermore, self-concept and intrinsic value are found to be predictive of educational attainment, indicating that adolescents who believe that they are skilled and have higher intrinsic value attached to coursework are more likely to have high educational attainment.

In addition, one of the unique contributions of the present study is to examine the temporal process of motivational beliefs and educational and occupational aspirations across late adolescence to adulthood. In supporting our expectations, each motivational belief uniquely predicted educational aspirations after controlling for prior achievement and aspirations. However, only self-concept was consistently found to predict occupational aspirations over time. Intrinsic and utility values contributed much less in the prediction of subsequent aspirations compared to self-concept. This finding adds to the growing evidence that academic self-concept plays a critical role in promoting career aspirations (e.g., Nagengast & Marsh, 2012; Parker et al., 2012; 2013). It is important to note that aspirations did not significantly predict subsequent motivational beliefs, expect for the negative effect of T3 (Grade 12) occupational aspirations on T4 intrinsic value. As noted previously, students' intrinsic motivations are likely to develop significantly after high school graduation. One attempt to explain this negative effect may be the mismatch between knowledge and skills taught in the curriculum and what is expected to fulfill their career goals. Indeed, community colleges have vocational aspects to the learning curriculum that may thus more directly reflect students' interest and career goals, while 4-year colleges/universities have more general educational requirements, especially in the first year

of curriculum, which may not be directly related to the interests of students (see Appendix 5 in the online journal for additional analysis).

Indirect Link Between IQ, Motivational Beliefs, Achievement, Aspirations, and Attainment

Our results align with prior studies and the EVT (Eccles, 2009; Wang, 2012) in that prior academic achievement predict motivational beliefs, which in turn influence subsequent occupational and educational aspirations. Importantly, the current study is one of few studies to examine the long-term indirect effect of cognitive and noncognitive assets on educational attainment over an eight-year span. Academic self-concept has stronger long-term indirect effects on future educational attainment compared to task values, which is consistent with our expectation. This finding indicates that in early high school, students' academic self-concept has substantial influence on their future educational attainment. Likewise, self-concept played a crucial role in shaping future occupational aspirations. However, the contributions of intrinsic and utility values were relatively small for aspirations and attainment.

In addition, it is worth noting that IQ was included in our hypothesized model and contributed to the prediction of occupational aspirations and educational attainment. However, the magnitudes of these indirect effects of IQ were substantially smaller than those of T1 achievement (GPA at the end of Grade 9). This finding is consistent with the prior empirical studies, which showed that high school grades account for almost all of the association between IQ and educational attainment (see Hauser, 2010, for a review).

Implication for Theory, Research, and Practice

The results of the present investigation have important implications for theory, research, and practice. Theoretically, by demonstrating the temporal process between motivational beliefs, achievement, and aspirations in influencing long-term educational attainment, the results provide strong support for modern EVT and extend the substantial evidence that attests to the effect of expectancy-value on achievement-related behaviors. Additionally, the results also provide new and additional support to academic self-concept theories stating that academic self-concept contributes to the prediction of important outcome variables beyond what can be explained by academic achievement.

With respect to instructional practices, the reciprocal effects of self-concept and intrinsic value with academic achievement shown in the results suggest that educators should

strive to improve both academic self-concept and intrinsic value along with achievement in order to produce positive changes in each of these constructs. For example, teachers can promote student motivation by creating a supportive school/classroom environment in which students feel free to ask questions and interact with instructors (Urdan & Schoenfelder, 2006; Wang & Degol, 2013; Wang & Eccles, 2012). The findings also suggest that teachers and parents should pay more attention to the changes in children's academic self-concept because stable self-concept during the high school years appears to play a decisive role in shaping future occupational and educational aspirations and attainment. In the meta-analysis of self-concept interventions, Haney and Durlak (1998; also see Huang, 2011) showed that self-concept interventions would lead to improved academic achievement, consistent with the reciprocal effects model of the causal ordering of academic self-concept and achievement, suggesting that self-enhancement and skill development should be integrated in the intervention programs. In the other meta-analysis of self-concept interventions, O'Mara, Marsh, Craven, and Debus (2006) noted that interventions targeting a specific academic self-concept domain and subsequently measuring that domain were much more effective than those solely targeting global or skill-based self-concept. They also reported that attributional feedback, goal feedback, and contingent praise yielded significantly higher effects sizes—particularly when coupled with skill training. This again emphasizes the importance of the reciprocal effects model that was a central feature of the present investigation.

In addition, the clear evidence about significant associations between educational attainment and aspirations across time implies that promoting students' occupational and educational aspirations is another imperative issue for educational policymakers and practitioners as these aspirations also seem to play a major role in shaping the course of individual development. Therefore, this study offers new insights into how expectancy-value motivation and aspirations have profound effects on the lives of students. We believe that our model, which encompasses the key elements of academic self-concept and task values, which are the prominent and well-validated theoretical propositions, is a fruitful vehicle in gaining some deeper insights into students' decisions and career paths.

