Original Research Article

Medical Student Well-Being and Lifelong Learning: A Motivational Perspective

Oksana Babenko[1], Lia M. Daniels[2], Shelley Ross[1], Jonathan White[3], Anna Oswald[4]

Departments of [1]Family Medicine, [2]Educational Psychology, [3]Surgery and [4]Medicine, University of Alberta, Edmonton, Alberta, Canada

Address for correspondence:

Dr. Oksana Babenko, Department of Family Medicine, 6-10 University Terrace, University of Alberta, Edmonton, Alberta, T6G 2T4, Canada.

E-mail: oksana.babenko@ualberta.ca

ABSTRACT

Background: Medical school poses many pressures and challenges for individuals aspiring to health careers. Only some students, however, experience high stress and exhaustion, whereas others adaptively respond to schooling demands and engage in lifelong learning practices. By drawing on three motivation theories – self-determination theory, self-theories of ability, and achievement goal theory – this study examined the relations among motivational constructs, stress, exhaustion, and lifelong learning in medical students. **Methods:** All medical students in a 4-year program were invited to complete a questionnaire containing measures of psychological need satisfaction, self-theories of ability, achievement goals, stress, exhaustion, lifelong learning, and background characteristics. Using structural equation modeling, we tested a structural model that combined the three motivation theories to explain stress, exhaustion, and lifelong learning in medical students. **Results:** A total of 267 medical students participated in the study (response rate 42%). The results largely confirmed the hypothesized relations, revealing that unmet

psychological needs and a fixed mind-set were associated with maladaptive cognitions (i.e., the pursuit of avoidance goals) and psychological distress (i.e., high stress and exhaustion). In contrast, psychological need satisfaction and a growth mind-set had distinct pathways to beneficial cognitions (i.e., mastery approach goals) and lifelong learning practices in medical students. **Discussion:** Adaptive motivations, cultivated through personal and environmental factors, may help to protect medical students from psychological distress and enhance their growth as lifelong learners. Understanding the mechanisms and pathways to desirable and undesirable outcomes in medical students is critical for creating learning environments that will serve these students well.

Keywords: Lifelong learning, medical students, motivation theory, well-being

Background

Individuals seeking entrance to medical schools are academically high performing, goal oriented, and motivated to achieve. While these attributes are searched for in medical school admissions, they can also lead to problems. The pressure of professional studies may trigger psychological distresses, such as anxiety, stress, emotional exhaustion, and even burnout in some high-achieving students[1] as the odds of being the best become harder to achieve (see social comparison research, for example, the big-fish-little-pond effect).[2,3] The prevalence of high stress and burnout in medical students, for example, has been consistently higher than in similar age individuals in a general student population; about 50%–60% of medical students experience high stress and burnout.[1,4-6] Psychological distress has been associated with poor learning outcomes and professionalism lapses.[5]

Given the inextricable relationship between motivation and learning, a critical question, thus becomes how motivational constructs may help to protect students from psychological distress and enhance their growth as lifelong learners. Drawing on three established theories of motivation – self-determination theory (SDT),[7-9] self-theories of ability,[10,11] and achievement goal theory (AGT)[12] – the aim of the present study was to determine how these motivational constructs relate to stress, exhaustion, and lifelong learning in medical students. Understanding the mechanisms and pathways to desirable and undesirable outcomes in medical students is an integral piece for creating learning environments that will serve these students well.

With this goal in mind, we first briefly describe each motivation theory. Building on earlier research, in which these theories have been largely tested with general student populations, we propose and test a structural model to explain stress, exhaustion, and lifelong learning specifically in medical students. We conclude with recommendations for professional education programs that may help to develop resilient and successful health professionals.

