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Abstract
The purpose of the study was to better understand how students at the beginning of a premed curriculum are different from their science peers on career-related variables. A total of 165 undergraduates were classified into three groups; these were premed students, students with the intent to pursue a graduate degree, and students with the intent to pursue a bachelor's degree. Both distal (e.g., prior achievement) and proximal (e.g., mathematics and science self-efficacy and interest) social cognitive constructs were measured. Based on social cognitive career theory (SCCT), the authors predicted that the three groups would not differ on the distal variables. In contrast, the authors expected systematic group differences on the proximal variables. The hypothesis was supported; no significant group differences were found for the distal variables, but the premed group scored significantly higher than the bachelor's degree group on almost all proximal SCCT variables. Implications for career counseling are discussed.

Keywords
Management, premed, science, mathematics, self-efficacy, interests, goals

Disciplines
Educational Psychology | Higher Education | School Psychology | Science and Mathematics Education | Social Psychology

Comments
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Abstract

The purpose of the study was to better understand how students at the beginning of a premed curriculum are different from their science peers on career-related variables. 165 undergraduates were classified into three groups; these were premed students, students with the intent to pursue a graduate degree, and students with the intent to pursue a Bachelor's degree. Both distal (e.g., prior achievement) and proximal (e.g., mathematics and science self-efficacy and interest) social cognitive constructs were measured. Based on social cognitive career theory (SCCT; Lent, Brown, & Hackett, 1994), we predicted that the three groups would not differ on the distal variables. In contrast, we expected systematic group differences on the proximal variables. The hypothesis was supported; no significant group differences were found for the distal variables, but the premed group scored significantly higher than the Bachelor's degree group on almost all proximal SCCT variables. Implications for career counseling are discussed.

Keywords: premed, science, mathematics, self-efficacy, interests, goals.

Distinguishing Beginning Premed Students from their Science Peers: The Salience of Proximal Variables

Given the selectivity and the prestige of the medical profession, it is surprising how little research has been conducted on the career trajectory of premed students. Much of the pertinent literature consists of descriptive studies that focus on how premed students are viewed by themselves and others (e.g., Brieger, 1999; Conrad, 1986; Sade, Fleming, & Ross, 1984). However, very little is known concerning the career development of this selective group of students early in their college career.

Career counselors on college campuses are in dire need of information on the defining characteristics of these students especially when they are in the formative years of their training. Career counselors and students may hold the belief that only the best and the brightest should pursue a premed curriculum. Beginning students who want to pursue a premed curriculum may avoid pursuing their dreams due to the beliefs that they are not academically well prepared or smart enough. Yet the necessary ingredients may be the determination and confidence to follow their career aspirations. Career counselors are in a unique position to identify these students early in their career planning and reassure them that they are indeed suited to follow their passion.

The purpose of this study is to challenge the belief that the major defining characteristics of beginning premed students are their academic preparedness and general aptitude. Based on theory and prior research, we propose that the crucial variables are those that motivate the students to pursue a premed option; these might include confidence, interests, and goals specific to the sciences. However, no studies were located in which beginning premed students were compared to their non-premed peers on salient academic and career-related variables. Another shortcoming in the premed literature is the absence of theoretically driven research that guides researchers as to what variables are likely to be more and less salient in predicating the career aspiration of becoming a premed student. We were unable to locate any conceptually driven studies concerning the career path of beginning premed students.

Therefore, the purpose of the present research was to fill these gaps in the literature by exploring the attributes of undergraduates who identify themselves as premed students early in their college career. Specific hypotheses regarding possible differences between these premed students and their peers were derived from social cognitive career theory (SCCT; Lent, Brown, & Hackett, 1994). The major goal was to identify the social cognitive variables that differentiate a group of premed students from two meaningful comparison groups. In this sample, the term *premed* was defined as students who self-identified as premed students in their first two years, and who intended to be a medical doctor, dentist, or veterinarian. The first comparison group consisted of students pursuing a science major who did not plan to extend their formal education beyond a Bachelor's degree. The second comparison group included students pursuing a science major who aspired to complete a graduate degree (i.e., M.S. or Ph.D.) in a non-medical field. The three groups differed on two variables, namely educational aspirations (premed group and graduate degree group compared to the Bachelor's degree group) and career aspirations (premed group compared to the other two groups).

