Second-year medical students' motivational beliefs, emotions, and achievement

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CONTEXT A challenge for medical educators is to better understand the personal factors that lead to individual success in medical school and beyond. Recently, educational researchers in fields outside medicine have acknowledged the importance of motivation and emotion in students' learning and performance. These affective factors have received less emphasis in the medical education literature.

OBJECTIVES This longitudinal study examined the relations between medical students' motivational beliefs (task value and self-efficacy), achievement emotions (enjoyment, anxiety and boredom) and academic achievement.

METHODS Second-year medical students (n = 136) completed motivational beliefs and achievement emotions surveys following their first and second trimesters, respectively. Academic achievement was operationalised as students' average course examination grades and national board shelf examination scores.

RESULTS The results largely confirmed the hypothesised relations between beliefs, emotions and achievement. Structural equation modelling revealed that task value beliefs were positively associated with course-related enjoyment (standardised regression coefficient [β] = 0.59) and were negatively related to boredom ($\beta = -0.25$), whereas self-efficacy beliefs were negatively associated with course-related anxiety only ($\beta = -0.47$). Furthermore, student enjoyment was positively associated with national board shelf examination score (β = 0.31), whereas anxiety and boredom were both negatively related to course examination grade ($\beta = -0.36$ and -0.27, respectively). The overall structural model accounted for considerable variance in each of the achievement outcomes: R^2 = 0.20 and 0.14 for the course examination grade and national board shelf examination score, respectively.

CONCLUSIONS This study suggests that medical students' motivational beliefs and achievement emotions are important contributors to their academic achievement. These results have implications for medical educators striving to understand the personal factors that influence learning and performance in medical training.

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INTRODUCTION

A challenge for medical educators is to better understand the personal factors that lead to individual success in medical school and beyond. Because doctors practise medicine in largely unsupervised settings, individual success, as measured by growing expertise, is critical.[1] Unfortunately, the factors that lead to individual success are not well understood. Moreover, the medical education literature tends to focus primarily on cognitive factors (e.g. prior academic achievement and standardised test scores), which typically explain only small to moderate amounts of variance in academic outcomes.[2,3]

Recently, the importance of affective factors (e.g. motivation and emotion) has received greater emphasis among educators in fields outside medicine.[4,5] In particular, these educational researchers have begun to explore how affect might ultimately influence achievement outcomes, above and beyond the effects of cognitive factors alone.[6,7] In essence, these educators have argued *against* the over-simplified computer metaphor of learning, whereby the human mind is simply a processor of information, cognition primarily involves the manipulation of that information, and learning is merely the acquisition and storage of information. Instead, contemporary educational psychologists have proposed that human thinking is much more 'fuzzy' and flexible, and is subject to motivations and emotions that may serve multiple purposes at any given time.[8] Given this complexity, current models of learning and performance often include consideration for affective factors. The purpose of this study was to extend this recent emphasis on affect in learning into the realm of undergraduate medical education.

Theoretical framework

The model presented in Fig. 1 was adapted from Pekrun[6] and forms the theoretical foundation of the present study. This model takes a social cognitive approach to academic motivation and emotion. Social cognitive theory assumes that human functioning results from the triadic, dynamic and reciprocal interaction of *personal factors* (e.g. beliefs, expectations, attitudes and prior knowledge), *behaviours* (e.g. individual actions, choices and verbal statements), and the social and physical *environment* (e.g. resources, consequences of actions, other people and physical settings).[9] Thus, the model in Fig. 1 proposes that contextual features of the learning environment (e.g. task characteristics, instructional resources and other broader socio-cultural factors) affect students' motivational beliefs about their capabilities and the value of learning activities. In turn, these beliefs influence discrete achievement