Strengths, Limitations, and Directions for Future Studies

In interpreting the findings, some strengths and weakness of the present study have to be considered. Despite potential limitations, important design features of the YIT database were critical in terms of the present investigation and motivation research more generally. In particular, the YIT is one of few longitudinal data sets that provides diverse motivational

constructs based on multiple items as well as measures of both cognitive and noncognitive assets, which all possess strong psychometric properties. Furthermore, YIT is one of the few studies spanning such a long period while covering the critically important post-school transition period. These specific characteristics of YIT enabled us to investigate the directionality of the temporal associations between these important factors corrected for measurement error and their role in the prediction of educational attainment across this important developmental period. The multiple wave design further enabled us to test indirect effects while respecting the assumed temporal ordering of all variables, and this allowed us to develop a better theoretical understanding of the roles that motivational beliefs play in shaping aspirations and attainment. To our knowledge, no other current data set presents all of these characteristics.

Consistent with this perspective, the YIT has been a traditional testing ground for new and evolving theoretical models in self-concept and motivation research as well as the central focus of critical debates in relation to these constructs (e.g., Bachman & O'Malley, 1986; Brezina, 2010; Marsh, 1990; Marsh & O'Mara, 2008, 2010; Marsh, Scalas, & Nagengast, 2010; Sullivan, 2011). Thus, for example, the debate about the role of self-concept in predicting future outcomes between Baumeister and colleagues (Baumeister, Campbell, Krueger, & Vohs, 2003, 2005) and Marsh and Craven (2006)hinged on competing interpretations of results based on the YIT. The resolution of the claims and counterclaims underpinning this debate (Marsh & O'Mara, 2010) was then based on a subsequent reanalysis of YIT data, showing that academic self-concept emphasized by Marsh and Craven (2006)was a critical predictor of long-term academic outcomes, while self-esteem emphasized by Baumeister and colleagues was not. Given the importance of this YIT database in motivational and self-concept research on which the present investigation builds, it is particularly well suited to test the long-term implications of the juxtaposition of academic self-concept and academic task values that are at the heart of modern expectancy-value theory.

Nevertheless, there are also some important limitations to this study. We note that the sample used in this study only included U.S. boys and was dated (from the 1960s and 1970s), which leads to conclusions of unknown generalizability to modern youth, particularly for girls. Indeed, multiple previous studies have documented significant gender differences in self-concept and interest development as well as related differences in academic and career trajectories (e.g., Elder, 1999; Köller et al., 2001; Schoon & Polek, 2011). These observations suggest that future research is needed to test the generalizability of our results based on

similar longitudinal research designs involving newer and mixed-gender nationally representative samples. Furthermore, future comparisons of longitudinal studies across different national/international samples or more diversified populations would be useful for clarifying whether the current findings are unique to this U.S. sample of male participants or whether they reflect a generalizable educational and occupational attainment process. Another limitation of this study is that students' academic achievement was assessed based on students' self-reports, which have previously been demonstrated to lack accuracy among lower-performing students (Kuncel, Credé, & Thomas, 2005). Also, the measure of motivational beliefs is inconsistent across measurement points. Specifically, although motivational beliefs were found in the present study to play critical roles during the post-school transition years, these variables were not available at Time 3 (late Grade 12), right before this transition. This makes the comparisons of pre, versus post, school transition results imprecise, as it is impossible to clearly assess whether the post-transition tendencies were already present in Grade 12. Furthermore, only a single indicator was used to assess intrinsic value at T4. Hence, there is a need for further research incorporating consistent measurement of the expectancy-value motivation and teacher/school-based academic achievement. Finally, an important direction for further research would be to consider the process through which students academically and socially integrate into their universities, colleges, or institutions. In doing so, a more nuanced understanding of the development of motivational beliefs during post-school transition and how this process is impacted by substantial educational choices would be obtained.

Conclusion

The aims of the present study were to disentangle the complex directionality of the associations among motivational beliefs, achievement, aspirations, and attainment and to address a critical gap in achievement motivation research related to the roles of motivational beliefs in associations between achievement, aspirations, and attainment during late adolescence to early adulthood. To this end, our study provides clear evidence that academic self-concept and intrinsic value have reciprocal effects with achievement over time, and both motivational beliefs also contribute to the prediction of educational attainment. In relation to aspirations, motivational beliefs partially mediate the relationship between achievement and educational and occupational aspirations, and self-concept plays a critical role in predicating aspirations. Finally, academic self-concept and achievement at early high school showed a stronger long-term effect on educational attainment compared to intrinsic and utility value,

IQ, and aspirations. These main findings have practical implications for educational policymakers and practitioners seeking to promote individual's educational attainment.

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