Educational Aspirations

Distal variables. Prior academic achievement and academic preparation in high school and as well as parental support were considered the distal variables in this study. Social cognitive career theory (SCCT; Lent, Brown, & Hackett, 1994) addresses the importance of proximal social cognitive variables (e.g., self-efficacy) over more distal influences in differentiating among students with different educational aspirations. Distal variables, with the exception of personality, have not been emphasized in prior SCCT research given the purported salience of proximal variables. Moreover, level of academic achievement, academic preparation, and parental support of premed students in comparison to other groups of students has not been reported in the literature to date. Based on the theory, we would anticipate that the premed students would not differ from their science peers across the distal variables.

Proximal variables. The following proximal social cognitive variables were included in the study: a) the four sources of academic self-efficacy (self-reported mastery, modeling, social persuasion, and anxiety); b) self-efficacy, interests, and goals, all with respect to the domains of mathematics and science; c) career choice actions regarding the pursuit of a career in the health care field; and d) career commitment. Although not identified directly in SCCT, career commitment can be viewed as conceptually similar to goals, since both relate to the intention to pursue a specific course of action.

The theory specifies four sources that are posited to impact self-efficacy in both a positive way (self-reported mastery, modeling, and social persuasion), and in a negative way (anxiety). In the model, these four sources influence self-efficacy, which in turn affects interests, goals, and educational aspirations. Only one study was located that provided evidence that students with different levels of educational aspirations would report varying levels of proximal SCCT variables. Rottinghaus and colleagues (2002) showed that investigative self-efficacy and interests aided in distinguishing between U.S. students with different educational aspirations, such as pursuing a Ph.D. degree compared to a Bachelor's degree (Rottinghaus, Lindley, Green, & Borgen, 2002). These results support the idea that premed students and the graduate degree group may report higher levels of mathematics and science self-efficacy and interest than their peers who are intent on pursuing only a Bachelor's degree.

Career Aspirations

Distal variables. As mentioned earlier, SCCT posits the importance of proximal social cognitive variables over more distal influences in differentiating students with different career aspirations (aspiring to be a health care professional). To date, researchers have not examined the distinguishing characteristics of premed students using an SCCT framework. Based on the

theory, we would anticipate that the premed group would not be different from their science peers on distal variables.

Proximal variables. According to the SCCT theory, proximal variables are posited to differentiate students with different career aspirations. In the model, the sources influence self-efficacy, affects interests, goals, and career aspirations (e.g., considering premed as a career aspiration) and career choice actions (e.g., pursuing a health care related externship). One study provided evidence that proximal social cognitive variables were predictive of career aspirations. Investigative self-efficacy was salient in discriminating among groups of Taiwanese students who varied in their career aspirations (Larson, Wei, Wu, Borgen, & Bailey, 2007). This suggests that premed students would report stronger percepts of science self-efficacy than their peers. However, Larson and colleagues did not differentiate among students with varying educational aspirations. This is an important variable because Rottinghaus and colleagues (2002) showed that students with higher educational aspirations, like the premed group and the graduate degree group, reported higher levels of self-efficacy and interest. The premed group and the graduate degree group should be different on those proximal SCCT variables that would differentiate between whether or not they wanted to become a health care professional. Given that the premed curriculum emphasizes job shadowing, externships and internships in the medical field, we anticipated that premed students would differentiate themselves from their graduate degree peers in their intentions to engage in these career choice actions. We would also expect the premed group to differentiate themselves from the Bachelor's degree group regarding career choice actions since the latter group also had no aspirations to become health care professionals.

The Present Study

The purpose of this study was to determine whether proximal social cognitive variables were salient in identifying students who were pursuing a premed career option in contrast to two

meaningful comparison groups. The first comparison group, the Bachelor's degree group, did not intend to pursue an advanced degree and had different career aspirations than the premed group. The second comparison group, the graduate degree group, had similar educational aspirations but different career aspirations.

First hypothesis: Distal variables. As predicted by SCCT, the premed group was not expected to differ from the comparison groups with respect to the distal variables (prior academic achievement and preparation, as well as parental support), based on the rationale that those factors are furthest away in time from their current choice intention to be a physician, dentist, or veterinarian. From this theoretical perspective, we would not expect these students to be brighter or better prepared for a mathematics and science curriculum than other university students taking science courses.

