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The relation between achievement goal and expectancy-value theories in predicting achievement-related outcomes: A test of four theoretical conceptions

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Abstract Although achievement goal and expectancy-value theories are both dominant in the achievement motivation literature, the relation between goals and expectancy-value variables in predicting achievement-related behaviors remains unclear. The present study evaluated the empirical validity of four contrasting theoretical conceptions which posit that (1) goals and expectancy-value variables are independent predictors of achievement-related outcomes (2) goals predict expectancy-values, (3) goals mediate the relation between expectancies and task-values, and (4) goals partially mediate the relation between expectancy-values and achievement outcomes, in predicting course performance, career intentions and academic aspirations. Path models evaluating these conceptions were tested separately in mathematics and language arts domains among 697 6th and 8th grade students. Results supported the fourth theoretical approach suggesting that expectancy-value variables predict achievement-related outcomes both directly and indirectly through achievement goals. These findings provide insight about the relation between expectancy-value and achievement goal theories and highlight their complementary role in predicting achievement behaviors.

Keywords Academic aspirations · Course performance · Career intentions · Expectancy-value · Achievement goals · Motivation

Introduction

Among contemporary social-cognitive theories of motivation, achievement goal theory (Ames 1992; Dweck and Leggett 1988; Elliot 1999, 2006) and expectancy-value models (Eccles et al. 1983; Feather 1992; Pintrich 2003a; Wigfield and Eccles 2000) are dominant. As noted by some researchers (e.g., Hulleman et al. 2008; Pintrich 2003b; Wigfield 1994), however, research on motivation has tended to emphasize one theoretical perspective or the other without exploring how these variables might be related to each other in predicting achievement-related outcomes. For instance, Pintrich (2003b) argued that expectancy-value models have focused on the role of individuals' expectations of success and task-values, and their relation to future performance and achievement-related choices, but have not examined how these variables might be related to goals. Conversely, achievement goal theory has not considered how goals may operate differently at various levels of task-values (Pintrich 2003b; Wigfield 1994). Therefore, the integration of expectancy-value and achievement goal theories could allow researchers to understand motivational

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processes in a way that a single perspective may not completely capture (Hulleman et al. 2008; Pintrich 2003b).

Although achievement goals and expectancy-value variables might independently predict achievement-related outcomes, there are also reasons to believe that these motivational variables are related and jointly predict individuals' achievement behaviors. Researchers have made three major predictions concerning the relation between expectancy-value variables, and achievement goals. From a theoretical perspective, goals can be viewed as aspects of the self that exist prior to encountering an achievement situation (Eccles et al. 1983; Friedel et al. 2007; Meece et al. 2006). Goals can also be considered as mediators of expectancy-value variables in that goals could derive from individuals' expectancies (Elliot 1999; Elliot and Thrash 2001), and be a predictor of their subjective value for a task or domain (Hulleman et al. 2008). Finally, goals can be conceptualized as a variable predicted by the perceptions of the current achievement situation, resulting from their expectancies, and task-values (Greene et al. 1999; Maehr 1984; Pintrich and Schunk 2002). Although a large body of literature supports achievement goal theory and expectancy-value models in predicting achievement-related behaviors, the relations among achievement goals, expectancy-value variables, and achievement-related outcomes is not yet clear. Thus, the present study was designed to evaluate the empirical validity of four theoretical conceptions in predicting academic performance, career intentions, and academic aspirations: (1) achievement goals and expectancy-values are independent predictors, (2) achievement goals predict expectancy-values, (3) achievement goals mediate expectancies and task-values, and (4) expectancy-values predict achievement goals. A better understanding of the relations among these variables is not only important to the continued development of motivational theory, but also to the enhancement of our understanding of motivational processes. Furthermore, this integrative approach may contribute to clarity and parsimony in motivational theories, as expectancy-value variables and achievement goals may play complementary roles in predicting achievement-related outcomes (Harackiewicz and Linnenbrink 2005; Hulleman et al. 2008; Pintrich 2003b).

Theoretical framework

Achievement goal theory

Achievement goal theory proposes that people engage in various achievement activities for two main reasons that influence their interpretations and reactions to achievement-related events (Elliot 2005; Meece et al. 2006). These reasons pertain to *mastery goals*, which focus on learning and the development of competencies, and *performance*

goals, which focus on demonstrating or validating competence relative to others. Although these goals have been more recently subdivided into approach and avoidance dimensions (Cury et al. 2006; Elliot and McGregor 2001), we focused on approach-related achievement goals in the present research, as they relate most directly to the value assessments relevant to expectancy-value models and is also consistent with previous research (e.g., Hulleman et al. 2008). While there is some debate about the origins of achievement goals (e.g., DeShon and Gillepsie 2005; Dweck and Leggett 1988; Elliot and Church 1997) researchers have generally investigated goals as aspects of the self that remain fairly stable over time and situations (e.g., Fryer and Elliot 2007). Mastery and performance goals, however, can also be temporarily invoked by the achievement situation or context (Meece et al. 2006; Murayama and Elliot 2009). In the present work, we focused on individuals' relatively stable achievement goals towards the academic domains of mathematics and language arts in order to examine the relation between goals, expectancy-value variables, and achievement-related outcomes.