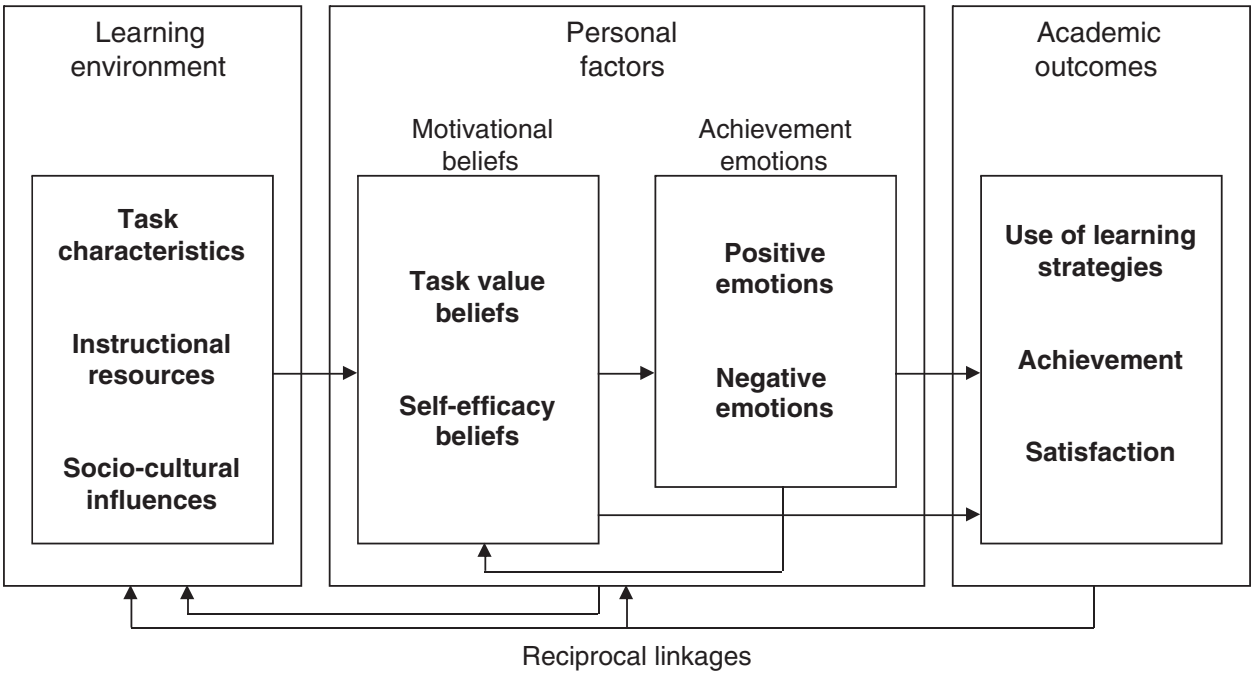

Figure 1 A social cognitive model of academic motivation and emotion, adapted from Pekrun[6]

emotions, such as enjoyment and anxiety,[6] which then link to various academic outcomes, such as student achievement and satisfaction.

In this study, *motivational beliefs* and *achievement emotions* were used to predict medical students' academic achievement in an introductory clinical reasoning course. In terms of motivational beliefs, two constructs were considered. The first is *task value*, which can be defined as students' judgements of how interesting, important and useful a course is to them.[10] Research in non-medical contexts has typically demonstrated that task value beliefs positively predict many important outcomes, such as choice of future learning activities[10] and academic achievement.[11]

The second motivational belief examined was academic *self-efficacy*, which can be defined as students' judgements of their capabilities to successfully perform specific academic tasks.[9] Generally, research has shown that self-efficacy beliefs positively influence many academic outcomes, including, for example, choice of activities,[12] level of effort[13] and academic achievement.[14]

Achievement emotions represent the second set of personal factors in the conceptual model. Although sparse, scholarly work in this area has grown considerably in the last 5 years.[5,8] For instance, Pekrun[6] has proposed a control-value theory of achievement emotions. Control-value theory defines achievement emotions as discrete emotions that are associated with achievement-related activities such as, for example, the enjoyment that often comes from learning something new, the anxiety associated with taking a high-stakes examination or the boredom that may occur during a long, uninteresting lecture. According to Pekrun,[6] achievement emotions are determined, in part, by individuals' motivational beliefs, such as self-efficacy and task value beliefs. Limited educational research in secondary schools and post-secondary universities has indicated that achievement emotions predict students' use of learning strategies, choice of future courses and academic achievement.[15,16]