Second hypothesis: Proximal variables. Premed students and the graduate degree group should report higher levels of the proximal social cognitive variables like science self-efficacy, interests, goals, and career commitment in comparison to the bachelor's degree group. Given the premed group's and the graduate degree group's posited higher self-efficacy, they should *subjectively* report higher levels of academic mastery, modeling, and social persuasion, and lower levels of anxiety. [Note: within social cognitive theory (e.g., Bandura, 1986), it is important to distinguish between subjective mastery and objective performance]. These two groups of students should report higher levels of self-efficacy as they need to have ample confidence in their mathematics and science ability to persevere and be successful in the courses necessary to pursue their career aspirations. They should report higher levels of mathematics and science interests compared to their Bachelor's peers, since interest will help them approach the required science and mathematics courses. Moreover, they should express stronger goals and commitment to their future career than their science peers pursuing only a Bachelor's degree given the rigor and demands of the either the premed curriculum or science curriculum leading to graduate school. In essence, the environmental demands require these students to have strong

confidence, considerable interest, and high goals, particularly in the science domain and somewhat in the mathematics domain (e.g., calculus is required in the premed curriculum).

Third hypothesis: Career choice actions related to health care. Premed students should engage in more health care-related choice actions than their science peers regardless of their educational aspirations. The rationale derived from SCCT is that career choice actions (e.g., volunteering at a hospital) are most proximal and most specific to the premed group's future educational aspiration, namely to apply to medical school, dentistry school, or veterinary school.

Method

Participants

The sample consisted of 165 undergraduate students recruited from several introductory science classes (e.g., biology, biochemistry, and genetics) at a large Midwestern university. All but four of the students identified as a science major. Students did not receive any compensation for their participation in the study. The sample consisted of 38.1% women and 61.9% men, and the participants were on average 18.5 years old (SD = 0.6 years). About 54% of the students were first year students and 44% of the students were second year students. Students reported their ethnicity as White (88.5%), African-American (2.4%), Hispanic (2.4%), Asian-American (2.4%), or other (4.2%).

Participants were classified into three groups based on their educational aspirations, career aspirations, and the extent to which they self identified as a premed major. The first group (n = 79), the *premed group*, included the participants who met all of the following criteria: a) they checked the option, "Medical Degree" in response to the question "What are your current educational aspirations" (dentist or veterinarian was not an option); b) their self-reported career choice was to be a physician, dentist, or veterinarian; c) their response to the question "I consider myself a premed major", scored on a 6-point scale (with higher scores indicating a higher degree of identification as a premed major), was a score of 4 or higher.

The second group (n = 46), the *graduate degree group*, included participants who met all of the following criteria: a) they checked either the option, "Master's Degree" or "Doctorate" in

response to the question “What are your current educational aspirations”; b) their self-reported career choice did not include being a physician, dentist, or veterinarian; c) their response to the question “I consider myself a premed major” was a score of 3 or lower.

The third group (n = 40), the *Bachelor’s degree group*, included participants who met all of the following criteria: a) they checked the option, “Bachelor’s Degree” in response to the question “What are your current educational aspirations”; b) their self-reported career choice did not include being a physician, dentist, or veterinarian; c) their response to the question “I consider myself a premed major” was a score of 3 or lower.

All participants were asked whether they have a family member who is a health care professional. Contrary to common expectations, the three groups did not significantly differ on this demographic [$\chi^2(2) = 1.5$, $p = .48$]. The percentage of students in each group who had a health care professional as a family member was 68.4% for the premed group, 58.7% for the graduate degree group, and 60.0% for the Bachelor’s degree group.

Measures

Demographics. The demographic form contained questions concerning age, year in school, choice of academic major, decidedness on a major, self-identification as a premed student, and seven career choice action items. These items addressed whether the student had or planned to engage in the following actions in the health care field: job shadowing, completing an externship, informational interviewing, volunteering, joining a health care organization, attending a professional meeting, and taking certification classes.

Prior academic achievement and preparation. Prior academic achievement was operationalized as the overall high school Grade Point Average (GPA), mathematics GPA, science GPA, and total ACT (American College Testing) score reported on the transcript. The overall GPA was taken from the high school transcript. The GPA for high school science and mathematics courses was computed by first converting letter grades to numbers (e.g., A = 4.0, B = 3.0) and then averaging all the numbers for mathematics classes and science classes, respectively. [Note: A letter-plus grade corresponds to one-third above these numbers (B+ =

3.33, C+ = 2.33), and a letter-minus grade corresponds to one-third below these numbers (A- = 3.67, B- = 2.67). A+ grades were computed as an A (A+ = 4.0)].

The American College Testing (ACT) battery assesses high school students' aptitude for college-level work and general educational development (ACT, Inc., 2007). It includes four subscales administered in a multiple-choice format: mathematics (60 items), science (40 items), English (75 items), and reading (40 items). The test has a range of 0-36 points, and the national mean ACT score in 2008 in a sample of 1.4 million students was 21.1 points (ACT, Inc, 2009).

Prior academic preparation was operationalized as the number of high school mathematics and science credits a student has taken as determined by the university's admissions office. The admissions office used a standardized definition of what high school course at each high school counted as a credit; in general, one credit corresponds to one semester credit.

