

Predicting Success in College: A Longitudinal Study of Achievement Goals and Ability Measures as Predictors of Interest and Performance From Freshman Year Through Graduation

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The authors examined the role of achievement goals, ability, and high school performance in predicting academic success over students' college careers. First, the authors examined which variables predicted students' interest and performance in an introductory psychology course taken their first semester in college. Then, the authors followed students until they graduated to examine continued interest in psychology and performance in subsequent classes. Achievement goals, ability measures, and prior high school performance each contributed unique variance in predicting initial and long-term outcomes, but these predictors were linked to different educational outcomes. Mastery goals predicted continued interest, whereas performance-approach goals predicted performance. Ability measures and prior high school performance predicted academic performance but not interest. The findings support a multiple goals perspective.

What variables are important to consider when trying to predict students' success in college? One answer can be found in admissions offices at universities across the country. Although the particular measures and weight given to each may vary from campus to campus, two variables stand out as key predictors: students' ability, typically measured in terms of SAT or ACT scores, and prior academic performance, typically assessed using high school GPA or high school graduation rank. Both variables have been shown to be independent, positive predictors of undergraduate grades (Covington, 1992; Lavin, 1965; Willingham, Lewis, Morgan, & Ramist, 1990), and there is no question about their utility in predicting academic success in college. Are these the only predictor variables to consider, however, and are grades the only outcome measure of success worth predicting? We believe that another important indicator of success in education is the development of interest in a topic or discipline, and that a broader definition of success requires consideration of a wider range of predictors (Harackiewicz, Barron, & Elliot, 1998; Hidi & Harackiewicz, 2000; Maehr, 1976).

Motivational variables may play a key role in predicting both kinds of success in college. For example, a large body of literature indicates that self-efficacy is related to academic performance (Bandura, 1986; Schunk, 1981; Zimmerman, 1989). Researchers have also had some success in predicting academic performance with global, trait measures of achievement motivation (Covington & Omelich, 1979; Dunham, 1973; Raynor, 1970; Spence & Helmreich, 1983). Moreover, there is some evidence that the relationship between achievement motivation and grades may be obtained even with aptitude variables controlled. For example, Spence and Helmreich (1983) found that achievement motivation predicted undergraduate GPAs with SAT scores controlled. However, other researchers have noted that the relationship between various measures of achievement motivation and academic performance is typically weak, and that findings across studies have been inconsistent (Cantor, Markus, Niedenthal, & Nurius, 1986; Entwisle, 1972; Klingler, 1966; Margrain, 1978; Weinberger & McClelland, 1990; Weiner, 1972).

More recently, theorists have focused on achievement goals, conceptualized as situationally specific measures of motivational orientation, and argued that they may be stronger predictors of academic success (Pintrich & Schunk, 1996). Achievement goals reflect the purpose of achievement behavior in a particular setting (Dweck & Leggett, 1988; Nicholls, 1984). When pursuing mastery goals in a learning situation, a student's purpose is to develop competence by acquiring new knowledge and skills. When pursuing performance goals, a student's purpose is to demonstrate competence relative to others. Not all students are positively oriented toward competence, however, and some adopt work avoidance goals that focus on effort minimization (Brophy, 1983; Nicholls, 1989).

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Because students can and do pursue multiple goals in their classes, researchers have recently begun to examine the independent and interactive effects of these goals (Barron & Harackiewicz, 2000; Hidi & Harackiewicz, 2000; Linnenbrink & Pintrich, 2000; Pintrich, 2000). Although there is little debate about the positive effects of mastery goals or the negative effects of work avoidance goals, the pattern of performance goal effects has been mixed, with negative, null, and positive effects on measures of interest and performance (for review, see Harackiewicz et al., 1998; Rawsthorne & Elliot, 1999; Utman, 1997). Theorists have separated performance-approach goals (a focus on attaining favorable judgments of competence relative to others) from performance-avoidance goals (a focus on avoiding unfavorable judgments). Performance-avoidance goals have been shown to have deleterious consequences for interest and performance (Elliot & Harackiewicz, 1996; Middleton & Midgley, 1997; Skaalvik, 1997), but a number of studies have found positive effects of performance-approach goals on grades in high school and college classes (Archer, 1994; Bouffard, Boisvert, Vezeau, & Larouche, 1995; Bouffard, Vezeau, & Bordeleau, 1998; Elliot & Church, 1997; Kaplan & Midgley, 1997; Pintrich, 2000). For example, Harackiewicz, Barron, Carter, Lehto, and Elliot (1997) found that performance-approach goals predicted higher grades in an introductory psychology class and argued that these goals are consistent with the general context of college courses where competence is defined in terms of outperforming others and normative grading structures are used.

In contrast, Harackiewicz et al. (1997) found that mastery goals were unrelated to academic performance but that mastery goals predicted interest in the class. Harackiewicz, Barron, Tauer, Carter, and Elliot (2000) recently replicated these findings and extended the study of goal effects over time with a three-semester follow-up of Introductory Psychology students. Performance-approach goals predicted grades in an introductory psychology class, grades in subsequent psychology classes, and academic grade-point average (GPA) over the ensuing three semesters. In contrast, mastery goals predicted interest in the class as well as continued interest in psychology. Thus, achievement goals predicted students' performance and interest over a 2-year period, suggesting that motivational variables may indeed play a critical role in college students' success. Considered together, this pattern of findings supports a multiple goal perspective (Barron & Harackiewicz, 2000) in which both goals can promote important educational outcomes and suggests that students who endorse both mastery and performance-approach goals will be most likely to attain success in college.

In sum, previous research has consistently shown strong relationships between measures of ability and high school performance and success in college, measured in terms of academic performance. Although links between global measures of achievement motivation and academic performance have been weaker and more inconsistent, more recent research suggests a number of strong links between achievement goals and measures of academic success. However, we know of no study that has tested all of these predictors together, and we hope to combine these three approaches that have been studied separately to date. Only by examining them together can we compare them and estimate their relative efficacy in predicting success in college.

The Present Research

The purpose of the present research was to consider the interplay of ability, prior performance, achievement motivation, and achievement goals in predicting college students' success over the course of their entire college careers. Specifically, will these variables have independent or interactive effects in predicting success in college? Will achievement goals continue to predict academic performance and interest when we control for ability and prior performance, and will they continue to predict success over the length of a college career? No research has examined the correlates of achievement goals over the course of students' entire academic careers, yet such a study would afford analysis of the short- and long-term effects of goals, relative to other potential predictors. For example, we might find that achievement goals predict outcomes in the short term but that more general measures of achievement motivation prove to be stronger predictors of academic performance when aggregated over a longer period (i.e., cumulative GPA), as hypothesized by Spence and Helmreich (1983). Alternatively, achievement goals might influence motivation and performance in early, foundational courses and have powerful indirect effects over the course of an academic career. It is also important to evaluate these motivational predictors controlling for aptitude variables known to have reliable and robust effects over the entire course of students' careers. Only by following students through graduation can we evaluate the overall impact of achievement goals relative to other predictors.

To address these questions, we studied a sample of students who had taken an introductory psychology course their first semester at college, allowing us to examine their goals in a foundational course taken at the outset of a college career. Specifically, we identified the group of students who had participated in the Harackiewicz et al. (2000) study as freshmen and obtained their ability test scores (SAT or ACT), measures of high school performance, and trait measures of achievement motivation. We then obtained their academic transcripts for their entire undergraduate career. We thus assessed a wide array of predictor variables, measured before and during the freshman year, including ability, high school performance, achievement motivation, and mastery, performance-approach, and work avoidance goals in an introductory psychology class. We examined outcome measures of success in the short term (the first semester at college) by assessing interest in psychology, enjoyment of the class, final grade in the course, and overall GPA for the semester. We examined outcome measures of success in the long term (over the course of students' entire undergraduate careers) by assessing continued interest in psychology (the number of additional psychology credits taken), grades in subsequent psychology classes, and overall GPA. We also examined whether students majored in psychology, another important indicator of continued interest in psychology.