Finally, consistent with social cognitive theory, the relationships depicted in the conceptual model are assumed to be reciprocal. That is, contextual factors, personal beliefs and emotions, and academic outcomes ultimately interact as determinants of one another.[6] For example, academic self-efficacy not only impacts on achievement emotions, but negative feelings, such as test anxiety, can also influence later self-efficacy beliefs.[9]

Purpose and hypotheses

A review of the medical education literature revealed no empirical studies that have directly examined how students' motivational beliefs and achievement emotions relate to their academic achievement in undergraduate medical education. Furthermore, limited findings from fields outside medicine suggest that there may be complex inter-relations between motivation, emotion and cognition that require further investigation.[17] The present study addressed this complex interplay in an effort to better understand the factors associated with student achievement in a medical school course. In particular, this longitudinal investigation tested the following hypotheses:

1 students' motivational beliefs (task value and self-efficacy) will be positively associated with their course-related enjoyment and negatively associated with their course-related anxiety and boredom, and
2 students' course-related enjoyment will be positively associated with their performance on two measures of academic achievement (course examination grade and national board shelf examination score), whereas students' course-related anxiety and boredom will be negatively associated with these same outcomes.

METHODS

Participants

The participants were second-year medical students enrolled in the F Edward Hébert School of Medicine, Uniformed Services University of the Health Sciences (USU). The USU is the only US federal medical school and matriculates approximately 170 medical students each year. At USU, all second-year medical students are enrolled in an introductory clinical reasoning course. For the purposes of the present investigation, all the students enrolled in this course (n = 174) were invited to participate in the study. There were no exclusion criteria.

Instructional context

The instructional context was a second-year course called Introduction to Clinical Reasoning (ICR). This course was chosen for the present study because it represents students' first exposure to clinical decision making and, as such, was thought to induce a

plethora of motivations and emotions that might influence academic achievement.

As an introductory course, ICR is not meant to serve as a comprehensive review of diagnoses that will be seen in the clinical clerkships. Instead, the course illustrates a variety of clinical reasoning techniques by examining a series of common symptoms, physical examination findings, laboratory test abnormalities and syndromes. Students are given cases depicting common and/or serious presenting symptoms or complaints for each topic; they are then asked to synthesise presenting symptoms and findings into a problem list, to make a differential diagnosis and, on occasion, to generate 'next steps' in the diagnosis or treatment.

Generally speaking, each ICR session begins with an overview lecture on the topic, which is followed by mandatory small-group sessions on the topic. In the overview lecture (30–50 minutes), the general goals are: to teach relevant terminology; to review and reinforce pertinent pathophysiology, and to illustrate a practical approach to the topic. In the small-group sessions, the general goals are two-fold: to illustrate major diagnostic entities encompassed within the topic, and to teach typical 'patterns' of presentation for these diagnostic entities and key decision points to help students arrive at the diagnosis. This second general goal of the small-group session includes teaching students to identify key findings, recognise problems and construct problem lists, build clinical vocabulary, identify syndromes, compare and contrast similar diagnoses seen with a given topic, and formulate a differential diagnosis that the student can defend using the presenting data.

Procedures

The year-long ICR course spanned three trimesters. At the end of the first trimester, students were invited, via e-mail correspondence, to complete an online survey that assessed their motivational beliefs (task value and self-efficacy) in relation to their course experiences (see the description of the End-of-Trimester-1 Survey below). Similarly, at the end of the second trimester, students were invited to complete another online survey that assessed their achievement emotions (enjoyment, anxiety and boredom) in relation to their course experiences (see the description of the End-of-Trimester-2 Survey below). For both end-of-trimester surveys, students were given 1 week to complete the survey; all students received one follow-up e-mail reminder (in addition to the initial e-mail request). Participation in the surveys was voluntary. Ethical approval was obtained from the USU Institutional Review Board.

Measurements

Surveys

The two online surveys were composed of 26 items adapted from previously published survey instruments; both surveys employed a 5-point, Likert-type agreement response scale (1 = strongly disagree; 5 = strongly agree).