Mastery goals have generally been found to be more beneficial than performance goals. For instance, the adoption of mastery goals predicts greater persistence and effort during challenging tasks (Elliott and Dweck 1988; Stipek and Kowalski 1989) and increased use of deep-level cognitive processing strategies (Ames and Archer 1988; Elliot and McGregor 2001; Grant and Dweck 2003; Greene and Miller 1996; Meece and Miller 2001; Nolen 1988; Wolters 2004). However, the expected positive relation between mastery goals and academic performance has not been consistently observed (Barron and Harackiewicz 2001; Elliot and Church 1997; Grant and Dweck 2003; Harackiewicz et al. 2000; Skaalvik 1997). In contrast, performance goals generally predict better school performance, especially among college students (see Harackiewicz et al. 2002; Linnenbrink et al. 2008 for reviews). Additionally, given that individuals who pursue performance goals tend to emphasize the outcome of task engagement (e.g., school grades), they may not become as deeply engaged as those who endorse mastery goals (Harackiewicz et al. 1997; Hulleman et al. 2008). The positive relation between performance goals and achievement, however, is not consistently found across various stages of educational development (see Midgley et al. 2001; Pajares and Cheong 2003). The specific reasons for why the links between performance goals and achievement are less consistently observed among younger students are not yet clear (see Midgley et al. 2001 for a review). Nonetheless, some researchers have argued that these inconsistent results may be due to the learning climate, such that K–12 courses are generally less competitive than college courses (Harackiewicz et al. 2002; Harackiewicz et al. 2000).

Although the relation between achievement goals and achievement outcomes has been extensively studied, less attention has been paid to the links between goals and academic aspirations or career intentions, which constitute important long-term educational outcomes. In a recent investigation, however, Creed and colleagues (2011) examined the links between achievement goals in school and career as well as educational aspirations. Results of this study, conducted among a high school student sample, showed that performance goals predicted both career and academic aspirations, whereas mastery goals were not significantly related to either outcome. Extending these recent findings, our study examined how career and academic aspirations are jointly predicted by achievement goals and expectancy-value variables.

In examining the relation among domain-specific achievement goals and expectancy-value variables in predicting course grades, career intentions, and academic aspirations, our study provides an important contribution to achievement goal literature. Indeed, it may afford a more nuanced understanding of the role achievement goals play in predicting not only achievement, but also future aspirations; a topic that is less frequently investigated by achievement goal researchers.

Expectancy-value models

Concomitant with achievement goal theory, expectancy-value models have been used extensively as a conceptual framework for explaining motivational processes. In such models, achievement outcomes, such as task performance and future aspirations, are primarily influenced by internalized perceptions of outcome *expectancies* and *value* of specific tasks or domains (Bandura 1997, 1999; Eccles et al. 1983; Pintrich 2003a; Pintrich and Schunk 2002; Wigfield and Eccles 2000). The expectancy component corresponds to beliefs about one's own competence and self-efficacy (Eccles and Wigfield 2002; Pintrich and Schrauben 1992; Wigfield and Eccles 2000). In contrast, the value component refers to the reasons for engaging in a specific task and includes four principal components: attainment value, intrinsic value, utility value, and cost (Eccles et al. 1983; Eccles and Wigfield 2002; Jacobs and Eccles 2000). Attainment value is defined as the personal importance of doing well on a task, whereas intrinsic value refers to the enjoyment an individual gets from performing an activity, or to the subjective interest an individual has in a subject or activity. Utility value is determined by how well a task or domain relates to current and future goals, such as career goals and academic aspirations. Finally, cost is conceptualized in terms of the negative aspects of engaging in a task, such as performance anxiety and fear of both failure and success, as well as the amount of effort
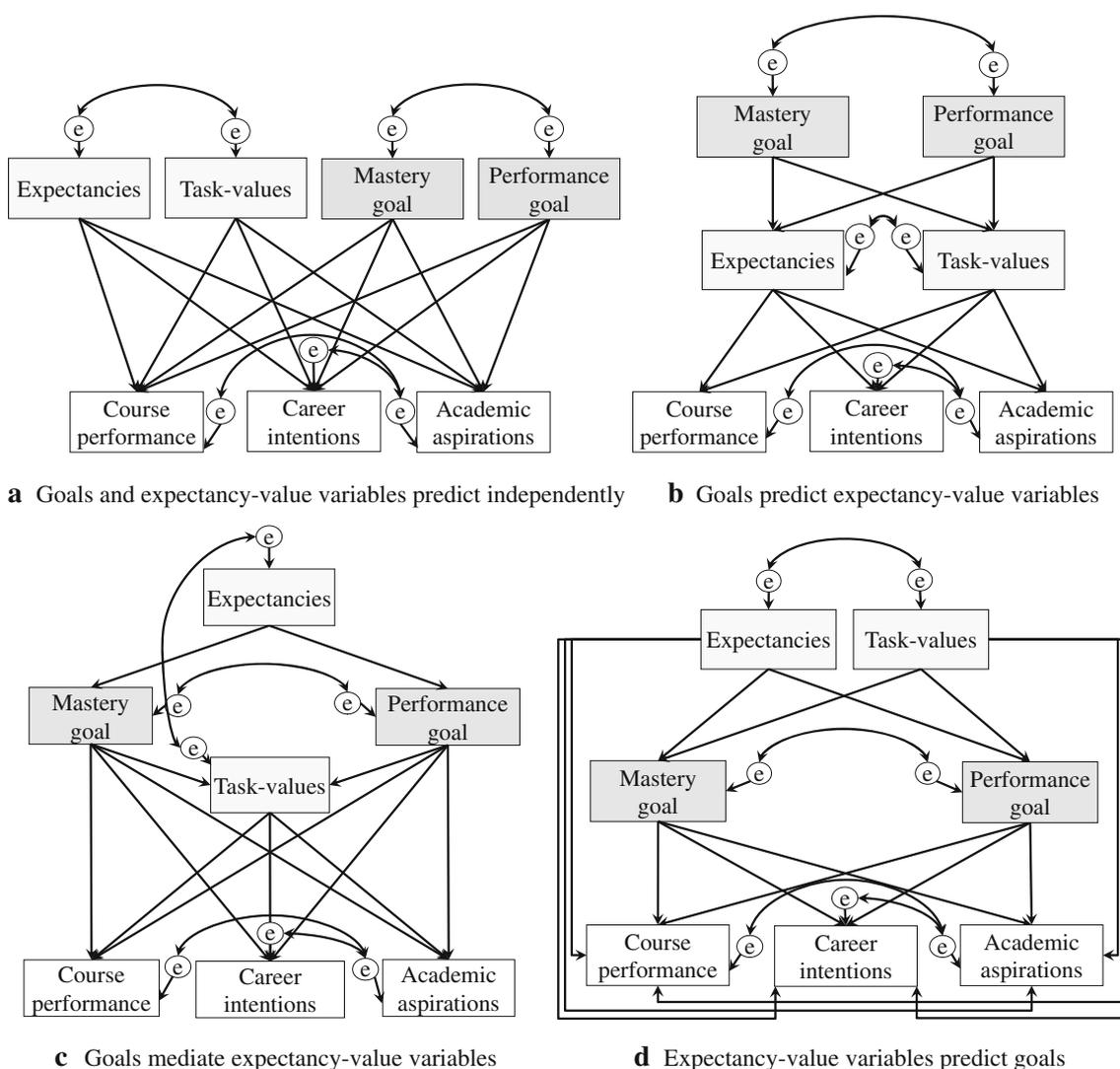
needed to succeed and the lost opportunities that result from making a choice rather than another.