Social Provisions Scale. The Social Provisions Scale (SPS; Cutrona, 1989) was developed to measure the amount of social support an individual receives from both parents. The scale includes 12 items (six items to measure mother support, and six items to measure father support). Example items include "I can depend on my mother to help me if I really need it," and "My father recognizes my competence and skill". Each item was designed to measure a different facet of social provisions: attachment, social integration, reassurance of worth, reliable alliance, guidance, and opportunity for nurturance. Response format was a 6-point Likert scale (1 = *very strongly disagree* and 6 = *very strongly agree*). Mean scores across the six respective items were calculated separately for mother and father support, yielding a score range of 1 to 6; higher scores indicated greater mother or father support. Internal consistency for the combined scales reported by Cutrona (1989) was $\alpha = .69$. Further, the reliability of the combined scale in a sample of 944 Canadian college students was $\alpha = .81$ (Wintre & Bowers, 2007). The present study's authors found a sample reliability estimate of $\alpha = .86$ (mother support) and $\alpha = .83$ (father support).

Sources of Academic Self-efficacy Expectations Scale (SASE). Anderson and Betz's (2001) Sources of Social Self-Efficacy Expectations scale (SASE) was adapted for the present

study to assess Bandura's (1986) four sources that contribute to people's academic self-efficacy beliefs. This adapted 38-item measure included four subscales that correspond to the four sources of self-efficacy: mastery experiences (ten items), modeling (nine items), social persuasion (ten items), and anxiety (nine items). Examples of items include "People have told me I'm a good student" (original: "People have told me I'm easy to talk to") and "My favorite teachers are strong academically" (original: "My favorite teachers had good social skills"). Participants responded using a 6-point Likert scale ranging from 1 = *very strongly disagree* to 6 = *very strongly agree*. Mean scores were calculated for each subscale, resulting in a score range of 1 to 6, with higher scores indicating a greater reported level of experience.

Internal consistency coefficients for subscales in the version adapted for the present study were as follows: α = .82 (perceived mastery), α = .71 (modeling), α = .83 (social persuasion), and α = .79 (anxiety). The original four scales correlated *rs* = .46 to .70 with generalized self-efficacy as measured by the Self-Efficacy Scale (Anderson & Betz, 2001), which supported the validity of the scale.

Fouad-Smith scales for Subject Matter Specific Social-Cognitive Constructs (FSS). The Fouad-Smith Scales for Subject Matter Specific Social-Cognitive Constructs (FSS; Smith & Fouad, 1999) were developed to assess self-efficacy, interests, and goals across different academic domains. Only the mathematics and science subscales were used in the present study. The response format of each subscale was a 6-point Likert scale, with higher scores indicating a higher standing on the construct. Subscale scores were calculated by averaging the responses, which resulted in a response range of 1 to 6.

The self-efficacy subscale of the measure included four items for science, and five items for mathematics. Example items include "I feel confident that with the proper training I could classify animals that I observe" and "I feel confident that with the proper training I could earn an A in an advanced calculus course". Cronbach's alpha for the combined mathematics/science self-efficacy subscale reported by Smith and Fouad (1999) was α = .85. The internal consistency

coefficients in the current sample were $\alpha = .79$ for science self-efficacy, and $\alpha = .78$ for mathematics self-efficacy.

The interest subscale of the measure included 15 items for science, and four items for mathematics. Example items included “Indicate the extent to which you like or dislike working in a science laboratory” and “Indicate the extent to which you like or dislike watching a science program on TV”. Smith and Fouad (1999) reported an internal reliability coefficient for the combined mathematics/science interest subscale as $\alpha = .94$. The internal consistency coefficient in the current sample was $\alpha = .89$ for science interest, and $\alpha = .77$ for mathematics interest.

The goals subscale of the measure included four items for science and three items for mathematics. Example items included “I intend to enter a career that will use science,” and “I plan to take more science courses than are required of me”. Cronbach’s alpha for the goals subscale has been previously reported as $\alpha = .87$ (Smith & Fouad, 1999). Internal consistency estimates in the current sample was $\alpha = .82$ for science goals, and $\alpha = .69$ for mathematics goals.

Smith and Fouad (1999) used confirmatory factor analysis to examine the factor structure of the subscales. The results indicated that a model specifying the three SCCT constructs as independent factors provided the best model fit. Smith and Fouad (1999) reported correlations between the three constructs for the mathematics/science domain as $r = .41$ between goals and self-efficacy, and as $r = .66$ between goals and interests, which is consistent with Lent et al.’s (1994) theoretical model.