End-of-trimester 1 survey

Students' motivational beliefs were measured using two subscales adapted from Artino and McCoach:[18]

1. a 6-item task value subscale assessed students' judgements of how interesting, important and useful the clinical reasoning course was to them, and
2. a 5-item self-efficacy subscale assessed students' confidence in their ability to learn the material presented in the course.

Several minor wording changes were made to the motivational beliefs subscales; these changes addressed the differences between the original survey context and the medical education context studied in the present investigation. For example, the original self-efficacy item from Artino and McCoach[18] ('I'm confident I can do an outstanding job on the activities in a self-paced online course') was changed to: 'I'm confident I can do an outstanding job on the activities in this course.'

End-of-trimester 2 survey

Students' achievement emotions were measured using a shortened version of the class-related emotions section of the Achievement Emotions Questionnaire (AEQ):[19]

1. a 4-item enjoyment subscale assessed students' course-related enjoyment;
2. a 6-item anxiety subscale assessed students' course-related anxiety, and
3. a 5-item boredom subscale assessed students' course-related boredom.

Once again, changes were made to the original subscales to reflect the specific medical education

context studied here. For example, the original enjoyment item from the AEQ ('I enjoy being in class') was changed to: 'I enjoy the small-group discussion sessions.' Similarly, the original anxiety item ('I worry whether I'm sufficiently prepared for the lesson') was changed to: 'I worry whether I'm sufficiently prepared for the small-group discussions.' Furthermore, several subscale items from the original AEQ were not applicable to medical students and, as such, were not used (e.g. the anxiety item 'I feel scared'). Finally, it is worth noting that similar versions of the shortened AEQ have been employed in previously published research.[20,21]

Achievement outcomes

Course examination grade

The ICR students took three in-house examinations, one at the end of each trimester. The first two examinations were multiple-choice tests that used clinical vignettes. The third examination was a cumulative, short-essay test that also included vignettes, but this time students were asked to pose additional history and physical examination questions, construct a differential diagnosis and propose next steps in patient management. For this study, students' course examination grade was calculated as the mean of the three in-house examination scores; this average course examination grade served as the first of two achievement outcomes.

National board shelf examination score

The National Board of Medical Examiners (NBME) offers a variety of multiple-choice shelf examinations for medical students. In this study, students completed the Introduction to Clinical Diagnosis shelf examination at the end of the course. This NBME shelf examination is designed to have a national mean score of 500 with a standard deviation (SD) of 100; it served as the second achievement outcome.

Analysis

Prior to analysis, the data were screened for accuracy and missing values, and each survey item was checked for normality. Following data screening, three sets of analyses were conducted. First, confirmatory factor analysis (CFA) techniques were used to validate the hypothesised survey structure and identify survey modifications that would result in a refined, more parsimonious measurement model. Factors identified in the CFA were then subjected to reliability analysis, and descriptive statistics and Pearson correlations were calculated. Finally, a causal model was estimated using structural equation modelling (SEM). Built upon the multivariate techniques of factor and path analysis, SEM is a flexible and powerful statistical tool that allows researchers to test *a priori* hypotheses regarding the inter-relationships between both observed and latent variables (for a detailed explanation of SEM and its applicability in medical education research, see Violato and Hecker[22]). In the present study, the aim of the SEM was to test the hypothesised linear relations between the latent beliefs and emotions variables and students' academic achievement. All CFA and SEM analyses were conducted using AMOS 7.0[23] and the remainder of the analyses were conducted using SPSS 16.0 (SPSS, Inc., Chicago, IL, USA).

RESULTS

In most longitudinal studies, missing data and attrition are frequent problems; this study was no exception. Among the 174 students enrolled in the ICR course, 136 agreed to complete both surveys (giving a 78% response rate). The sample included 86 men (63%) and 50 women; their mean age was 24.9 years (SD = 1.5).