Research supports the validity of expectancy-value models by demonstrating that expectancies and task-values are linked to achievement and academic choices in specific domains, such as mathematics (Green et al. 1999; Marsh and Yeung 1997, 1998; Meece et al. 1990; Spinath et al. 2004) and language arts (Eccles 1984, 1987; Eccles et al. 1983; Meece et al. 1990; Spinath et al. 2004). More specifically, performance is found to be most proximally predicted by expectancies (Eccles et al. 1983; Marsh et al. 2005; Marsh and Yeung 1998; Meece et al. 1990; Steinmayr and Spinath 2009), whereas it is mostly the value attributed to a domain that will determine goal-related behaviors, such as course plans and enrollment (Crombie et al. 2005; Eccles 2005; Stevens et al. 2007). Thus, the expectancy and value components of the model have independent and complementary effects on behaviors, hence both are necessary to understand achievement aspirations and choices, as well as overall achievement.

Conceptions of the relation among achievement goals and expectancy-value variables

With few exceptions (e.g., Greene et al. 1999; Hulleman et al. 2008; Liem et al. 2008), empirical investigations study achievement goals and expectancy-value models in isolation. Along with these two lines of motivation research, it seems plausible that achievement goals, as well as expectancies and task-values, independently predict individuals' achievement-related behaviors. Accordingly, achievement goals and expectancy-value variables would both predict achievement outcomes without being related to each other. This first theoretical conception is presented in Fig. 1a.

Achievement goals, expectations, and task-values might also be interrelated and play a complementary role in predicting achievement outcomes. Based on prior literature, three main theoretical perspectives, presented in Fig. 1b–d, integrate achievement goals and expectancy-values. A first integrative conception (see Fig. 1b) posits that goals are predictors of expectancies and task-values (Eccles et al. 1983; Eccles and Wigfield 2002; Friedel et al. 2007; Meece et al. 2006). For instance, in the expectancy-value model proposed by Eccles and collaborators (see Eccles et al. 1983; Eccles and Wigfield 2002), goals are conceptualized as broad purposes children have for learning. These broad purposes, such as career plans and the desire to act in accordance with certain normative behaviors, are hypothesized to predict individuals' expectations of success and task-values, and then achievement-related behaviors. In line with expectancy-value models (Eccles et al. 1983; Wigfield and Eccles 2000), this second

a Goals and expectancy-value variables predict independently

b Goals predict expectancy-value variables

c Goals mediate expectancy-value variables

d Expectancy-value variables predict goals

Fig. 1 Theoretical models representing (**a**) achievement goals and expectancy-value variables as independent predictors, (**b**) achievement goals as predictors of expectancy-value variables (**c**) achievement goals as mediators of expectancies and task-values (**d**) expectancy-value variables as predictors of achievement goals

hypothesis proposes that goals predict individuals' expectancies and task-values, which, in turn, predict achievement outcomes. Expectancy-value variables would thus fully mediate the relation between achievement goals and achievement outcomes (see Fig. 1b).

Goals can also be conceived as a mediator of the relation between expectancy-value variables (Dweck and Elliott 1983; Elliot 1999, 2005; Elliot and Thrash 2001; Hulleman et al. 2008; Pekrun et al. 2006). For instance, Elliot (1999, 2005) argues that individuals' expectations of success indirectly orient their achievement behaviors, through their achievement goal adoption. Accordingly, high expectations of success are viewed as a facilitator for the adoption of approach-oriented mastery and performance goals. In turn, achievement goals can be viewed as predictors of individuals' task-values (Dweck and Elliott 1983; Hulleman

et al. 2008). For example, Hulleman et al. (2008) demonstrated that task-values mediate the relation between mastery goals and school performance, whereas performance goals directly predict school grades. Task-values would thus partially mediate the relation between goals and achievement outcomes. According to this third theoretical conception, expectancies predict the adoption of achievement goals and, in turn, these goals predict both task-values and achievement outcomes. Thus, task-values partially mediate the links between goals and the achievement-related outcomes (see Fig. 1c).

Finally, a fourth conception posits that goals are predicted by expectancies and task-values and that both expectancy-value variables and achievement goals predict achievement outcomes (Greene, et al. 1999; Greene et al. 2004; Liem et al. 2008; Maehr 1984; Pintrich 2003a). From

this perspective, expectancies and task-values are conceived as perceptions about the self or activities that exist prior to achievement goals, which are viewed as a more specific orientation towards a task or domain. Thus, students' perceived competence and their value for a task or domain would predict their achievement goals towards specific tasks or domains. In turn, both expectancy-value variables and achievement goals would predict achievement-related outcomes. Thus, achievement goals would partially mediate the relation between individuals' expectancy-value beliefs and their achievement behaviors. According to this fourth conception, expectancy-value variables would be both directly linked to individuals' achievement-related outcomes, and indirectly related to them through their achievement goals (see Fig. 1d).