We expected to document positive effects of ability and high school performance on measures of academic performance in the short term but also expected to replicate the goal effects documented by Harackiewicz et al. (1997, 2000) with these ability measures controlled. Specifically, we hypothesized that performance-approach goals would positively predict grades, that work avoidance goals would negatively predict grades, and that mastery goals would predict enjoyment of the class and interest in psychology.

Predictors of Success Over the Course of a College Career

We tested whether the long-term goal effects documented by Harackiewicz et al. (2000) would extend over the course of an entire academic career. They found that mastery goals predicted continued interest over three semesters, thus we hypothesized that mastery goals would predict interest over the course of the academic career as well as majoring in psychology. In contrast, Harackiewicz et al. (2000) found that performance-approach goals predicted psychology grades over three semesters, and we hypothesized that they would continue to predict grades over the academic career. Although there were no effects of mastery goals on performance in the three-semester follow-up, mastery goals might prove more advantageous in advanced courses that require deeper processing and sustained effort. For example, the courses taken during the final years of college may differ in the level and quality of work required from students, as well as the structure and emphasis of the class, compared with the survey courses typically taken in the first few semesters. Thus, mastery goal effects might emerge over an even longer period of time during which students have more opportunities to take advanced psychology classes.

Although we might expect to find some direct effects of goals on measures of long-term interest and performance, we would expect these effects to be relatively small in magnitude. Given that our measures assessed achievement goals for a particular class taken the first semester of college, it seems unlikely that these goals would have a major, direct impact on subsequent interest and performance measured over the length of a student's academic career. Instead, these goals could affect the long-term outcomes through their impact on students' experience in their introductory course. Students' experiences in their introductory course may be a critical determinant of their motivation and performance in later courses in that discipline. Thus, we would expect that the effects of goals on long-term outcomes would be mediated through their impact on short-term outcomes. For example, we might expect mastery goals to predict continued interest in psychology and majoring in psychology because they promote interest in the topics covered in the introductory course. In contrast, ability and prior academic performance are more general measures that should have more direct effects on long-term performance.

In addition to these direct and mediated effects, we might also expect to find some indirect effects over time. For example, mastery goals might promote interest in psychology, which could then influence subsequent performance in psychology courses taken later (Hidi, 1990). In contrast, performance-approach goals might promote performance in an introductory psychology course, and students who perform well may be more likely to take more psychology courses or choose to major in that field. Alternatively, it may be that a combination of interest and good performance in introductory courses is necessary for students to continue taking additional psychology classes. In sum, we expect that long-term goal effects will be mediated through their short-term consequences. In contrast, we expect that the short- and long-term effects of ability and prior performance will be direct, reflecting the general nature of such measures and their relevance to any measure of academic performance.

Predictors of Achievement Goals

Another goal of the present research was to examine the interplay of ability, prior performance, and achievement motivation in predicting the specific achievement goals that students adopt in their classes. Previous research has examined how individual differences in achievement motivation can predispose students to adopt particular goals in a classroom. Although many theorists conceptualized achievement motivation as an unidimensional motive to strive for performance excellence (McClelland, Atkinson, Clark, & Lowell, 1953; Murray, 1938), Spence and Helmreich (1983) developed a multidimensional measure of achievement motivation that has proven particularly relevant to goal theory. They identified three components of achievement motivation: work, mastery, and competitiveness. The work and mastery components are highly correlated and typically combined into single workmastery orientation, resulting in a two-dimensional model of achievement motivation.

The workmastery-competitiveness distinction corresponds to the mastery-performance goal distinction, and Harackiewicz et al. (1997) found that students who were high in workmastery were particularly likely to adopt mastery goals and reject work avoidance goals, whereas students high in competitiveness were more likely to adopt performance-approach goals. Of particular interest in the present study was whether this pattern would be replicated when we controlled for the effects of ability and prior high school performance. Furthermore, if achievement motivation proves to predict goals with ability variables controlled, this would indicate that achievement motivation can influence academic outcomes through its impact on the specific goals that students adopt in their classes. In other words, goals may prove to be the more proximal and powerful motivational predictors of success, but these goals may be influenced by individual differences in achievement motivation.

We tested for the effects of gender in all analyses to determine whether it influenced goal adoption or moderated goal effects. We included gender for comparisons with other studies, although it was not a central focus of our study. For example, Midgley, Kaplan, and Middleton (2001) reported some evidence of gender differences in goal effects.

Method

Overview

We identified the subset of participants in the Harackiewicz et al. (2000) goals study who had taken Introductory Psychology as first-semester freshmen, obtained additional background information, and then followed these students through graduation. The initial component of the study took place over the course of a semester in introductory psychology classes at a large, midwestern university. We measured students' achievement goals for the class 2 to 3 weeks into the semester and their interest in psychology and enjoyment of the lectures near the end of the semester. We also obtained their final grades in the course. For the present study, we obtained admissions data, including SAT or ACT scores, and high school achievement records as well as measures of achievement motivation collected at the beginning of the semester. Seven years later, we obtained their complete academic records to examine their subsequent course choices, choice of academic major, and grades.

Participants and Setting

Students had been recruited from four sections of Introductory Psychology. This is a survey course, typically taken by freshmen and sophomores before they have selected a major. Sections of the course were taught by one of two instructors in a standard lecture format (average enrollment of 355 students per section). Students' grades were determined by their performance on multiple-choice exams, and grades were assigned according to normative curves recommended by the psychology department. A total of 604 students participated in the initial study (Harackiewicz et al., 2000), but 133 students were not first-semester freshmen when they took the course. Thus, the present sample (used in all data analyses, unless otherwise noted) comprised 471 students (152 men and 319 women).

Ability, High School Performance, and Achievement Motivation Measures

We collected several background measures for our participants. We obtained ability measures from the university registrar's office, which were SAT and/or ACT scores (some students took both exams). For SAT scores, we used a total score combining the verbal and quantitative subscales, and for ACT scores, we used the composite score. In cases where we had both measures, we used the ACT score, because this is the more commonly taken exam at this university. We computed the correlation between SAT and ACT scores for those students who took both exams, and they were highly correlated, $r(86) = .82, p < .01$. We standardized the SAT and ACT scores to put these measures on the same scale and created an ability index (ability) that was used in all subsequent analyses.

We also obtained a measure of high school academic performance, measured in terms of graduation percentile (high school percentile), reflecting students' overall GPA compared with their graduating class. These data were only available for 422 students, because not all high schools provided such information to the university.

Finally, we collected a measure of achievement motivation for all freshmen in our sample. As part of a department survey, participants completed the Work and Family Orientation Questionnaire (Spence & Helmreich, 1983), a 19-item questionnaire, at the beginning of the semester. This personality scale assesses individual differences in work orientation, mastery orientation, and competitiveness and has been shown to have good reliability and validity (Helmreich, Beane, Lucker, & Spence, 1978; Helmreich & Spence, 1978; Helmreich et al., 1980; Spence, Helmreich, & Pred, 1987; Spence, Pred, & Helmreich, 1989). The work and mastery scales were combined into a single index as recommended by Spence and Helmreich (1983), resulting in two measures of achievement motivation: workmastery ($\alpha = .78$) and competitiveness ($\alpha = .75$), which were positively correlated, $r(469) = .29, p < .01$.

Goal and Interest Measures

Two to 3 weeks into the term, after becoming familiar with the course but before taking any exams, students completed a self-report questionnaire measuring their adoption of mastery ($\alpha = .78$), performance-approach ($\alpha = .81$), and work avoidance ($\alpha = .50$) goals in the psychology class.¹ Near the end of the semester but before the last exam was given and the final course grades were received, we measured two components of students' interest in the class: interest in psychology ($\alpha = .92$) and enjoyment of the class ($\alpha = .71$; see Harackiewicz et al., 2000, for scale construction details).