Self-determination theory

SDT[7-9] provides a framework for understanding how environmental and personal factors can facilitate or undermine individuals' motivation, functioning, and well-being. Central to SDT is the concept of basic psychological needs – the needs for autonomy, competence, and relatedness – that must be ongoing satisfied for individuals to develop and function in healthy and optimal ways.[7-9]

The need for autonomy refers to individuals' desire for making their own choices, initiating actions, and expressing their feelings freely. The need for competence is individuals' propensity to engage in activities that allow them to apply their skills and knowledge and develop new competencies. The need for relatedness refers to the desire to have positive and beneficial

relationships and feel connected to others. Irrespective of the specific achievement setting, when basic psychological needs are satisfied, individuals are more likely to be oriented toward personal growth, mastery, and learning; they view challenges as opportunities for personal achievement.[13,14] In contrast, when basic psychological needs are not satisfied, individuals are more likely to experience psychological distress and engage in maladaptive (i.e., avoidance) behaviors.[14,15] SDT is gaining popularity in medical education because it offers insight into the critical role learning environments and instructional practices play in various learning outcomes;[16] however, the focus of studies conducted with medical students to date has been largely around autonomy support.[17,18]

Self-theories of ability

Whereas, the SDT explains the importance of need satisfaction through creating optimum conditions (e.g., learning environments), self-theories of ability examine beliefs that individuals hold about their own ability/intelligence and how these beliefs relate to their motivations and behaviors.[10,11,19-21] Dweck *et al.* have proposed that individuals view the potential and limitations of their ability/intelligence through one of two frameworks. A fixed mind-set views ability/intelligence as innate and immutable; whereas, a growth mind-set views ability/intelligence as malleable and something that can be changed through effort.

Individuals with a fixed mind-set have a higher desire to prove themselves to others, to be seen as smart, and to avoid looking unintelligent. Consequently, such individuals tend to avoid challenges, give up easily, see effort as fruitless, and feel threatened by the success of others. Because these individuals link their own success or failure to what they perceive to be a fixed amount of ability/intelligence, such individuals tend to be concerned with the maintenance of their current level of performance, avoid situations where they might perform poorly, and take on

easy tasks where they can demonstrate their competence relative to others. In contrast, individuals with a growth mind-set have a desire to learn and get better at something and thus actively seek opportunities to master new skills and improve on their past performance. Individuals who believe ability/intelligence can be developed tend to embrace challenges, persist in the face of obstacles, and view effort as the path to mastery.[10,11,19-21] In medical education, self-theories have been largely applied to study learners' feedback-seeking behaviors, including perceptions of feedback and associated psychological responses.[21] The application of self-theories to the study of lifelong learning, although called for in medical education,[21] has yet to be undertaken.

Achievement goal theory

Individuals' responses to environmental factors, combined with specific personal attributes, can be explained by the types of cognition individuals develop in achievement settings. AGT[12] proposes that individuals adopt certain subconscious orientations or goals as they approach achievement tasks where a possibility of failure exists. Elliot and McGregor's 2 × 2 framework[12] distinguishes four achievement goals: (1) performance approach – to demonstrate competence relative to others; (2) mastery approach – to learn, improve, or gain competence for its own sake; (3) performance avoidance – to avoid demonstrating incompetence relative to others; and (4) mastery avoidance – to avoid incompetence, with a focus on not doing worse than one has done in the past, often accompanied by feelings of not being able to master all the material and fear of making errors. Individuals can manifest one dominant goal or multiple goals, depending on their personal beliefs (e.g., self-theories of ability) and fluctuations in the learning environment.[22]

The extensive research on achievement goals in school age and undergraduate student populations supports the adaptive nature of mastery-approach goals relative to the other three goals. Specifically, mastery approach goals have been shown to promote interest, use of deep learning strategies, and self-regulated learning,[23-26] all of which are important attributes for lifelong learning.