Despite prior literature that provides theoretical support for each of these perspectives, the empirical validity of these four contrasting conceptions deserves further scrutiny. Considering the key role of both achievement goal and expectancy-value perspectives in persistence, achievement and future academic or career aspirations (see Eccles and Wigfield 2002; Meece et al. 2006 for reviews), a better understanding of the relation among these variables and achievement-related outcomes is crucial.

The present study

The present study was designed to examine the empirical validity of four conceptual hypotheses integrating achievement goals and expectancy-value variables, which posit that (1) goals and expectancy-value variables are independent predictors, (2) goals predict expectancy-values, (3) goals mediate the relation between expectancies and task-values, and (4) goals partially mediate the relation between expectancy-values and achievement outcomes, in predicting three major achievement outcomes: school performance, career intentions, and academic aspirations. Four models based on these contrasting conceptions were tested using path analyses (see Fig. 1a–d). To further evaluate the generalizability of the findings across domains, the current research used these four theoretical approaches to examine the two central academic domains of mathematics and language arts.

Method

Participants

The sample consisted of 697 French-speaking students from grades 6 (11 to 12 years old) and 8 (13 to 14 years old) who took part in the mathematics ($n = 652$; 288 males, 364 females) or language arts ($n = 693$; 307 males, 386 females) portions of the study. Participants were chosen from 14 schools in rural and suburban areas around Montreal, Canada. According to the socioeconomic index provided by the Québec Ministry of Education (MELS 2006), the students were predominantly from low-socioeconomic areas. All students had obtained parental authorization and had given personal assent.

Procedure

Students completed two questionnaires measuring expectancies and values, achievement goals, career intentions, and academic aspirations in mathematics and language arts, respectively, in their regular classroom settings under the supervision of a research assistant. In an effort to not overburden participants, the administration of the questionnaires was split into two 20- to 30-min sessions with an interval of 2 weeks between each session. Order effects relating to the administration of the questionnaires were controlled for by presenting half of the students (randomly chosen) with the mathematics questionnaire first, and the other half with the language arts questionnaire first.

Measures

Expectancy-value constructs

Participants' expectancies and task-values in mathematics and language arts were measured using a brief version of two scales validated among French-speaking Canadians (Vezeau et al. 1998). The expectancy scale comprised eight items evaluating students' self-perceptions of competence in mathematics or language arts ($\alpha_{math} = .88$; $\alpha_{language} = .81$; e.g., "I am certain I can succeed in mathematics/French," and "I feel confident that I will get a really good grade in my math/French class"). The task-values scale comprised four items evaluating students' perception of the present and future usefulness and intrinsic value of mathematics or language arts ($\alpha_{math} = .72$; $\alpha_{language} = .75$; e.g., "Mathematics/French is useful for everyday life," and "I think that math/French is an important school domain"). For each item of these two scales, participants indicated their response on a 5-point scale ranging from "Strongly disagree" (1) to "Strongly agree" (5). A complete list of the items used to measure expectancies and task-values can be made available upon request.

Achievement goals

The measure of achievement goals was adapted from an instrument initially developed and validated with French-speaking students (Bouffard et al. 1998). Although the initial instrument already included mastery goal and performance goal subscales, some items did not adequately

assess each construct. Based on current perspectives in achievement goal theory (Elliot 2006; Elliot and McGregor 2001; Harackiewicz et al. 1997; Meece et al. 1988), we selected items assessing mastery goals (10 items; $\alpha_{math} = .90$; $\alpha_{language} = .90$; e.g., "It is important for me to master the knowledge and abilities that we are supposed to learn in math/French classes," and "In mathematics/French, I want to learn as much as possible") and performance goals (five items; $\alpha_{math} = .66$; $\alpha_{language} = .66$; e.g., "In mathematics/French classes, I am in competition with other students to get high grades," and "It is important for me to do better than others in math/French courses"). For each item of these two scales, participants indicated their response on a 6-point scale ranging from "Strongly disagree" (1) to "Strongly agree" (6). A complete list of the items used to evaluate mastery and performance goals can be made available upon request.

Course performance

Participating schools provided each student's grades in mathematics and French as they appeared on their report cards at the end of the semester, approximately 3 months after students had completed the questionnaires. For 6th graders, grades were obtained as numbers ranging from 1 to 4, with 1 corresponding to the highest mark and 4 to the lowest. For 8th graders, grades were given as percentage scores. To achieve consistency in scoring, scores for 6th grade students were reversed so that the higher scores (close or equal to 4) indicated good marks, while the lower scores (close or equal to 1) indicated poor marks. Subsequently, scores for grade 6 and 8 students in mathematics and French were standardized using a z-score.

Career intentions

The assessment of students' career intentions was adapted from a survey used in previous research conducted on the topic (e.g., Crombie et al., 2005; Stevens et al., 2007). Participants' intention to work in a math-related field was measured by the item "Later, I would like to work in a math-related field," whereas the item "Later, I would like to work in a language-related field," assessed students' intention to work in a language arts-related field. For each item, participants had to indicate their degree of agreement on a 4-point scale ranging from "Not at all true for me" (1) to "Totally true for me" (4).

Academic aspirations

Based on past research on the topic (e.g., Rojewski and Yang 1997), students' academic aspirations were assessed by asking them to report the highest level of education they aspired to achieve. Participants reported the level up to which they intended to pursue academics on a 4-point scale ranging from 1, representing aspirations less than high school, to 4, representing aspirations to obtain a college degree.

Results

In order to evaluate the empirical validity of the four contrasting models (see Fig. 1a–d), path analyses were performed separately for mathematics and language arts. Before presenting the results for the path analyses, we first present the descriptive statistics and results from the factor analyses.