Grades

Final grade in psychology. Students' final course grades were obtained from departmental records. Students could receive one of eight possible grades based on the university's 4-point scale. The average grade for

students in our study was 2.75 ($SD = .92$). Grades were distributed as follows: A = 18.0%, AB = 16.6%, B = 15.9%, BC = 15.3%, C = 26.1%, D = 7.0%, F = 1.1%. The average grade for students in our sample was higher than the average grade for all students enrolled in Introductory Psychology ($M = 2.58; N = 1,542$), but the overall distribution of grades was comparable with that of our sample.

Semester GPA. We also obtained students' grades for all other courses taken that semester and computed an overall GPA for the semester (semester GPA).

Long-Term Follow-Up

Seven years later, we obtained the academic records for the freshmen. By this point, all participants had either graduated or dropped out of the university.² Thus, the 7-year follow-up affords a picture of students' complete undergraduate careers at this university. Of the 471 freshmen, 410 eventually graduated with undergraduate degrees and 61 left the university before completing academic degrees.

We used these records to compute four long-term outcome measures. To measure continued interest in psychology, we counted the number of additional psychology course credits taken by students over the years, providing a behavioral measure of interest (mean number of psychology credits taken = 5.32; $SD = 9.25$). The typical psychology course at this university is worth three credits, thus on average, students took approximately two more courses. Because of the great variability in the total number of credits taken over this time period (mean number of academic credits taken = 105.73; $SD = 30.32$), we constructed a proportional measure of psychology credits relative to the total number of credits taken (courses taken). Because this measure was a proportional variable and highly positively skewed, we subjected it to an arcsine transformation. We also recorded whether students had declared a major and if so whether they had majored in psychology (major). To measure academic performance in psychology courses, we computed a GPA for subsequent psychology courses for those students who took additional psychology classes (psychology GPA). Finally, as a general measure of academic performance, we also computed a GPA for all courses taken after the semester of the initial study (subsequent GPA).

Results

Descriptive and Correlational Analyses

The means and standard deviations for all variables are reported in Table 1; zero-order intercorrelations are reported in Table 2. Although the structure, content, and grading distributions of the four class sections were comparable, we tested for instructor and

¹ Because the alpha for work avoidance goals was low, Harackiewicz et al. (2000) reported primary analyses that did not include this measure but then repeated all analyses with work avoidance included in an ancillary set of regressions. They found that the inclusion of work avoidance goals did not alter the pattern or significance of the primary findings but did reveal significant effects of work avoidance goals. Preliminary analyses revealed that this was also true in the present data set. For purposes of comparison with previous research, we included work avoidance goals in all analyses reported here. Although these goals were not a major focus of our research and are not competence-related goals in the same way as mastery and performance-approach goals, they do help us understand students who do not seem to be motivated by competence concerns.

² Not all students graduate in 4 years, and a 7-year follow-up allowed us to follow all of the freshmen in this sample through to graduation (or to the point when it was clear that they had left the university without plans to return).

Table 1
Means and Standard Deviations for Primary Variables

Variable	N	Range	M	SD
Mastery goals	471	2.33–7.00	5.36	0.83
Performance goals	471	1.33–7.00	5.18	1.06
Work avoidance goals	471	1.00–7.00	3.76	1.05
Ability	471	–3.33–2.77	0.00	0.98
ACT	395	14.00–34.00	24.91	3.26
SAT	164	720.00–1,410.00	1,073.66	125.53
High school percentile	422	49.60–99.80	84.93	10.94
Workmastery	471	1.50–4.71	3.68	0.47
Competitiveness	471	1.20–5.00	3.61	0.73
Interest in psychology	471	1.63–7.00	5.19	1.15
Enjoyment of the class	471	1.00–7.00	4.88	1.17
Final grade	471	0.00–4.00	2.75	0.92
Semester GPA	471	0.83–4.00	2.92	0.65
Courses taken	471	0.00–0.42	0.05	0.09
Major	429	0.00–1.00	0.09	0.03
Psychology GPA	225	0.33–4.00	2.99	0.75
Subsequent GPA	471	0.54–4.00	3.16	0.51

section differences in all variables. The only significant instructor effects were on enjoyment and final grade, indicating that students enjoyed sections taught by one instructor more and received higher grades than students in the sections taught by the other instructor. Therefore, we included a contrast code term to test and control for differences between the two instructors in all subsequent analyses (Cohen & Cohen, 1983).

Regression Models

Overview. We conducted one series of multiple regression analyses to examine the predictors of the achievement goals adopted in the class, a second series to examine the effects on outcome variables measured during the semester in which students took Introductory Psychology (the short term), and a final series of regressions to examine the effects on measures collected in the follow-up assessment (the long term). Within the long-term anal-

yses, we tested different models for psychology-specific (courses taken, major, and psychology GPA) and general (subsequent GPA) measures.

This data analytic strategy allowed us to retain the continuous nature of the variables and to test the independent effects of each predictor variable as well as the interactions between them. For the following analyses, all continuous main effect terms were standardized, and multiplicative two- and three-way interaction terms were created with these variables (Aiken & West, 1991). To interpret significant interaction effects from these analyses, we computed predicted values (\hat{Y} s) for representative high and low groups (one standard deviation above and below the mean) from the regression equations using the unstandardized regression coefficients.

Missing data. Because we did not have measures of high school performance for all students, we used missing data techniques recommended by Cohen and Cohen (1983) to retain all cases in our model. Specifically, we added a dichotomous missing-data code, in which participants who were missing high school performance data were coded +1, and participants with high school performance data were coded 0. On the actual high school performance variable, we substituted the sample mean for students who had missing values. These steps allowed us to avoid the risk of nonrepresentativeness that can occur by dropping participants with missing data (Cohen & Cohen, 1983) as well as test whether there were any significant differences on any measure between students with high school percentile scores and those students missing this score.

Predictors of Goals

Our first series of multiple regression analyses examined the effects of ability, high school performance, and achievement motivation on goals adopted in the classroom. Initial regression models included the main effect terms for ability, high school percentile, the dichotomous missing-data code, workmastery, competitiveness, gender (coded +1 for women and –1 for men), and

Table 2
Zero-Order Correlations

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Mastery goals	—														
2. Performance goals	.06	—													
3. Work avoidance goals	–.28*	.22*	—												
4. Ability	–.02	–.03	.02	—											
5. High school percentile ^a	.05	.09	–.10	.22*	—										
6. Work mastery	.32*	.06	–.17*	–.01	.14*	—									
7. Competitiveness	.06	.40*	.07	.01	.07	.29*	—								
8. Interest in psychology	.40*	–.02	–.22*	.01	.03	.17*	–.04	—							
9. Enjoyment of the class	.23*	.03	–.21*	–.04	.05	.16*	.04	.57*	—						
10. Final grade	.07	.14*	–.15*	.38*	.46*	.10*	.05	.31*	.18*	—					
11. Semester GPA	.01	.12	–.11	.36*	.51*	.15*	.06	.14*	.12*	.79*	—				
12. Courses taken	.13*	–.00	–.00	–.03	–.06	–.04	–.02	.24*	.05	.05	–.02	—			
13. Major ^b	.13*	.04	–.02	.02	–.02	.00	.01	.19*	.03	.10	.03	.89*	—		
14. Psychology GPA ^c	.01	.13	–.09	.35*	.41*	.12	.14	.08	.07	.54*	.57*	–.01	.15	—	
15. Subsequent GPA	.06	.08	–.08	.24*	.44*	.13*	.07	.08	.07	.59*	.64*	.01	.09	.73*	—

Note. N = 471 unless otherwise noted.