Career Commitment Measure (CCM). The Career Commitment Measure (CCM; Carson & Bedeian, 1994) assesses an individual’s motivation to work in a chosen vocation. The scale consists of three factors, each having four items, that represent three aspects of career commitment, namely career identity (e.g., “This line of work/career field has a great deal of personal meaning to me.”), career planning (e.g., “I have created a plan for my development in this line of work/career field.”), and career resilience (e.g., “The discomforts associated with my line of work/career field sometimes seem too great.”). Only the total

score across all 12 items was used in the present study. Response format is a 6-point Likert scale, where 1 = *strongly disagree* and 6 = *strongly agree*. The internal reliability coefficient has been reported as $\alpha = .81$ for the scale total (Carson & Bedeian, 1994). In the present sample, the internal reliability for the total score across all 12 items was comparable ($\alpha = .85$). Carson and Bedeian (1994) showed that the measure correlates highly with scales measuring similar constructs, which is evidence for convergent validity. Further, career commitment as measured by the CCM was related to various career-related outcome criteria such as tenure in one's career field.

Procedure

Students were invited by their course instructors at the beginning of a class period to participate in the study. After giving written consent, participants first completed the demographic questionnaire, followed by the remaining scales, namely the SPS, the SASE, the FSS, and the CCM, presented in a randomized order.

Results

The independent variable in each of the following analyses was the participant group. There were three levels of this variable: the premed group, the graduate degree group, and the Bachelor's degree group. The dependent variables can be conceptually divided into three categories: (a) distal variables of prior academic achievement and preparation as well as parental support; (b) proximal SCCT variables with regard to science and mathematics and career commitment; and (c) career choice actions related to the medical field. Preliminary analyses revealed no significant gender differences on any of the variables included in the study. Therefore, data from men and women were combined in the analyses.

First Hypothesis: Distal Variables

The dependent variables that represented participants' prior academic achievement and preparation consisted of high school GPA, (overall, science, and mathematics), ACT total score, and credits of high school mathematics and science courses. Descriptive and inferential statistics for the three groups are shown in Table 1. These variables were treated as the dependent

variables in separate One-Way Analyses of Variance (ANOVAs). Due to multiple analyses, we adjusted the p value to .01. The analysis showed that the three participant groups did not significantly differ in their prior academic achievement and preparation. The ACT total score yielded a *p* value of .02 as shown by Table 1. Mother and father support was tested with two One-Way ANOVAs; the groups were not significantly different from each other on this variable ($p > .05$), as shown in Table 1. In sum, the hypothesis that premed students would be comparable to their peers on distal variables was largely supported.

Second Hypothesis: Proximal Social Cognitive variables

The proximal dependent variables were a) the four SASE subscales, b) the six FSS subscales, and c) the CCM. In all analyses, the independent variable was group (three levels, namely the premed group, graduate degree group, and Bachelor's degree group). Each of the first two sets of variables was analyzed with a One-Way Multivariate Analysis of Variance (MANOVA). The significant MANOVAs were followed up with univariate ANOVAs. The CCM was analyzed separately with a One-Way ANOVA. For the ANOVAs, the significance level was set at a conservative value of $\alpha = .01$. All ANOVAs that were statistically significant at $\alpha = .01$ were followed up by Games-Howell pair-wise comparisons of the three participant groups. The Games-Howell post-hoc analysis method has the advantage that it does not assume equal variances or equal sample sizes across groups.

Regarding sources of academic self-efficacy, the groups significantly differed in the One-Way MANOVA across all four subscales of the SASE when analyzed collectively [*Wilk's Lambda* = .908, $F(8, 318) = 1.97$, $p < .05$]. As shown in Table 2, there were significant group differences on three of the four sources of self-efficacy as measured by the SASE. Students in the premed group, compared to the Bachelor's degree group, reported significantly higher scores on the perceived mastery, the modeling, and the social persuasion subscales than the Bachelor's degree group. Mean scores on the anxiety subscale did not differ across the three groups. The premed group was not significantly different from the graduate degree group across the four subscales of the SASE. The graduate degree group compared to the Bachelor's degree group was

not significantly different on the SASE subscales. In sum, the second hypothesis was mostly supported for the academic sources of self-efficacy for the premed group but not for the graduate degree group.