Descriptive statistics and factor analyses

Descriptive statistics for the indicator variables in mathematics and language arts are reported in Table 1, and Pearson's correlations are presented in Table 2. As expected, all planned path variables, except grades and career intentions, were correlated significantly (see Table 2). Additionally, in mathematics and language arts, all predictor variables were significantly correlated with school performance, academic aspirations, and career intentions with the exception of task-values and mastery goals in mathematics, which were non-significantly associated with math grades.

To test whether the measured constructs conformed to a priori classification, we conducted principal-components factor analyses (using Oblimin rotation of factors with Kaiser normalization) separately in mathematics and language arts with the achievement goal and expectancy-value items. In both academic domains, results yielded a four-factor solution reflecting our a priori identification of

Table 1 Descriptive statistics for all variables assessed

		Min	Max	Mean	SD
Expectancies	Math	1	5	3.47	0.84
	Lang	1	5	3.38	0.74
Task-values	Math	1	5	3.65	0.78
	Lang	1	5	3.45	0.73
Mastery goal	Math	1	6	4.67	0.97
	Lang	1	6	4.49	0.97
Performance goal	Math	1	6	3.64	0.89
	Lang	1	6	3.48	0.85
School performance	Math	−2.98	2.36	0.00	1.00
	Lang	−2.96	2.09	0.00	1.00
Career intentions	Math	1	4	2.62	0.96
	Lang	1	4	2.28	0.91
Academic aspirations	Math	1	4	3.15	0.83
	Lang	1	4	3.16	0.82

Table 2 Correlations between all assessed variables in mathematics and language arts

	Expectancies	Task-values	Mastery goal	Performance goal	School performance	Career intentions	Academic aspirations
Expectancies	–	.21***	.36***	.29***	.55***	.35***	.18***
Task-values	.26***	–	.48***	.23***	.03	.29***	.15***
Mastery goal	.38***	.42***	–	.33***	.07	.31***	.19***
Performance goal	.25***	.18***	.31***	–	.09*	.18***	.11***
School performance	.50***	.20***	.21***	.14***	–	.07	.20***
Career intentions	.27***	.37***	.36***	.15***	.06	–	.15***
Academic aspirations	.25***	.20***	.29***	.13***	.30***	.29***	–

* $p < .05$; ** $p < .01$; *** $p < .001$. Values above the diagonal represent correlations in mathematics. Values below the diagonal represent correlations in language arts

expectancy, task-value, mastery goal, and performance goal factors. In mathematics, eigenvalues ranged from 1.46 to 8.46, and explained 31.34 percent of the variance. Items produced factor loadings ranging from .41 to .84 in the expected factor. In language arts, the four factors produced eigenvalues from 1.81 to 7.43, and accounted for 27.50 percent of the variance. Items loaded on their intended factor with values from .42 to .85.

Path analyses

To evaluate the four contrasting hypothesized models (see Fig. 1a–d), path analyses were performed with Amos statistical software package (Arbuckle 2006). As recommended by many statisticians (e.g., Bollen and Long 1993; Hoyle 1995), goodness-of-fit was assessed using Chi-square and several additional indices. We thus examined the ratio between Chi-square and degrees of freedom (χ^2/df), the

Comparative Fit Index (CFI) (Bentler 1990), and the Root Mean Square Error of Approximation (RMSEA) (Steiger 1990). A reasonable fit of a specified model to the data is generally indicated when the χ^2/df ratio is less than 5 (Marsh and Hocevar 1985; Wheaton 1987). For the CFI, Hu and Bentler (1999) proposed that cutoff values close to, or over .95 be used as indicators of acceptable fit. For the RMSEA, values below .05 suggest an excellent model fit, whereas values between .05 and .08 indicate a good fit (Browne and Cudeck 1993). In addition to examining these fit indices for each model, the Akaike Information Criterion (AIC) (Akaike 1974) was used to compare the goodness-of-fit of the models. Contrary to other goodness-of-fit measures, the AIC has no specific cutoff values. Rather, given that the AIC penalizes for lack of parsimony and overparameterization, it is used to compare different models with the lower value representing the better fit (Burnham and Anderson 1998). Fit indices for the four models are displayed in Table 3.

Table 3 Indices of fit for tested path models

|	χ^2	df	χ^2/df	CFI	RMSEA	AIC
Model 1: Achievement goals and expectancy-value variables independently predict achievement outcomes						
Mathematics	317.38***	5	63.48	0.63	0.31	377.38
Language arts	220.27***	5	44.05	0.73	0.25	266.27
Model 2: Achievement goals → expectancy-value variables → achievement outcomes						
Mathematics	52.74***	7	7.54	0.94	0.11	108.75
Language arts	43.73***	7	6.24	0.94	0.10	99.73
Model 3: Expectancies → achievement goals → task-values → achievement outcomes						
Mathematics	283.65***	4	70.91	0.67	0.33	345.65
Language arts	168.77***	4	42.19	0.79	0.24	230.77
Model 4: Expectancy-value variables → achievement goals → achievement outcomes						
Mathematics	4.83	1	4.83	0.99	0.04	72.83
Language arts	1.58	1	1.58	0.99	0.03	69.58
Final models without non-significant paths: Expectancy-value variables → achievement goals → achievement outcomes						
Mathematics	5.96	6	0.99	0.99	0.03	66.99
Language arts	1.96	5	0.39	1.00	0.00	61.96