^aN = 422. ^bN = 429. ^cN = 225.

*p < .01.

the instructor contrast code (coded +1 for one instructor and -1 for the other) and all two- and three-way interactions among these variables. Preliminary analyses revealed one significant interaction, between workmastery and competitiveness, and all nonsignificant interaction terms were trimmed, resulting in an eight-term goal adoption model.

Mastery goals. The overall model was significant, $F(8, 462) = 7.70, p < .01 (R^2 = .12)$. Main effects were found for workmastery, $F(1, 462) = 41.26, p < .01 (\beta = .31)$, and gender, $F(1, 462) = 7.45, p < .01 (\beta = .13)$. Students high in workmastery were more likely to adopt mastery goals, and female students were more likely to adopt mastery goals.

Performance-approach goals. The overall model was significant, $F(8, 462) = 14.66, p < .01 (R^2 = .20)$, and the main effect of competitiveness was significant, $F(1, 462) = 84.91, p < .01 (\beta = .41)$. This effect showed that students high in competitiveness were more likely to adopt performance-approach goals. A significant interaction between competitiveness and workmastery, $F(1, 462) = 15.30, p < .01 (\beta = .17)$, showed that students high in both competitiveness and workmastery were the most likely to adopt performance-approach goals ($\hat{Y} = 5.72$), relative to those high in competitiveness but low in workmastery ($\hat{Y} = 5.50$), those high in workmastery but low in competitiveness ($\hat{Y} = 4.58$), and those low in both ($\hat{Y} = 4.89$).

Work avoidance goals. The overall model was significant, $F(8, 462) = 3.42, p < .01 (R^2 = .06)$, and the main effects of workmastery, $F(1, 462) = 15.43, p < .01 (\beta = -.19)$, and competitiveness, $F(1, 462) = 8.68, p < .01 (\beta = .14)$, were significant. Competitive students were more likely to endorse work avoidance goals, and students high in workmastery were less likely to endorse work avoidance goals.

In sum, these analyses suggest that there were no significant effects of ability or high school performance on the goals students adopted. Rather, individual differences in achievement motivation and gender were the only significant predictors of goals.

Short-Term Effects of Goals

Regression model for short-term analyses. In our second series of multiple regression analyses, we tested the short-term effects of goals, ability, high school performance, and achievement motivation on interest, enjoyment, final grade, and semester GPA. Preliminary models included the main effects of mastery, performance, and work avoidance goals; gender; instructor; ability; high school percentile; the missing-data code; workmastery; competitiveness; and all two- and three-way interactions among these variables. Preliminary testing revealed no significant interactions or any significant effects of the achievement motivation variables on any of our short-term outcome measures, and these terms were therefore trimmed from the model. Moreover, preliminary analyses revealed no significant interactions with gender, instructor, or work avoidance goals on any measures, and thus the only interaction term that we retained in our final model was that between mastery and performance goals. We therefore tested a nine-term basic model.

Interest in psychology. The basic model was significant, $F(9, 461) = 11.13, p < .01 (R^2 = .18)$. A main effect was found for mastery goals, $F(1, 461) = 61.14, p < .01 (\beta = .35)$, such that students who adopted mastery goals reported higher levels of

interest in psychology than students who did not endorse mastery goals. A main effect for work avoidance goals, $F(1, 461) = 5.86, p < .05 (\beta = -.11)$, showed that students who adopted work avoidance goals reported less interest in psychology.

Enjoyment of the lectures. The basic model was significant, $F(9, 461) = 15.21, p < .01 (R^2 = .23)$. The main effect of mastery goals, $F(1, 461) = 13.73, p < .01 (\beta = .16)$ indicated that individuals who had adopted mastery goals enjoyed the lectures more, and the main effect of work avoidance goals, $F(1, 461) = 15.05, p < .01 (\beta = -.17)$, showed that students who had adopted work avoidance goals enjoyed the lectures less. A main effect of instructor, $F(1, 461) = 78.51, p < .01 (\beta = .36)$, showed that students of one instructor enjoyed lectures more than students of the other instructor, and a main effect for gender, $F(1, 461) = 10.45, p < .01 (\beta = .14)$, indicated that women enjoyed the class more than men.

Final grade. The basic model was significant, $F(9, 461) = 26.48, p < .01 (R^2 = .34)$, and there were significant main effects of performance-approach goals, $F(1, 461) = 16.07, p < .01 (\beta = .16)$, and work avoidance goals, $F(1, 461) = 13.85, p < .01 (\beta = -.15)$. Students who adopted performance-approach goals achieved higher grades in their introductory psychology course, and students who adopted work avoidance goals earned lower grades. The main effect of ability was significant, $F(1, 461) = 67.27, p < .01 (\beta = .33)$, indicating that high-ability students obtained higher grades in their introductory psychology course. The main effect of high school percentile was significant, $F(1, 461) = 71.28, p < .01 (\beta = .33)$, indicating that students who performed well in high school achieved higher grades in the course. There were also main effects for instructor, $F(1, 461) = 5.35, p < .05 (\beta = .09)$, and gender, $F(1, 461) = 5.50, p < .05 (\beta = .09)$. Students of one instructor received higher grades, and women had higher grades. The missing-data code variable was also significant, indicating that course grades were lower for students for whom we were missing high school percentile scores, $F(1, 461) = 5.11, p < .05 (\beta = -.09)$. Figure 1 displays a path model illustrating the predictors of interest, enjoyment, and final grade, constructed from the nine-term direct effects model.

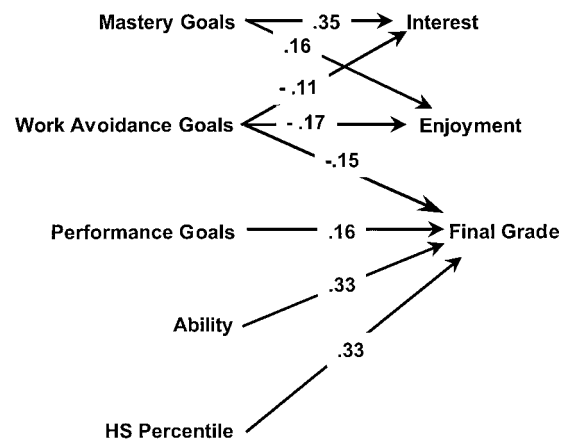


Figure 1. Predictors of interest, enjoyment, and final grade. For clarity of presentation and consistency with other figures, significant gender, instructor, and missing-data code effects are not shown. HS = high school.

Semester GPA. The basic model was significant, $F(9, 461) = 30.47, p < .01 (R^2 = .37)$, and the main effect of performance-approach goals, $F(1, 461) = 14.46, p < .01 (\beta = .15)$, showed that students who adopted performance goals in their psychology class attained higher grades in all of their classes that semester. The main effect of work avoidance goals, $F(1, 461) = 9.28, p < .01 (\beta = -.12)$, indicated that those who adopted work avoidance goals received lower grades. A main effect of mastery goals, $F(1, 461) = 4.85, p < .05 (\beta = -.09)$, showed that students who adopted mastery goals in their introductory psychology class attained lower GPAs that semester. This negative effect may reflect a suppression effect, given that the zero-order correlation of mastery goals with semester GPA was .01 (Conger, 1974). The main effect of gender, $F(1, 461) = 31.52, p < .01 (\beta = .22)$, showed that women attained higher grades than men.