Regarding students' self-efficacy, interest, and goals related to the mathematics and science domain, the results of the One-Way MANOVA indicated that the three groups significantly differed as expected across the six FSS subscales when examined simultaneously [*Wilk's Lambda* = .762, $F(12, 316) = 3.82$, $p < .001$]. Follow-up univariate ANOVAs showed significant group differences in all six of the proximal variables measured by the FSS. Participants in the premed group had on average significantly higher scores than the Bachelor's degree group with regard to their self-efficacy, interests, and goals in the science and mathematics domains. The premed group also scored significantly higher than the graduate degree group on the science and mathematics goal measures. The graduate degree group in turn had higher scores than the Bachelor's degree group with regard to science-related interest and goals. Therefore, the second hypothesis was mostly supported for mathematics and science self-efficacy, interests, and goals.

Finally, the One-Way ANOVA for the CCM also yielded significant results [$F(2, 162) = 4.87$, $p < .009$]. The Games-Howell pair-wise comparisons (Table 2) revealed that the premed group had on average significantly higher scores than the Bachelor's degree group on the CCM; the premed group did not significantly differ from the graduate degree group.

In summary, the second hypothesis concerning the premed group was mostly supported. The premed group, compared to the Bachelor's degree group, reported significantly higher levels of: (a) perceived mastery, modeling, and social persuasion in the academic domain; (b) self-efficacy, interest, and goals in the science and mathematics domains; and (c) career commitment. As can be seen in Table 2, the graduate degree group's science and mathematics goals were significantly lower compared to the premed group. The second hypothesis concerning the graduate degree group being significantly different from the Bachelor's degree group was

somewhat supported. That is, the graduate degree group's science interest and goals were on average significantly higher than those of the Bachelor's degree group.

Third Hypothesis: Career Choice Actions Related to Health Care

The third hypothesis concerned the participants' responses to questions inquiring about their participation in seven experiential activities related to the health care field. The dependent variables were the proportion of individuals in each group who had planned on or engaged in the respective activity. The χ^2 test of independence was used to determine whether the proportion of individuals with the particular experience differed significantly across the three groups. In order to determine which of the three groups differed from each other, the χ^2 test was complemented by calculating and interpreting pairwise confidence intervals for the difference between two proportions. The difference between two proportions was statistically significant when the confidence interval did not include a value of 0.

The percentages of individuals in each group who have engaged in the respective activity along with the inferential statistics are given in Table 3. There were significant differences in the proportion of individuals in each group for all seven activities. The pairwise comparisons based on confidence intervals revealed that significantly more students in the premed group had engaged in experiential activities related to a health care field than the students in the other two groups. The graduate degree and Bachelor's degree groups did not differ with regard to their health care related experiences. In sum, the third hypothesis was supported.

Discussion

The purpose of the present study was to better understand what differentiates beginning premed students from their science peers. Using SCCT as the theoretical framework, we argued that distal variables, such as prior academic achievement, would not distinguish beginning premed students from their science counterparts. On the contrary, it was expected that proximal variables (e.g., science and mathematics self-efficacy and interest) would distinguish premed students from their peers who plan to discontinue their education after the Bachelor's degree.

Given similarly high educational aspirations, we expected the premed group to differ from the graduate degree group with respect to career choice actions related to the health care field.

The distal hypothesis was clearly supported. Consistent with SCCT, the three groups did not differ in terms of their high school academic achievement and preparation, nor did they differ in how much support they received from their mother or father. Our findings suggest that premed students have not had better grades in high school, are not better prepared, or are more supported by their parents than their science peers.

The proximal hypothesis was mostly supported for the premed group and partially supported for the graduate degree group. The premed group reported higher levels of self-efficacy, interest, and goals in the science and mathematics domains as well as stronger career commitment than the Bachelor's degree group. These findings are in line with SCCT and prior empirical findings (Larson et al., 2007; Rottinghaus et al., 2002).

Moreover, the premed group reported more *perceived* academic mastery and modeling opportunities than the Bachelor's degree group. This contrasts with the finding that the premed group's *actual* academic performance and preparation in high school was comparable to the Bachelor's degree group. This discrepancy is predicted in social cognitive theory, which specifies that perceived success is mediated through the self and is not always congruent with reality (e.g., Bandura, 1986). The evidence suggests that it is not the high school academic performance or preparation, but rather the interpretation of these variables through the lens of the student, that determines who will and who won't pursue the premed option. That is, students who perceive that they have had more mastery and modeling experiences express more self-efficacy in the science and mathematics domains. Social cognitive theory clearly distinguishes between actual mastery (e.g., high school performance) versus perceived mastery (self report of academic success). Given the same background, our results imply that premed students in comparison to those with lower educational aspirations may be incorporating those successes into their self-evaluation, which may lead them to enter their college experience with higher levels of self-efficacy, interest, and goals in the science and mathematics domains.