*** $p < .001$

Results suggest that the first model (see Fig. 1a) should not be accepted. In mathematics and language arts, fit indices revealed that the fit of the models were inadequate, as the χ^2 results were statistically significant, the χ^2/df ratios were above 5, CFI values were below acceptability, and RMSEA values that were unacceptably high. Additionally, results of the path analyses for the Model 2 (see Fig. 1b) revealed a poor fit in mathematics and language arts. Indeed, χ^2 results were statistically significant, the χ^2/df ratios and RMSEA values were too high, and CFI values were below the acceptable value of .95. Similarly, results suggest that Model 3 (see Fig. 1c) in mathematics and language arts should not be accepted, as χ^2 results were statistically significant, the χ^2/df ratios and RMSEA values were too high, and CFI values were below acceptability. In contrast, results of the path analyses suggest that, for both mathematics and language arts, the fourth model (see Fig. 1d) should be accepted. As shown in Table 3, Model 4 provided an excellent fit to the data for both mathematics and language arts, as well as being a significantly better fit to the data than Models 1, 2, and 3, as shown by the lower AIC values (see Table 3). Therefore, after removing the non-significant paths, Model 4 in mathematics and language arts was selected for further examination. As expected, removing these non-significant paths did not significantly modify the model fit in mathematics ($\Delta\chi^2$ (5) = 1.13; $p = ns$) or language arts ($\Delta\chi^2$ (4) = 0.38; $p = ns$). Figure 2 illustrates the final model in mathematics (a) and language arts (b) with standardized coefficients.

As can be seen in Fig. 2, expectancies and task-values predicted a stronger adoption of mastery and performance goals. In turn, mastery goals predicted stronger career intentions and academic aspirations in both school domains, whereas a negative link was found between mastery goals and math grades. Unexpectedly, performance goals did not significantly predict any of the academic outcomes. Results also revealed that expectancies strongly predicted math and language arts grades, whereas the relation between expectancies and career intentions or academic aspirations was weaker. Conversely, task-values in mathematics and language arts were highly related to career intentions, whereas task-values barely predicted grades and academic aspirations, or were non-significantly associated with these outcomes.

Finally, to examine whether the mediated links (i.e., the indirect links between expectancy-value variables and the achievement outcomes) were significant or not, we performed bootstrap analyses that simulated 2,000 samples, as recommended (Preacher and Hayes 2008), using Amos statistical software package (Arbuckle 2006). The bootstrapping method tests whether the indirect effect of a predictor variable on the outcome variable is significant. Simulation studies have demonstrated that bootstrapping has substantially more power than traditional methods, such as the Sobel test (Sobel 1982), while maintaining reasonable control over the Type I error rate to evaluate mediational links (Cheung and Lau 2008; MacKinnon et al. 2004; Preacher and Hayes 2008).

In mathematics, the mediating role of mastery goals provided significant indirect links between expectancies and school performance ($\beta = -.05$, $p < .01$; 95% CI: $-.07$, $-.02$), career intentions ($\beta = .05$, $p < .01$; 95% CI: .02, .08) and academic aspirations ($\beta = .07$, $p < .01$; 95%
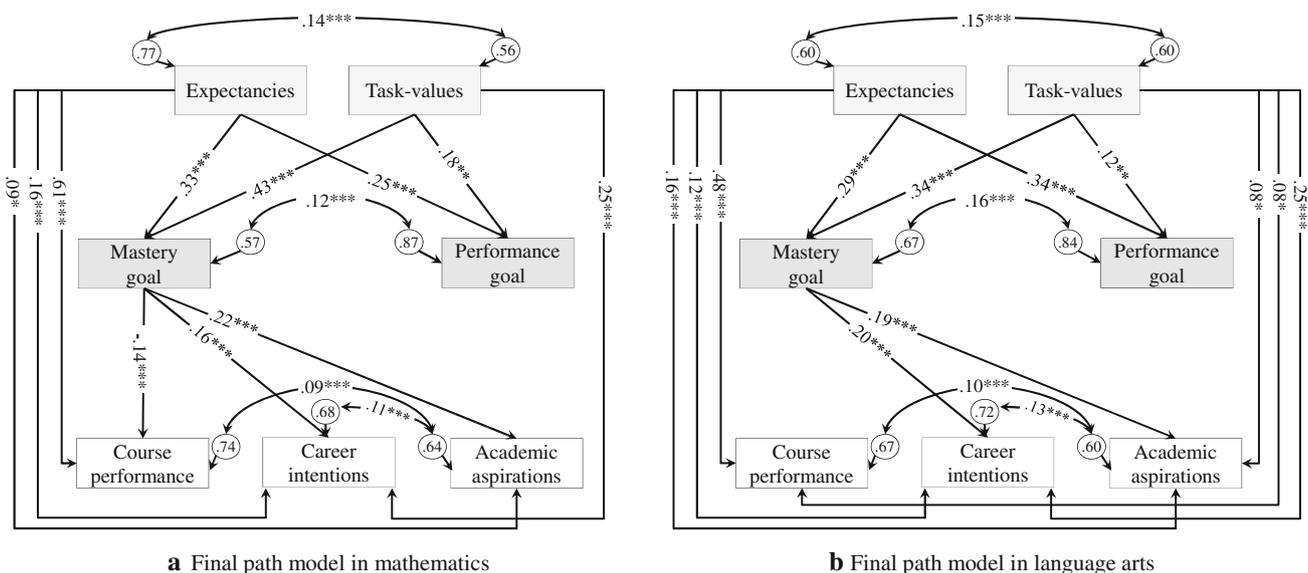
Fig. 2 Final path model in mathematics (**a**) and language arts (**b**) with maximum likelihood estimates (standardized estimates). * $p < .05$, ** $p < .01$, *** $p < .001$. All error terms are significant at $p < .001$

CI: .05, .11). Additionally, task-values indirectly predicted school performance ($\beta = -.06$, $p < .01$; 95% CI: $-.09$, $-.03$), career intentions ($\beta = .07$, $p < .01$; 95% CI: .03, .11) and academic aspirations ($\beta = .10$, $p < .01$; 95% CI: .06, .13) through mastery goals. In language arts, bootstrapping revealed that mastery goals significantly mediated the links between expectancies and career intentions ($\beta = .06$, $p < .001$; 95% CI: .04, .10) as well as between expectancies and academic aspirations ($\beta = .06$, $p < .001$; 95% CI: .03, .09). Similarly, the indirect links between task-values and the achievement outcomes, through mastery goals, were significant. Indeed, these goals mediated the relation between task-values and career intentions ($\beta = .07$, $p < .001$; 95% CI: .04, .10) as well as between task-values and academic aspirations ($\beta = .07$, $p < .001$; 95% CI: .04, .10).