Replication analyses. To compare these results with those reported by Harackiewicz et al. (2000) for the original sample that also included sophomores, juniors, and seniors, we tested six-term regression models that were identical to those tested in the earlier work. These models excluded ability, high school percentile, and achievement motivation because those variables were not tested in that study. The results for the present freshmen sample replicated those reported for the entire sample, with only the differences noted here. On interest and enjoyment, the significant mastery goal effects were smaller (β s = .36 and .16, compared with .41 and .22 in the original sample). On final grade and semester GPA, the performance goal effects were larger (β s = +.19 and +.18, compared with +.15 and +.13 in the original sample), as were the work avoidance goal effects (β s = -.20 and -.17, compared with -.17 and -.15 in the original sample). Two interactions were significant that had not been significant in the original sample. On final grade, the interaction between mastery and performance-approach goals was significant, $F(1, 464) = 5.24, p < .05 (\beta = -.10)$. Students who were high in performance-approach goals but low in mastery goals attained the highest grades in the course. Similarly, on semester GPA, the interaction between mastery and performance-approach goals was significant, $F(1, 464) = 5.24, p < .05 (\beta = -.10)$. Students who were high in performance-approach goals but low in mastery goals achieved the highest GPAs.³ These analyses indicate that the short-term goal effects documented by Harackiewicz et al. (2000) were evident in the subset of freshmen participants studied here.

In sum, although ability and high school performance measures proved to be significant predictors of academic performance, their inclusion in the regression models did not alter the pattern or significance of the performance-approach goal and work avoidance goal effects documented in previous work (Harackiewicz et al., 2000). Moreover, these variables had no effect on interest and enjoyment and did not alter the pattern or significance of mastery and work avoidance goals documented in previous work. Finally, inclusion of achievement motivation measures did not account for additional variance or affect the pattern or magnitude of these goal effects.

Long-Term Effects of Goals

Regression models for long-term analyses. In our final series of multiple regression analyses, we tested the long-term effects of goals in two steps. First, to investigate the direct effects of goals,

ability, and high school performance on the long-term outcomes, courses taken, major, psychology GPA, and subsequent GPA were regressed on the nine-term basic model established in the short-term analyses. (Preliminary testing revealed no significant effects of the achievement motivation variables on any long-term outcome measure.)

Second, we tested models to examine the long-term effects in the context of the short-term effects documented earlier. Specifically, we added the short-term outcome measures to the basic model to test for mediated or indirect goal effects. The particular short-term performance measure added to this model, however, depended on the long-term measure being investigated. When we analyzed the three psychology-relevant long-term outcomes (courses taken, major, and psychology GPA), the relevant short-term performance was a student's final grade in the psychology class (final grade). When we analyzed the long-term general performance measure (subsequent GPA), the short-term performance measure was a student's overall performance during their first semester (semester GPA).

For the three psychology-relevant outcome measures, we added interest, enjoyment, and final grade to the nine-term direct effects model. In addition, we tested the three two-way interactions between interest, enjoyment, and final grade, but preliminary testing revealed that neither the Interest \times Enjoyment nor the Enjoyment \times Final Grade interaction was significant on any of the three outcome measures. Thus, these terms were trimmed, resulting in a 13-term *final model*.

Although the regression models were identical for the three psychology-relevant outcome measures, the samples differed for each measure. All 471 students were included in analyses on courses taken. The major analyses were conducted with the subset of the sample that had declared a major ($N = 429$). Although all students who graduated had declared a major, some students who dropped out before graduating had not declared a major before leaving the university. Finally, the psychology GPA analyses were conducted with the subset of the sample that actually took additional psychology courses ($N = 225$).

For the long-term general measure of overall academic performance (subsequent GPA), we added interest, enjoyment, and semester GPA (instead of final grade) to the direct effects model. We also tested the three two-way interactions among these variables, but preliminary testing revealed no significant interactions. These terms were therefore trimmed, resulting in a 12-term *final model* for subsequent GPA, tested in the overall sample.

Direct effects on courses taken. The nine-term basic model was significant, $F(9, 461) = 4.20, p < .01 (R^2 = .08)$, and there were significant main effects of mastery goals, $F(1, 461) = 6.80, p < .01 (\beta = .13)$, and gender, $F(1, 461) = 20.80, p < .01 (\beta = .21)$. Students who adopted mastery goals in Introductory Psychology were more likely to take more psychology courses over their college career, as were women.

Mediated and indirect effects on courses taken. The addition of the short-term outcome measures resulted in a significant final model, $F(13, 457) = 5.95, p < .01 (R^2 = .14)$, and it accounted for

³ These interactions were not significant in the primary analyses that also tested ability and high school percentile as predictors of final grade and semester GPA and will not be interpreted further.

significantly more variance than the direct effects model, $F(4, 457) = 9.21, p < .01$. In this model, the main effect of interest was significant, $F(1, 457) = 28.22, p < .01$ ($\beta = .32$), and the main effect of gender remained significant, $F(1, 457) = 18.53, p < .01$ ($\beta = .20$). However, the mastery goal effect was reduced in size ($\beta = .04, ns$, from .13 in the direct effects model), indicating that the direct mastery goal effect was partially mediated through interest (Judd & Kenny, 1981). Finally, the interaction between interest and final grade was significant, $F(1, 457) = 5.56, p < .05$ ($\beta = .11$), indicating that students took more classes when they were high in interest and had high grades in their introductory course ($\hat{Y} = .08$), relative to students high in interest with low grades ($\hat{Y} = .06$) and relative to students low in interest with either high ($\hat{Y} = .01$) or low ($\hat{Y} = .02$) grades. This interaction is graphed in Figure 2.

Direct effects on major. For the major analyses, our sample was limited to the 429 students who had declared majors during their academic careers. We first regressed major on the basic model.⁴ Although the overall model was not significant, $F(9, 419) = 1.31, p = .23$ ($R^2 = .03$), the main effect of mastery goals was significant, $F(1, 419) = 5.23, p < .05$ ($\beta = .12$), suggesting that students who adopted mastery goals were more likely to major in psychology.

Mediated and indirect effects on major. When the short-term outcome measures were added to this basic model, the final model was significant, $F(13, 415) = 2.50, p < .01$ ($R^2 = .07$), and it accounted for significantly more variance than the direct effects model, $F(4, 415) = 5.06, p < .01$. In this model, the main effect of interest was significant, $F(1, 415) = 11.65, p < .01$ ($\beta = .23$), indicating that students who reported more interest in psychology during the introductory class were more likely to eventually major in psychology. The mastery goal effect was reduced in size ($\beta = .06, ns$, from .12 in the direct effects model), suggesting partial mediation. Finally, the Interest \times Final Grade interaction was significant, $F(1, 415) = 4.23, p < .05$ ($\beta = .10$), indicating that students who were high in interest and had high grades in their introductory class were most likely to major in psychology ($\hat{Y} = .19$), relative to students high in interest with low grades ($\hat{Y} = .09$) and relative to students low in interest with either high ($\hat{Y} = .01$) or low ($\hat{Y} = .01$) grades. This interaction is graphed in Figure 3.

Direct effects on psychology grades. For the psychology GPA analysis, our sample was limited to the 225 students who actually

enrolled in additional psychology classes. To examine the direct effects of goals on subsequent psychology grades, we regressed psychology GPA on the basic model. This model was significant, $F(9, 215) = 8.46, p < .01$ ($R^2 = .26$). The main effects of ability, $F(1, 215) = 22.00, p < .01$ ($\beta = .30$), and high school percentile, $F(1, 215) = 22.56, p < .01$ ($\beta = .31$), were significant, and the main effect of performance-approach goals was not, $F(1, 215) = 1.93, p = .17$ ($\beta = .09$). Students who were high in ability and those who performed well in high school attained higher grades in their subsequent psychology classes.