As expected, the graduate degree group's level of science interest and goals was higher than that of the Bachelor's degree group; the two groups did not differ on other social cognitive variables, however. This might be due to the relatively large heterogeneity within the graduate degree group, in which students with the aspiration of pursuing a master's degree were combined with those planning to complete a doctoral degree.

The final hypothesis was that the premed group compared to the other two groups would endorse more career choice actions specific to their career plans of becoming health care professionals. This hypothesis was fully supported. In fact, nearly all of the premed students engaged in these career choice actions related to the health care field, such as volunteering, participating in externships, and internships. Social cognitive theory in general and SCCT in particular highlight the specificity of the domain. That is, variables that are most proximal and specific to the career domain should be most salient. In this study, all the SCCT variables were in the general science and mathematics domain, which should theoretically equally apply to both the premed group and the graduate degree group. However, the career choice actions were specific to the health care domain; therefore, they are more relevant to the premed group in comparison to the other two groups.

Are premed students fundamentally different from other students? The results from this study indicate that the answer to this question is both yes and no: Our results show that students, who aspire to pursue advanced studies in the health care field, indeed can be differentiated from their peers with lower educational aspirations (a Bachelor's degree) on key social cognitive variables in the domains of mathematics and science. However, the comparably higher levels of science and mathematics interest, self-efficacy, and goals are not unique to premed students, but rather a reflection of the intention to pursue an advanced degree. The present results show that it is the level of educational aspiration, irrespective of whether a student wants to be a health care professional or a Ph.D.-level research scientist that sets these students apart from the group of students who do not plan to pursue advanced training beyond a Bachelor's degree. Although the specific career domain differs between the two higher aspiration groups, the academic context is

similar for these students. Both groups of students have to navigate a competitive environment with various challenges (e.g., maintaining high grades, taking demanding courses, and seeking out relevant extracurricular activities) in order to increase their chances of admission into the graduate program or medical school of their choice. Students who pursue such a career path know that they will have to work hard, and they have to be strongly committed to the endeavor in order to succeed; this attitude is reflected in the results of the present study. In sum, our findings are consistent with the prior literature on premed students that suggests that many of the behaviors and characteristics commonly thought of as specific to premed students can be traced to the academic context rather than to the presence of a particular set of innate character traits (e.g., Brieger, 1999; Conrad, 1986; McCranie & Lewis, 1987).

This study has some practical implications for the career counselor. Career counselors need to encourage students who may be avoiding a premed career aspiration to reconsider their apprehension by reassuring them that the defining attributes involved in pursuing a premed curriculum include strong percepts of efficacy, interests, and goals in the science and mathematics domain, and not superior grades in high school science and mathematics courses. College students and perhaps some career counselors may want to revise their previous views of premed students as very bright and overly prepared to more realistic views of premed students as confident, interested, and committed to their career aspirations of being health care professionals.

Some limitations of this study should be noted. First, the data collected are cross-sectional; longitudinal studies are needed to ascertain whether students aspiring to pursue health care related advanced degrees (e.g., medicine, dentistry, or veterinary science) will stay the course, apply to these professional schools, and be admitted. However, our intention was to contribute to the literature by focusing on first and second year premed students rather than students already admitted to medical schools given the preponderance of literature concerning medical students. The second limitation concerns the insufficient numbers of racial and ethnic minority students in this sample to adequately determine if cultural background would alter the findings; this limitation should be addressed in future work.

In spite of these limitations, the findings from this study advance our understanding of students aspiring to be doctors, dentists, and veterinarians in comparison to their science counterparts. First, these groups of students were similar in terms of distal variables such as prior academic achievement and preparation, as well as parental support. Second, the premed group differed significantly from the Bachelor's degree group on proximal SCCT variables in the science and mathematics domains. Third, the premed group differed from the graduate degree group only in terms of their science and mathematics goals and the career choice actions specific to the health care profession. The central message of these findings is that premed students are embedded in a context whereby self-efficacy, interests, goals, and career commitment take center stage over more distal variables. Given the demands of the premed curriculum, these attributes should serve these students well.

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Table 1

Mean and Standard Deviation of Distal Indicators of Prior Academic Preparation and Achievement, and Mother and Father Support for the Three Participant Groups.