Discussion

Although expectancy-value and achievement goal theories are mostly studied independently, these two dominant theories of motivation might play a complementary role in predicting achievement-related outcomes (Harackiewicz and Linnenbrink 2005; Hulleman et al. 2008; Pintrich 2003b). In order to provide a better understanding of the relation among achievement goals and expectancy-value variables in predicting achievement-related outcomes, the present study examined the empirical validity of four distinct theoretical perspectives. The first approach (Fig. 1a) suggests that achievement goals and expectancy-value variables independently predict achievement-related outcomes without being related to each other. The second conception (Fig. 1b) posits that achievement goals are predictors of expectancies and task-values, which, in turn, predict their academic achievement (e.g., Eccles et al. 1983; Eccles and Wigfield 2002; Wigfield and Eccles 2000). The third theoretical conception (Fig. 1c) proposes that goals mediate the relation between expectancy-value beliefs (e.g., Elliot 1999, 2005; Elliot and Thrash 2001). Finally, the fourth perspective (Fig. 1d) suggests that expectancy-value variables predict achievement goals and that both expectancy-value variables and goals predict achievement outcomes (e.g., Greene et al. 1999; Greene et al. 2004; Liem et al. 2008). The present study is the first to allow for a comparative evaluation of these four contrasting conceptions in predicting three critical achievement-related outcomes: academic performance, career intentions, and academic aspirations. Additionally, our results allowed for an evaluation of the generalizability of the results in two central ability domains, namely mathematics and language arts.

The relation between achievement goals and expectancy-value constructs in predicting achievement-related outcomes

In both academic domains, results from path analyses supported the theoretical conception that expectancy-value variables predict achievement goals. Additionally, through mastery goals, expectancy-value variables both directly and indirectly predicted the achievement-related outcomes. In particular, academic performance was mostly predicted by expectations of success, whereas task-values chiefly explained career intentions. Thus, in line with past research (Crombie et al. 2005; Steinmayr and Spinath 2009), our results suggest that, even when achievement goals predict grades and career intentions, expectancies have a stronger direct association with grades, and task-values are most directly associated with career intentions. In contrast, academic aspirations were mostly predicted by students' mastery goals. Indeed, expectancies in mathematics and language arts had a relatively small direct link with academic aspirations, whereas task-values were weakly or non-significantly associated with academic aspirations. Rather, academic aspirations were associated with stronger endorsement of mastery goals. These findings generally corroborate those of previous research showing the positive influence of mastery goals (see Elliot 2006; Harackiewicz et al. 2002; Meece et al. 2006 for reviews).

We also observed that performance goals are not significantly associated with any of the outcome variables in both mathematics and language arts. Although these results are inconsistent with prior work those of prior work showing a positive relation between performance goals and school grades among college students (see Harackiewicz et al. 2002 for a review), they replicate those of studies conducted among younger students, such as those in our sample, showing that performance goals do not necessarily predict higher grades (see Midgley et al. 2001 for a review). The absence of a significant link between performance and school performance could also be explained by the fact that our path analyses controlled for participants' expectancies, which is not typically done in achievement goal research. This hypothesis is supported by one of the few studies integrating achievement goals and expectancy-value variables to predict students' grades (Greene et al. 2004). The study found that, although students' performance goals were significantly correlated with their grades, these goals did not significantly predict their achievement once controlling for the variance related to their expectancies. Accordingly, more work combining achievement goal theory and expectancy-value models will be needed to understand the independent effects of goals and expectancy-value variables on achievement-related outcomes.

In contrast, our results did not support the first model presuming that achievement goals and expectancy-value variables are independent and separately predict achievement outcomes. The results suggest that these motivational variables are, in fact, related and that the study of expectancy-value and achievement goal variables jointly might lead to a more complete understanding of motivational processes.

Additionally, our results did not support the theoretical perspective derived from Eccles and colleagues' expectancy-value model (e.g., Eccles et al. 1983; Eccles and Wigfield 2002; Wigfield and Eccles 2000), stating that expectancy-value beliefs would mediate the relation between goals and achievement outcomes. One possible explanation for these results is that the definition of goals in Eccles and colleagues' expectancy-value model differs from the one adopted in the achievement goal theory (Wigfield 1994). Indeed, Eccles and colleagues (1983) conceive achievement goals as broad purposes children have for learning, such as educational and career plans or the desire to conform to social norms. In contrast, goal theorists consider goals as a more specific orientation towards a task or specific domain (Elliot 2006; Meece et al. 2006). Therefore, it is possible that the broad goals discussed by Eccles and colleagues (1983) shape expectancies and values and that expectancy-value variables predict more specific achievement goals (Wigfield 1994). A relevant avenue for future inquiries would thus be to explore the relation among the broad goals defined by Eccles and colleagues (1983), the specific goals described in achievement goal theory, expectancy-value variables, and achievement outcomes.

Additionally, results from our path analyses did not yield support for the theoretical perspective that achievement goals mediate the relation between expectancy-value variables (e.g., Elliot 1999, 2005; Elliot and Thrash 2001; Hulleman et al. 2008). These findings appear to conflict with past work supporting the notion that expectancies indirectly relate to individuals' achievement-related behavior through their achievement goals (Cury et al. 2006; Elliot and Church 1997). For instance, Elliot and Church (1997) used path analyses to confirm the validity of a theoretical model proposing that achievement goals (i.e., mastery, performance-approach, and performance-avoidance goals) fully mediate the relation between competence expectancies and graded performance. Rather, results from our final model demonstrated that, despite an indirect link between expectancies and school performance through mastery goals, expectancies have a strong direct link with school performance. Moreover, once expectancies are controlled for, achievement goals are moderately or non-significantly linked to students' grades.