Confirmatory factor analysis

A CFA was conducted to examine the convergent and discriminant validity of the two surveys. Maximum likelihood estimation was used to estimate the parameters and a chi-square test was conducted to assess model fit. Generally, a non-significant chi-square result indicates a good model fit.[24] However, because the chi-square test is affected by the sample size and the size of the correlations in the model, researchers do not normally rely on the chi-square test as the sole measure of model fit. Therefore, several additional fit indices were considered together with the chi-square test. These indices included the chi-square : degrees of freedom ratio (also referred to as the normed chi-square statistic), the comparative fit index (CFI), and the root-mean-square error of approximation (RMSEA).

The 26 survey items used in this study were hypothesised to load onto five distinct latent variables: task value, self-efficacy, enjoyment, anxiety and boredom. Based on the model fit guidelines outlined by Hu and Bentler,[25] the resulting goodness-of-fit indices

indicated that the model fit the data only marginally well. In particular, the chi-square result was statistically significant (χ^2 [289, n = 136] = 565.89, $p < 0.001$), and although the normed chi-square statistic (1.96) was < 3.0, the CFI (0.80) was < 0.90 and the RMSEA (0.08) was > 0.06 (the latter two statistics indicated a marginal model fit).

Next, in an attempt to improve model fit, standardised residuals and modification indices were examined and five items were identified as having large standardised residuals and/or large modification indices. Because one of the objectives of the CFA was to further refine the measurement model, these five items were trimmed from the final solution (see recommendations in Brown).[26] The trimmed items included one item from the self-efficacy scale ('I'm confident I can learn in the context of the small-group sessions'), two items from the anxiety scale ('I feel uneasy during the small-group discussion sessions' and 'I feel nervous during the small-group discussion sessions') and two items from the boredom scale ('I feel this course is fairly dull' and 'I'm generally uninterested in the course material').

Following the trimming procedure, a second CFA was conducted; all fit indices improved as a result of these modifications. The chi-square result remained statistically significant (χ^2 [179, n = 136] = 259.92,

Table 1 Survey items retained in the final confirmatory factor analysis solution; all items were measured on a 5-point agreement response scale (1 = strongly disagree; 5 = strongly agree)

Survey subscales and items	Mean	SD
Task value		
It is personally important for me to perform well in this course	4.50	0.62
This course provides a great deal of practical information	4.52	0.63
I'm very interested in the content of this course	4.46	0.57
Completing this course is moving me closer to attaining my career goals	4.39	0.68
It is important for me to learn the material in this course	4.47	0.54
The knowledge I gain by taking this course can be applied in many different situations	4.35	0.70
Self-efficacy		
Even in the face of difficulties, I'm certain I can learn the material presented in this course	3.92	0.85
I'm confident I can do an outstanding job on the activities in this course	3.76	0.89
I'm certain I can understand the most difficult material presented in this course	3.70	0.86
Even with distractions, I'm confident I can master the clinical reasoning skills required in this course	3.71	0.77
Enjoyment		
I enjoy the small-group discussion sessions	3.76	0.88
I'm excited about the course material	3.61	0.74
I'm happy I understand the material	4.03	0.54
My enjoyment of the course makes me want to learn the material	3.65	0.73
Anxiety		
I worry whether I will be able to understand the material	2.61	1.05
I worry whether I'm sufficiently prepared for the small-group discussions	2.93	1.02
I worry whether the course demands might be too great	2.82	0.99
I worry whether I'm sufficiently prepared for the course examinations	3.67	1.01
Boredom		
I'm bored in the small-group sessions	2.64	0.96
My mind tends to wander in the small-group sessions	2.78	0.98
I often think about what else I would rather be doing in the small-group sessions	2.66	0.99

SD = standard deviation

$p < 0.001$); however, the normed chi-square result (1.45) went down to < 3.0, the CFI (0.92) went up to > 0.90 and the RMSEA (0.05) went down to < 0.06, all indicating that the revised model was an adequate fit to the data. The survey items retained in the final solution are provided in Table 1, along with their means and SDs.