Mediated and indirect effects on psychology grades. When the effects of the short-term measures were added to the basic model, the final model was significant, $F(13, 211) = 9.22, p < .01$ ($R^2 = .36$), and accounted for significantly more variance than the direct effects model, $F(4, 211) = 8.35, p < .01$. The main effect of final grade was significant, $F(1, 211) = 32.70, p < .01$ ($\beta = .43$). Students who received higher grades in introductory psychology received higher grades in their later psychology courses. The main effects of ability, $F(1, 211) = 5.11, p < .05$ ($\beta = .15$), and high school percentile, $F(1, 211) = 5.36, p < .05$ ($\beta = .15$), remained significant. The performance-approach goal effect was reduced in size ($\beta = .03, ns$, from .09 in the direct effects model). We found no evidence of indirect mastery goal effects (β for interest = $-.10, ns$, and β for Interest \times Final Grade = $-.02, ns$).

Figure 4 displays a path model illustrating the direct, indirect, and mediated effects on the three psychology-relevant outcome measures. Paths with two coefficients reflect significant interaction effects, and these coefficients were derived from the overall regression equation (Aiken & West, 1991; Judd & McClelland, 1989). For example, the path from interest to courses taken reflects a significant main effect ($\beta = +.32$), qualified by the significant interaction with final grade, indicating that the interest effect was stronger for students who were 1 *SD* above the mean for grades in the class ($\beta = +.43$) than for those 1 *SD* below the mean ($\beta = +.21$).

In sum, when testing the simultaneous effects of goals and short-term outcome variables as predictors of our long-term outcomes, we found that the effects of goals on long-term outcomes could be understood in terms of their short-term consequences.

Direct effects on subsequent GPA. The basic model was significant, $F(9, 461) = 16.55, p < .01$ ($R^2 = .24$). There were main effects of performance-approach goals, $F(1, 461) = 5.46, p < .05$ ($\beta = .10$), and gender, $F(1, 461) = 17.91, p < .01$ ($\beta = .18$). Students who adopted performance-approach goals in Introductory Psychology had higher grades over the course of their academic careers, and women obtained higher grades than men. The main effects of ability, $F(1, 461) = 18.20, p < .01$ ($\beta = .18$), and high school percentile, $F(1, 461) = 68.76, p < .01$ ($\beta = .35$), were also

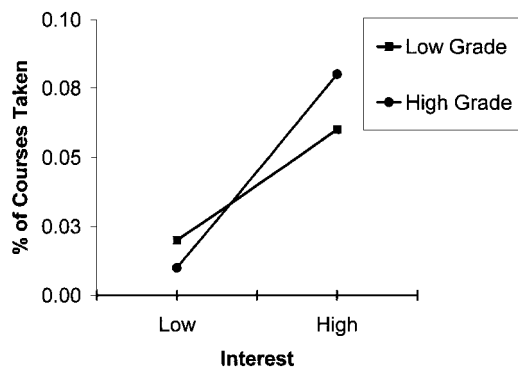


Figure 2. The Interest \times Final Grade interaction on courses taken. Graph is based on predicted values generated from the regression equation for individuals 1 *SD* above and below the mean for interest and final grade.

⁴ We also analyzed this variable with logistic regression, which is appropriate when analyzing a dichotomous dependent variable, and obtained the same pattern of findings reported here. A number of researchers (Lunney, 1970; Rosenthal & Rosnow, 1991), however, suggested that multiple regression procedures yield accurate results for dichotomous dependent variables as long as the sample size is sufficiently large and that the split between categories of the dependent variable is not extreme. We therefore present the multiple regression results for consistency with the other analyses reported here.

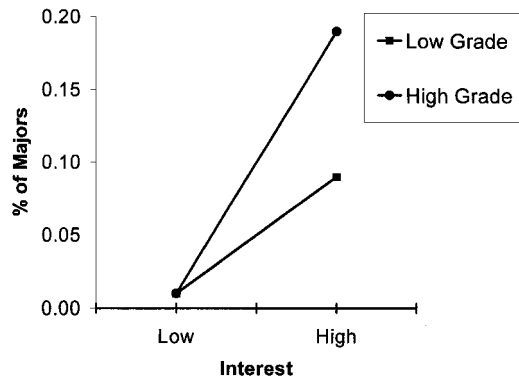


Figure 3. The Interest \times Final Grade interaction on major. Graph is based on predicted values generated from the regression equation for individuals 1 *SD* above and below the mean for interest and final grade.

significant. Students with higher ability test scores and students who performed well in high school had higher overall GPAs.

Mediated and indirect effects on subsequent GPA. The addition of short-term outcomes resulted in a significant final model, $F(12, 458) = 30.03, p < .01 (R^2 = .44)$, and accounted for significantly more variance than the direct effects model, $F(3, 458) = 37.04, p < .01$. The main effects of semester GPA, $F(1, 458) = 159.04, p < .01 (\beta = .56)$, and high school percentile, $F(1, 458) = 12.03, p < .01, (\beta = .14)$, were significant. Students who received higher grades in the semester in which they took Introductory Psychology received higher grades over the course of their college careers, and students who performed well in high school performed well in college. The fact that the performance-approach goal effect was reduced in size ($\beta = .02, ns$, from .10 in the direct effects model) indicates that the direct performance goal effect was partially mediated through semester GPA (Judd & Kenny, 1981). Figure 5 displays a path model illustrating the predictors of subsequent GPA.

Comparison with Harackiewicz et al. (2000) results. In the earlier study, Harackiewicz et al. (2000) had followed all 604 students over three semesters, examining continued interest, psychology grades, and overall GPA (but not academic major). To compare the present 7-year follow-up with those results, we also conducted regressions that excluded the predictor variables not tested in that study. We therefore tested a six-term regression model and found the same pattern of significant goal effects, although the goal effects were smaller over the 7-year follow-up. Specifically, the beta for mastery goals on continued interest was +.13, compared with +.16 in the three-semester follow-up, and the beta for performance-approach goals on psychology grades was +.16, compared with +.23 in the three-semester follow-up.⁵ On subsequent GPA, the effect of performance-approach goals was the same ($\beta = +.13$) in the three-semester and 7-year follow-up. Although the effect of work avoidance goals had not been significant in the three-semester follow-up, it was significant in the 7-year follow-up, $F(1, 464) = 5.17, p < .05 (\beta = -.11)$, suggesting that students who adopted work avoidance goals in their introductory psychology class attained lower grades over the course of their academic career.⁶

Discussion

Our primary objective in this research was to examine the role of achievement goals, in conjunction with ability, prior high school performance, and achievement motivation, in predicting academic success over the course of students' entire college careers. Using a multifaceted definition of success, we examined students' interest and performance over time, with attention to students' continued interest in the field of psychology and grades in subsequent courses. In our previous work (Harackiewicz et al., 2000), we found that students' achievement goals in an introductory class predicted their academic success in both the short term and over a three-semester follow-up. In the present study, we sought to extend our study over time to follow the original freshmen participants through graduation.

Ability and Prior Performance as Predictors of Academic Success

Ability and high school performance measures predicted academic performance in both the short and long term. All of these effects were of comparable magnitude, suggesting that ability and prior performance have independent, positive effects on academic performance and that the effects on long-term measures were as robust as the effects on short-term measures. These results are consistent with a large body of research documenting the effects of ability measures and performance history variables on academic performance (Willingham et al., 1990). It is important to note, however, that these variables had no effect on measures of interest in either the short or long term and that they did not interact with any motivation measures to reveal any additional effects on our outcome variables.

Direct Effects of Achievement Goals

Above and beyond these strong, direct effects of ability and prior performance on academic performance, we continued to find clear evidence of goal effects in the short term. Students who adopted performance goals in their introductory psychology course attained higher grades in that class as well as in their other courses that semester, and students who endorsed work avoidance goals received lower grades in the course as well as in their other courses. We also found significant gender effects on enjoyment and grades, but there was no evidence that goal effects differed as a function of gender. These findings replicate previous findings (Bouffard et al., 1998; Elliot & Church, 1997; Harackiewicz et al., 1997, 2000; Wolters, Yu, & Pintrich, 1996) and extend them by testing goal effects in models that controlled for both ability and high school performance.