	Premed (n = 79)		Graduate degree (n = 46)		Bachelor's degree (n = 40)		F(2,162)	p
	M	*SD*	*M*	*SD*	*M*	*SD*		
HS science GPA	3.52	0.47	3.46	0.51	3.44	0.43	0.5	.60
HS math GPA	3.41	0.58	3.28	0.72	3.25	0.53	1.3	.28
HS GPA (overall)	3.69	0.37	3.68	0.38	3.58	0.34	1.2	.31
HS science credits	9.08	1.48	8.64	1.40	8.64	2.32	0.3	.74
HS math credits	8.93	1.49	8.60	1.67	8.27	1.43	0.2	.81
ACT total	25.2*	3.56	24.6	4.43	22.9*	3.26	4.2	.02
SPS mother	4.97	1.18	4.67	1.21	4.46	1.27	2.5	.08
SPS father	4.89	1.31	5.00	0.96	4.49	1.44	1.9	.14

Note. HS = High School; GPA = Grade Point Average; ACT = American College Testing; SPS = Social Provisions Scale. Score range is 0-4 for GPA, and 0-36 for ACT total; higher scores indicate greater academic achievement and higher levels of mother and father support. The credits are determined by the university's admission criteria and closely correspond to one high school semester.

* mean scores are significantly different at $p < .05$.

Table 2

Descriptive and Inferential Statistics for the Proximal Variables across the Three Participant Groups.

	Premed (n = 79)		Graduate degree (n = 46)		Bachelor's degree (n = 40)		F(2,162)	p	η^2
	M	*SD*	*M*	*SD*	*M*	*SD*			
SASE									
Mastery	4.50_{a}	0.86	4.25	0.80	3.96_{a}	0.67	5.95	**.003**	.07
Modeling	4.70_{a}	0.73	4.48	0.72	4.26_{a}	0.81	4.59	**.012**	.05
Social persuasion	4.95_{a}	0.80	4.76	0.71	4.46_{a}	0.85	5.02	**.008**	.06
Anxiety	3.69	0.94	3.68	1.02	4.02	0.71	1.99	.141	.02
FSS									
Science SE	4.69_{a}	1.05	4.39	1.10	3.91_{a}	0.95	7.42	**.001**	.08
Mathematics SE	4.85_{a}	0.98	4.51	0.99	4.27_{a}	0.90	5.12	**.007**	.06
Science interest	4.32_{a}	0.67	4.05_{c}	0.87	3.52_{ac}	0.89	13.8	**<.001**	.15
Mathematics interest	3.75_{a}	1.03	3.51	1.19	3.09_{a}	1.06	4.91	**.009**	.06
Science goals	5.27_{ab}	0.75	4.75_{bc}	1.10	4.14_{ac}	1.17	18.3	**<.001**	.19
Mathematics goals	4.06_{ab}	1.09	3.51_{b}	1.06	3.22_{a}	1.32	8.07	**<.001**	.09
CCM	4.36_{a}	0.78	4.19	0.94	3.87_{a}	0.70	4.87	**.009**	.06

Note. SASE = Sources of Academic Self-efficacy; FSS = Fouad-Smith Scales; SE = self-efficacy; CCM = Career Commitment Measure. The scales are scored on a 6-point scale; higher scores indicate higher standing on the respective construct. *p*-values in **bold font** denote group differences that are significant at a significance level of α = .01. Group means that share the same letter subscript are significantly different from each other.

Table 3

Percentage of Individuals in Each of the Three Participant Groups who Plan to or already have Engaged in Career Choice Actions Related to the Health Care Field.

	Premed (n = 79)	Graduate degree (n = 46)	Bachelor's degree (n = 40)	$\chi^2(2)$	p
Career choice actions	%	%	%		
Job shadowing	88.5_{ab}	54.3_{a}	52.5_{b}	23.9	<.001
Externship	70.5_{b}	50.0	37.5_{b}	12.9	.002
Info. Interview	91.0_{ab}	60.9_{a}	52.5_{b}	24.9	<.001
Volunteering	92.4_{ab}	58.7_{a}	57.5_{b}	25.5	<.001
Joined organization	83.5_{ab}	45.7_{a}	32.5_{b}	35.0	<.001
Attended prof. meeting	83.5_{ab}	45.7_{a}	35.0_{b}	32.9	<.001
Taken certif. classes	90.9_{ab}	69.6_{a}	61.5_{b}	15.4	<.001

Note. Percentages of groups sharing the same letter subscript are significantly different at a Bonferroni-adjusted level of significance of $\alpha = .017$. Job shadowing = Shadowed a health care professional on the job; Externship = Completed an externship in a health care setting; Info Interview =. Interviewed a health care professional about their job experiences; Volunteering = volunteered in a health care facility; Joined organization = Joined a professional organization in a health care field; Attended meeting = Attended a professional meeting of a health care organization; Taken certif. classes = Obtained certification in a health care area.