Descriptive statistics and Pearson correlations

Based on the CFA results, final variable scores were created by computing a mean score for the items associated with a particular subscale. These variable statistics are presented in Table 2. Internal consistency reliability estimates (Cronbach's alpha) for the five subscale scores were also calculated; all reliability estimates were within the desired range, with actual values of 0.76–0.85.[27]

Table 2 also presents descriptive statistics and results from the correlation analysis. Pearson correlations indicated that task value and self-efficacy were positively related to one another ($r = 0.39$) and to students' enjoyment ($r = 0.51$ and 0.27, respectively). Task value was also positively correlated with course examination grade ($r = 0.26$). By contrast, task value was negatively related to boredom ($r = -0.28$), and self-efficacy was negatively related to both anxiety ($r = -0.36$) and boredom ($r = -0.23$). Finally, enjoyment was positively related to NBME shelf examination score ($r = 0.20$), anxiety was negatively related to both achievement outcomes, and boredom was negatively related to course examination grade ($r = -0.26$). Course examination grade and NBME shelf examination score were positively correlated ($r = 0.64$).

Evaluating the structural equation model

The structural model reflecting the hypothesised linear relationships among the five latent constructs and the two achievement outcomes was tested using SEM techniques. Overall, the structural model yielded a reasonable fit:[25] the chi-square result was statistically significant (χ^2 [211, $n = 136$] = 293.36, $p < 0.001$) and the normed chi-square statistic (1.39) was < 3.0, the CFI (0.93) was > 0.90 and the RMSEA (0.05) was < 0.06.

The results of the structural model are summarised in Fig. 2. As indicated, task value beliefs were positively related to enjoyment (standardised regression coefficient [β] = 0.59) and negatively associated with boredom ($\beta = -0.25$); task value did not have a statistically significant direct association with either of the achievement outcomes. By contrast, self-efficacy beliefs were negatively related to anxiety only ($\beta = -0.47$); self-efficacy beliefs also had no direct association with the achievement outcomes. In terms of achievement emotions, results partially confirmed expectations. Both anxiety and boredom were negatively related to course examination grade ($\beta = -0.36$ and -0.27, respectively), whereas enjoyment was positively related to NBME shelf examination score ($\beta = 0.31$).

The explanatory power of the structural model is also shown in Fig. 2. As indicated, task value and

Table 2 Descriptive statistics, Cronbach's alphas and Pearson correlations for the study variables (n = 136)

Variable	Mean	SD	Items, *n*	α	1	2	3	4	5	6	7
1 Task value	4.45	0.48	6	0.85	–	0.39*	0.51*	– 0.08	– 0.28†	0.26†	0.01
2 Self-efficacy	3.77	0.70	4	0.85		–	0.27†	– 0.36*	– 0.23‡	0.17	0.08
3 Enjoyment	3.76	0.56	4	0.76			–	– 0.24†	– 0.30*	0.16	0.20‡
4 Anxiety	3.01	0.80	4	0.79				–	0.03	– 0.25†	– 0.19‡
5 Boredom	2.69	0.84	3	0.81					–	– 0.26†	– 0.16
6 Course exam grade	82.62	5.86	–	–						–	0.64*
7 NBME shelf exam score	547.35	86.92	–	–							–

All subscale variables were measured on a 5-point agreement response scale
* $p < 0.001$; † $p < 0.01$; ‡ $p < 0.05$
SD = standard deviation; NBME = National Board of Medical Examiners; Course exam grade = mean of the three course examination grades; NBME shelf exam score = score on the NBME Introduction to Clinical Diagnosis shelf examination