⁵ Although the performance-approach goal effect was not significant on psychology grades in the primary analyses reported here (in models including ability and high school percentile), it was significant in the six-term model tested here for comparison purposes, $F(1, 218) = 5.51, p < .05 (\beta = +.16)$, replicating the three-semester result reported by Harackiewicz et al. (2000).

⁶ This effect was not significant in the primary analyses that also tested ability and high school percentile as predictors of subsequent GPA and will not be interpreted further.

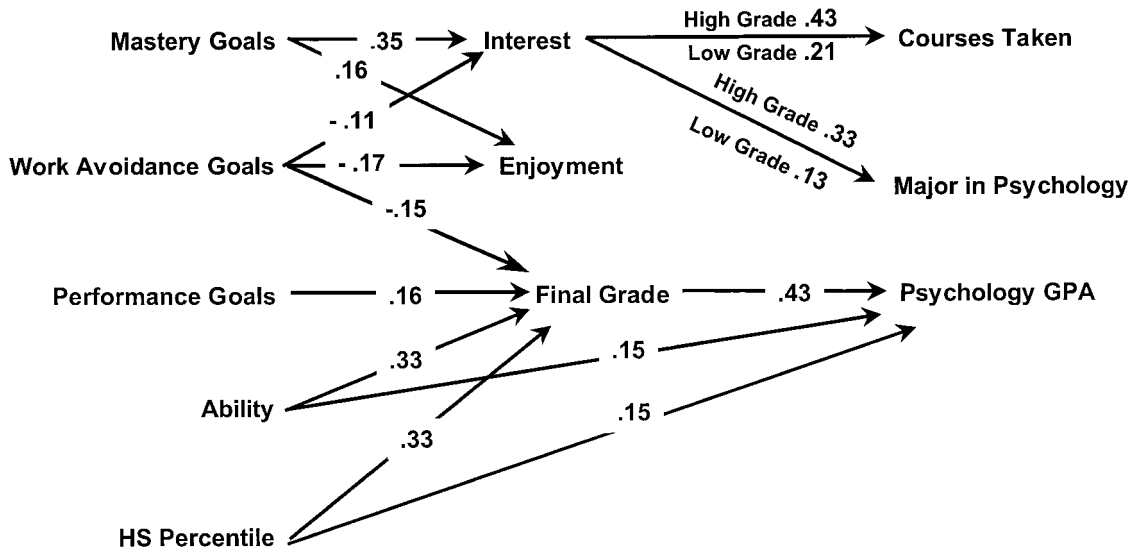


Figure 4. Direct, indirect, and mediated effects on the long-term psychology-relevant outcomes. For clarity of presentation, significant gender, instructor, and missing-data code effects are not shown. The paths with two coefficients indicate that the significant effect of interest was qualified by interactions with final grade such that the effect of interest on courses taken was stronger for students with higher grades in Introductory Psychology ($\beta = .43$) than it was for students with lower grades ($\beta = .21$). Similarly, the effect of interest on major was stronger for students with higher grades in Introductory Psychology ($\beta = .33$) than it was for students with lower grades ($\beta = .13$). HS = high school.

Goal effects on academic performance measures were weaker in the long term, as hypothesized. We did, however, find some evidence that performance-approach goals predicted subsequent grades over the length of students' careers. Although we had hypothesized that mastery goals might have positive effects on performance in later psychology classes, we did not find evidence of such effects, nor did we find mastery goal effects on the more general measure of overall academic performance. Even though advanced courses may have afforded more opportunities for mastery oriented students to perform well, we believe that the general context of college education is predominantly performance oriented. This general context may overwhelm changes in specific class structures. Moreover, early experiences in large survey courses may color students' perceptions of the goal structure implicit in smaller classes taken later. In earlier articles (Harackiewicz et al., 1998, 2000), we have discussed the "match" of performance-approach goals with the normative grading structures used in introductory courses, but we now suspect that the match may be at the level of prevailing educational norms. It is puzzling and troubling that we found no positive effects of mastery goals on performance, and further research is needed to explore goal dynamics in this educational context.

Moreover, individual differences in achievement motivation did not predict performance in the short or long term. Rather, situationally specific measures of goal adoption proved to be the more proximal predictors of performance in that class, replicating Harackiewicz et al. (1997). More important, the present findings extend those findings by documenting the predictive power of achievement goals relative to trait measures of achievement motivation on long-term measures of performance. Spence and Helmreich (1983) argued that general trait measures of achievement

motivation should predict aggregated measures of performance (e.g., cumulative GPA), and we might expect that the more general trait measure would be a significant predictor of overall GPA. However, Harackiewicz et al. (2000) argued that their measure of performance-approach goals was actually fairly general and that the desire to out perform classmates may typify students' goal orientation in other classes in the same educational context. As such, this measure may be conceptualized as specific to college courses and afford greater predictive power than the even more general trait measure used by Spence and Helmreich (1983) that assesses motives without reference to specific contexts. Our results suggest that these general motives may influence academic performance but indirectly, by influencing the specific goals that students adopt in their classes.

With regard to interest outcomes, achievement goals appear to be the stronger and more robust predictors, relative to ability, prior performance, and achievement motivation. Our long-term measures reflect students' course choices over a 4- to 7-year period and serve as behavioral measures of continuing motivation in the field of psychology. A student's choice of academic major is, of course, highly correlated with the number of courses taken in a discipline, but it also symbolizes his or her commitment to the field and possible career direction. As such, the choice of major offers a unique measure of interest in an academic field for an undergraduate. Students who had adopted mastery goals at the outset of Introductory Psychology were more likely to take additional psychology courses over the course of their academic careers and were more likely to major in the discipline. These long-term goal effects extend those reported in our three-semester follow-up study (Harackiewicz et al., 2000) over a much longer period of course taking and they also extend our previous research by including a

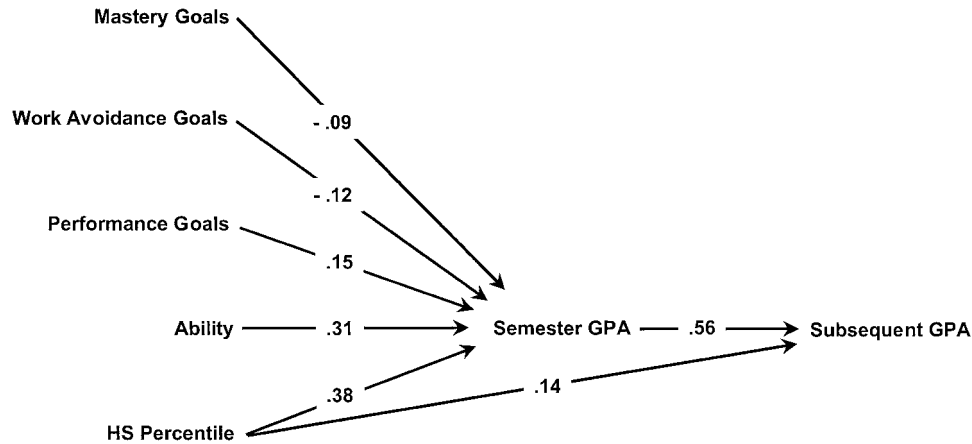


Figure 5. Predictors of subsequent GPA. For clarity of presentation, gender effects are not shown. HS = high school.

second measure of continued interest in the field—the student’s declared academic major.

Motivational Pathways: Mediated and Indirect Effects of Achievement Goals

We measured students’ achievement goals for an introductory course taken at the outset of their college career, and we did not expect these specific goals to have a major, direct impact on grades and course choices several years later. Rather, we hypothesized that the goals adopted by students in an introductory class would influence their interest in the field of psychology and their academic work in subsequent courses through their effects on students’ experience in the introductory course. In other words, long-term goal effects may be best characterized as cumulative, because they help shape the student’s experience in an introductory course that serves as the foundation for future work in the discipline. As such, achievement goals adopted in the first semester may play a critically important role in setting a student’s trajectory for the future.