One possible reason our results did not confirm the ones obtained by Elliot and Church (1997) is that their study was conducted with undergraduate students. Compared to elementary, middle, and high school pupils, college students are often ensconced in a highly competitive climate (Harackiewicz et al. 2002; Harackiewicz et al. 2000). Accordingly, we could hypothesize that their achievement goals—especially performance goals—are a strong predictor of their grades, even more than their expectations of success. However, in a subsequent study, Cury and colleagues (2006) replicated Elliot and Church's (1997) earlier findings with 12- to 14-year-old French students. They found that when achievement goals were controlled for, the relation between competence expectancies and school performance strongly and significantly diminished.

Although the gap between our results and those obtained in these two studies (Cury et al. 2006; Elliot and Church 1997) could be cultural, another explanation seems more likely. Contrary to past studies measuring competence expectancies and achievement goals in relation to a particular class (Elliot and Church 1997) or term (Cury et al. 2006), the self-reported variables (i.e., achievement goals and expectancy-value variables) in our study were domain-specific, relating to either mathematics or language arts. It may be that the efficacy of both theories in predicting achievement outcomes varies depending on the specificity of their assessment. Achievement goals may be more predictive when assessed at a situation-specific level, and expectancy-value variables may be more predictive at a domain-specific level, relative to achievement goals. Indeed, it is possible that students' expectations to succeed in mathematics or in language are highly related to their actual grades in these school domains, whereas their achievement goals could be a better predictor of their performance in a class or a term.

Theoretical and practical implications, limitations, and future directions

Although most research has emphasized expectancy-value or achievement goal theories when studying academic motivation, each perspective by itself appears to be limited. Indeed, expectancy-value theory focuses on individuals' competence expectations and how they value an academic task or domain, without considering how their specific goals or construals of achievement situations are involved in their motivation and achievement outcomes. On the other hand, achievement goal theory largely overlooks how individuals' task-values might be related to their achievement goals or outcomes (Elliot 2005; Wigfield 1994).

In supporting a model in which expectancy-value variables are both directly related to the achievement outcomes and indirectly linked to them, through achievement goals, the current research provides insight into how expectancy-value variables and achievement goals might work

together. These results also underscore the need for future research to integrate these different motivational constructs in order to develop a more complete understanding of optimal motivation. Furthermore, based on our findings, interventions aimed at simultaneously enhancing expectancies and task-values would be worthwhile. Indeed, although a great deal of research has documented the effects of classroom goal structures on students' achievement goals (see Meece et al. 2006 for a review), less work has investigated how interventions targeting students' expectancies and task-values could modulate their goals and achievement outcomes.

A few limitations in the current study should be addressed in future research. Despite the use of path analysis, the correlational and primarily cross-sectional nature of the data make it inappropriate to draw causal inferences or to test time-order. Path analysis (or structural equation modeling) is appropriate to examine the empirical validity of a priori theoretical conceptions involving mediators between two or more variables (MacKinnon 2008). Therefore, the acceptance of a model does not necessarily imply that other untested models would not provide a better fit to the data (MacKinnon et al. 2000) or that one variable in the model *causes* another one (MacKinnon 2008; Pearl 2000). That being said, from the four tested theoretical conceptions, only the model in which expectations of success and task-values predict achievement goals, and in which both expectancy-value variables and achievement goals predict the achievement outcomes, could be accepted. These results allow us to draw hypotheses about the relations between expectancy-value and achievement goal theories and highlight their complementary role in predicting course performance, career intentions, and academic aspirations. Future longitudinal studies examining the relations among expectancy-value variables, achievement goals, school performance, and actual course enrollment would be valuable in establishing their temporal ordering.

A second limitation concerns the generalizability of the results. Given that the study was conducted predominantly in low-socioeconomic areas, it is possible that students showed increased underachievement patterns (see Sirin 2005 for a meta-analysis). However, there are reasons to believe that the links between the motivational variables and the achievement outcomes would be similar with students from more privileged areas. Despite the lower levels of achievement observed among students from low socioeconomic areas, the relation between expectancy-value variables and achievement remains similar regardless of socioeconomic background (Ming and Xihua 2008; Schultz 1993). In a similar fashion, despite individual differences in goal adoption based on numerous variables, including socioeconomic background, the links between achievement

goals and achievement outcomes is generally comparable (Elliot 1999). Nevertheless, studies with samples drawn from a variety of socioeconomic backgrounds will be needed to further support the generalizability of our results.

Conclusion

Although achievement goal and expectancy-value theories are both dominant in the achievement motivation literature, the relations among achievement goals and expectancy-value variables in predicting achievement-related outcomes remains unclear. The present study evaluated the empirical validity of four contrasting theoretical conceptions, which posit that (1) achievement goals and expectancy-values are independent predictors, (2) achievement goals predict expectancy-value constructs, (3) achievement goals mediate expectancies and task-values, and (4) expectancy-value constructs predict achievement goals, in predicting school performance, career intentions, and academic aspirations. Taken together, our results supported the fourth theoretical approach, suggesting that achievement goals partially mediate the relation between expectancy-value constructs and achievement outcomes. Indeed, expectancies and task-values predicted stronger mastery and performance goals. Expectancies and task-values were both directly related to the achievement outcomes and indirectly associated with them, through achievement goals. Moreover, school performance in mathematics and language arts was mostly predicted by expectancies, and career intentions mostly stemmed from task-values, whereas academic aspirations were primarily associated with mastery goals. These findings suggest that interventions aimed at enhancing individuals' expectancies and task-values may not only serve to increase performance and strengthen future achievement-related intentions, but could also modulate their achievement goals.

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