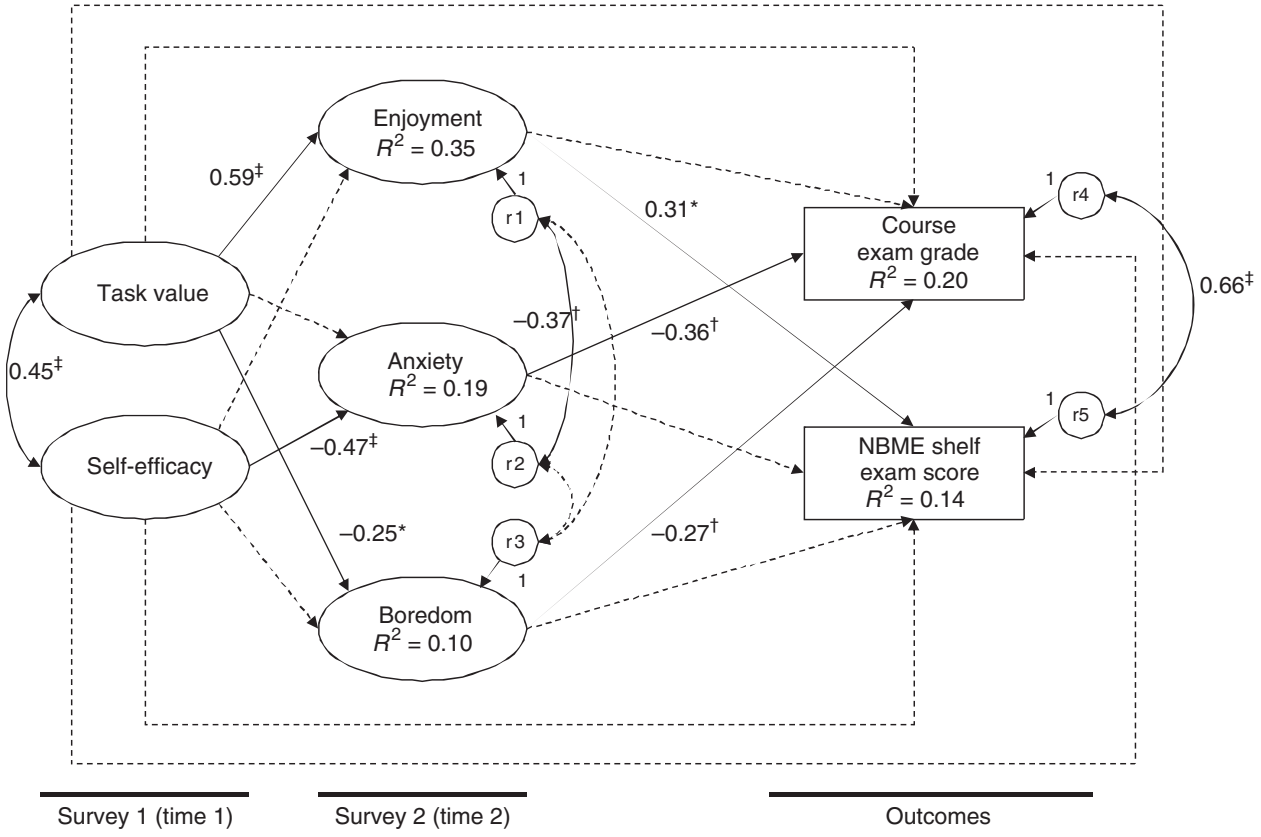

Figure 2 Parameter estimates (standardised regression coefficients) for the structural equation model of the linear relationships between students' motivational beliefs, achievement emotions and academic achievement in an introductory clinical reasoning course. Only latent variables, residual errors and achievement variables are presented. Dotted lines are non-significant paths. NBME = National Board of Medical Examiners. * $p < 0.05$; † $p < 0.01$; ‡ $p < 0.001$

self-efficacy accounted for 35% of the variance in enjoyment, 19% of the variance in anxiety and 10% of the variance in boredom (moderate to small effects). Additionally, students' motivational beliefs and achievement emotions accounted for 20% of the variance in course examination grades and 14% of the variance in NBME shelf examination scores (both moderate and educationally significant effects).

DISCUSSION

Recently, educational researchers in fields outside medicine have acknowledged the critical role personal affective factors, like motivation and emotion, play in learning and performance.[4–8,11] Given the practical significance of these affective constructs, the present study sought to extend the recent emphasis on motivation and emotion into the context of undergraduate medical education. In particular, this study addressed the relations between medical students' motivational beliefs, achievement emotions and, ultimately, their academic achievement in a second-year clinical reasoning course.