We hypothesized that performance-approach goals could influence subsequent academic performance by promoting performance in an introductory course that provides basic knowledge and prepares students for more advanced work in a particular discipline, and we found evidence that final grade was indeed a partial mediator of the direct effect of performance-approach goals on subsequent psychology grades. In contrast, we found no evidence of indirect mastery goal effects. This pattern of mediational findings on long-term academic performance replicates that found in our earlier three-semester follow-up and represents an important extension because these effects were documented in models that controlled for ability and prior performance.

We also hypothesized that the long-term effects of mastery goals on continued interest and major would be mediated through their short-term effect on interest in psychology. We measured two components of interest to distinguish specific reactions to the lectures from more general reactions to the content of the course. This distinction corresponds to one drawn by Hidi and Baird (1986) between conditions that trigger or “catch” interest and those

that “hold” interest over time (Dewey, 1913; Mitchell, 1993). Although we found mastery goal effects on both enjoyment and interest, we hypothesized that interest in the subject matter of the introductory psychology course was most likely to promote continued interest in the topic, as compared with enjoyment of the lectures (Harackiewicz et al., 2000; Renninger, 1992). In addition, we considered the possibility that performance-approach goals could have indirect effects on continued interest by promoting higher grades in Introductory Psychology that might, in turn, predict taking additional psychology courses.

When goals, interest, enjoyment, and final grade were added as predictors of subsequent course choices and academic major, we found that interest partially mediated the direct effect of mastery goals on continued interest and major. As hypothesized, enjoyment did not predict continued interest in psychology or academic major. The fact that students’ self-reported interest during the introductory course was correlated with their actual course enrollment behavior and choice of academic major over an ensuing 4- to 7-year period is evidence of the crucial role that interest can play in college education.

However, the interactions between interest and grades suggests a mechanism by which performance-approach goals can have indirect effects on continued interest. Students who were both high in interest and had received higher grades in Introductory Psychology were the most likely to take additional psychology courses, and they were the most likely to declare psychology as their major. These results suggest that interest and performance may both be important in influencing long-term academic choices. There was no evidence of this interactional pattern in our previous study, in which interest was the only significant predictor of courses taken over a three-semester period (Harackiewicz et al., 2000). The more complex interactional pattern observed here may require a longer period of time to develop, as students explore different disciplines, begin to narrow their choices, and ultimately decide where to focus their efforts over the course of their academic career. Interests may drive initial course choices, and indeed, may be the single most important determinant of course choices and career decisions. However, students may find certain disciplines even more appeal-

ing when they are interested *and* attain competence in them. College is a time of discovery, and it can take students time to discover the ideal combination of interest and talent that helps them to forge a direction for their academic work.

Although interest was a strong predictor of subsequent course choices and academic major, our regression models accounted for small amounts of variance relative to the other outcome measures studied here. This may be due in part to the skewed distribution and low frequency of these variables (only 9% of participants majored in psychology and, on average, only 5% of the credits taken after Introductory Psychology were in psychology). However, this may also indicate that other factors not measured here may play an important role in course selection and career decisions. For example, parental and peer pressure as well as financial and practical constraints (such as course availability and scheduling issues) may compete with interest in determining course choices. We found that women were more likely to take additional psychology classes, and other individual factors may also influence continued interest. Another factor to consider is that we selected students who chose to take Introductory Psychology their first semester at college, and they may have come into the class with high levels of interest, which may have biased our findings. It will be important to include measures of initial interest in future studies, and future research should consider other factors that might influence course choices.

In sum, our results suggest that a short self-report questionnaire about students' goals in a particular course at a single point in their education predicts important educational outcomes over the length of their undergraduate careers and explains unique variance over and above measures of ability and prior high school performance and over and above gender effects and personality measures of achievement motivation. One limitation of our correlational research, however, is the difficulty of evaluating the causal direction of particular effects. For example, even though we measured goals at the outset of students' college careers, it is possible that students who have a history of academic success in prior courses are more likely to care about grades and endorse performance goals in their subsequent courses. However, this possibility seems less likely given that we controlled for ability and prior performance and continued to find significant effects of performance goals on academic performance.

Predictors of the Goals Adopted in an Introductory College Course

We were also interested in testing how individual differences in achievement motivation, ability, and/or prior performance predicted the specific goals that students adopted in their introductory psychology course. Given that our participants were all first-semester freshmen, their academic performance in high school serves as the experiential base for their academic goals in their first college courses. We might therefore expect high school performance to influence the adoption of performance-approach or work avoidance goals, such that students who had performed well in the past would be motivated to perform well in a college class or be less motivated to avoid work. However, we found no evidence of prior performance or ability effects on goal adoption. Instead, trait measures of achievement motivation proved to predict the specific goals that students adopted in their introductory course.

These findings suggest that individuals' characteristic motivational orientation can influence the goals a student adopts in a particular class. Moreover, the present results emerged with ability and high school performance included in the regression models, suggesting that motivational dispositions are more powerful predictors of goal adoption than are variables that measure ability and performance history. Of course, these are but a few of the myriad of personal and environmental factors that might influence students' goals. For example, we also found gender differences in mastery goal adoption and believe it is important to continue study of the factors that influence goal adoption in different educational contexts.

Optimal Motivation in College Courses: Mastery Versus Multiple Goal Perspectives

Considered together, our short- and long-term results reveal clear evidence for the beneficial consequences of adopting both mastery and performance-approach goals in college courses. These benefits begin in the first semester of students' college careers and extend until they graduate. First, students who adopted mastery goals for their initial coursework in psychology were more likely to enjoy lectures, express interest in psychology, enroll in additional psychology courses, and ultimately declare a major in psychology. Thus, mastery goals appear to play an important role in promoting optimal motivation by fostering initial and continued interest in course work. Second, students who adopted performance-approach goals for their initial course work in psychology received higher grades in the introductory course, higher grades in the additional psychology courses taken over the course of their academic careers, as well as higher GPAs for all courses over the entire academic career. Thus, performance-approach goals also appear to play an important role in promoting optimal motivation by fostering academic achievement in college courses.

Although others have argued that performance-approach goals can have detrimental effects on educational outcomes (Midgley et al., 2001), it is important to consider the type of performance goals evaluated here and the educational context studied (Harackiewicz, Barron, Pintrich, Elliot, & Thrash, 2002). Our measure of performance-approach goals emphasized positive strivings toward competence defined in terms of relative ability and outperforming others, and this orientation appears to be adaptive for academic performance in a college setting. These results are consistent with the matching hypothesis advanced by Harackiewicz and Sansone (1991) that goal effects may depend on the general context in which goals are pursued (Harackiewicz & Elliot, 1993, 1998).

A number of achievement goal theorists have suggested that jointly pursuing mastery and performance-approach goals may prove to be a more adaptive motivational strategy than a sole focus on mastery goals in some educational contexts (Barron & Harackiewicz, 2000; Harackiewicz et al., 1998, 2002; Pintrich, 2000). Barron and Harackiewicz (2000, 2001) have identified several patterns of findings that would support a multiple goals perspective, and our results typify what they call the specialized pattern: independent main effects of mastery and performance-approach goals on different outcomes. Specifically, mastery and performance-approach goals were each independently linked to an important component of educational success, but neither type of goal predicted both outcomes. Success in college and university con-

texts depends on both performance and interest, and our results suggest that the optimal pattern of goal adoption may include both mastery and performance-approach goals. Our longitudinal data provide further evidence that both mastery and performance-approach goals have positive and complementary consequences for motivation and performance in college courses over the course of students' academic careers.

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