Findings from this study provide some support for the hypothesised relationships. Specifically, task value beliefs were positive predictors of students' course-related enjoyment and negative predictors of their reported boredom. Thus, the direction and magnitude of these effects, which are consistent with previous empirical work using control-value theory,[6,15,16] suggest that students who believed the course was interesting, important and useful were also more likely to enjoy it and less likely to become bored. Similarly, students' academic self-efficacy was a negative predictor of anxiety, indicating that those who were confident they could learn the course material were also less likely to experience course-related anxiety. The direction and size of this effect is also consistent with control-value theory[6,15,16] and Bandura's[9] original conceptualisation of self-efficacy and its influence on affective components of learning. Further, these results suggest that medical educators may observe improvements in students'

achievement emotions by first addressing students' task value beliefs and self-efficacy perceptions (for specific instructional recommendations, see Schunk *et al.*[11]).

In terms of achievement emotions, course-related enjoyment was positively related to students' NBME shelf examination scores, whereas both anxiety and boredom were negatively related to students' course examination grades. These results suggest that enjoyment, a positive emotion, may have important direct effects on *subsequent* achievement outcomes in medical school. By contrast, anxiety and boredom, both negative emotions, may have direct effects on *more immediate*, course-related achievement outcomes. These findings are compelling if one considers the longitudinal nature of this study, as well as the two different measures of objective achievement examined. Overall, these results suggest that medical educators should consider and explicitly address students' achievement-related emotions as these factors may explain substantial variance in students' future medical school performance.

Finally, the overall effects for the model were $R^2 = 0.20$ and 0.14 for the course examination grade and national board shelf examination score, respectively. These medium effect sizes are consistent with the limited empirical evidence linking achievement emotions to scholastic achievement.[6,15,16] For example, in their research with undergraduate college students, Pekrun *et al.*[16] found similar effects when using students' negative emotions (hopelessness, boredom, anxiety, anger and shame), measured early in the semester, to longitudinally predict their end-of-semester grades. Ultimately, the findings reported here provide corroborative evidence, but in a completely novel context (undergraduate medical education), that students' achievement-related emotions have important and moderately strong links to their academic achievement.[5,6,8,11,15–17]

Limitations

Two important limitations should be considered when interpreting these results. Firstly, because the data are correlational, one cannot infer causality from the observed relationships. Although the findings suggest fairly robust associations between the measured variables, definitive causal pathways cannot be ascertained. Accordingly, medical educators would do well to conduct more controlled, experimental studies to further untangle the inter-relations between motivation, emotion and achievement in medical school. A second important limitation concerns the relatively small, homogeneous sample utilised in the current study; the nature of the sample limits the extent to which these findings generalise to other medical students and other medical education contexts.

Implications for medical education

There is an implicit assumption that medical students are predominantly high-functioning and successful, and possess inherently strong motivational beliefs and advanced coping mechanisms with which they can assuage negative achievement emotions. Although the results presented here do confirm the presence of strong motivational beliefs, the findings suggest that medical students are not immune to the effects of negative achievement emotions. These findings also suggest that medical educators may in fact have some degree of control over educational outcomes through the choices they make about how a course is taught, which may have implications for students' motivation and emotion. In other words, a graded course and a pass/fail course presenting the same material may result in significantly different 'affective outcomes' that might then influence current (and future) learning. In addition, these findings suggest that educators should consider course structure, content, teaching method and grading scheme – and how these factors might impact both motivational beliefs and achievement emotions over time – as these personal factors could potentially affect other important performance outcomes. Finally, given the relationships unearthed in this investigation, it may be worthwhile to study the impact of educational interventions on various affective constructs. Ultimately, this type of broad, social cognitive approach to medical education research could benefit educators who are striving to better understand the factors that influence individual success in medical school and beyond.

Contributors: ARA co-conceived the research design, conducted (in part) the analyses, wrote the first draft of the manuscript (excluding the Discussion) and compiled the final draft. JSLR assisted with the research analyses and wrote the Discussion section of the manuscript. SJD co-conceived the research design and provided access to the study sample. All authors revised the manuscript critically for important intellectual content and edited the final draft for submission.
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