Performance approach goals have consistently been linked to high achievement; however, these goals appear also to be linked to a variety of behavioral outcomes depending on achievement settings.[24,27,28] For example, in achievement situations that present a challenge and a threat (i.e., a possibility of failure), such as traditional classroom settings and high-stakes assessments, performance approach goals relate to maladaptive behaviors (e.g., use of surface learning strategies, and cheating).[12,29] In achievement situations that present a challenge (e.g., the possibility of success with little chance of failure), such as problem-based learning and professional development activities, performance approach goals appear to be similar to mastery-approach goals in that individuals pursue opportunities to satisfy their innate need for achievement and to feel competent.[27]

Avoidance goals are considered maladaptive as they are associated with poor psychological well-being and inadequate coping strategies.[24,25] For individuals with performance avoidance goals, the prospect of a potential failure is likely to evoke self-protective withdrawal, disrupt concentration and task involvement, and lead to physical, cognitive, and emotional exhaustion.[12,30] Similarly, individuals with mastery-avoidance goals are more likely to exhibit maladaptive forms of perfectionism, experience worry and anxiety, use ineffective learning strategies, and develop procrastination habits,[31-33] all of which relate to feelings of stress.

In medical education, AGT has been used to study academic achievement and performance, with studies also examining psychosocial, medical abilities, frustration tolerance, procrastination, help-and feedback-seeking behaviors, and self-efficacy.[34-37] To the best of our knowledge, AGT has not been applied to study lifelong learning in medical students. With lifelong learning being a critical aspect of professionalism, it is yet to be determined how this learning outcome, together with psychological well-being, can be nurtured and supported in medical students.

General hypotheses in the present study

We combined motivational constructs from the three motivation theories in an effort to understand how environmental and personal factors give rise to achievement goals and their relationships with important outcomes in medical students. In light of the findings of the earlier research, we expected that when basic psychological needs are satisfied, individuals have the cognitive and emotional energy to devote their drive toward self-improvement and approach learning with the goal of developing their competences further. This would also be consistent with the function of growth mindsets. In contrast, when psychological needs are unmet, they are likely to give rise to self-protective processes in the form of avoidance goals and maladaptive (i.e., avoidance) behavior. This would also be consistent with the function of fixed mindsets. We, thus, hypothesized the following relationships [Figure 1]:

- Psychological need satisfaction is positively associated with approach goals and is negatively associated with avoidance goals
- Self-theories of ability are positively associated with mastery-approach goals and are negatively associated with performance and mastery-avoidance goals
- Approach goals are positively associated with lifelong learning
- Avoidance goals are positively associated with stress and exhaustion.

Methods

This study employed a cross-sectional design. Using an online questionnaire, quantitative data were collected in November 2016, with three reminders sent to all undergraduate medical students (n = 640) at a Canadian University. The questionnaire was comprised existing scales to measure students' psychological need satisfaction, self-theories of ability, achievement goals, exhaustion and lifelong learning, and single-item measures of perceived stress and students' background characteristics. Ethics approval was obtained from the Institutional Research Ethics Board before data collection.

Measures

The measures in the online questionnaire were included in the following order to test the hypothesized relationships:

Psychological need satisfaction

The 12-item Psychological Need Satisfaction Scale was used to assess students' general need satisfaction, with the focus on three psychological needs – autonomy, competence, and relatedness.[14] Instructions asked respondents to indicate how they typically felt in relation to their medical program. Sample items are "In my program, I can take on responsibilities" (autonomy); "I succeed in my program" (competence); and "When I am with the people from my program, I feel I am a friend to them" (relatedness). Students responded on a six-point Likert-style scale (1 – strongly disagree; 6 – strongly agree). A single summed score was created to reflect overall need satisfaction with higher scores being indicative of greater psychological need satisfaction.

Self-theories of ability

A four-item version of the Implicit Theories of Intelligence Scale[10] was used to measure students' implicit beliefs about the developmental potential of intelligence. Instructions asked respondents to indicate how they felt about their intelligence (e.g., "I have a certain amount of intelligence and I cannot really do much to change it"). Students responded on a six-point Likert-style scale (1 – strongly agree; 6 – strongly disagree). Higher scale scores were indicative of a growth mindset of ability, and lower scale scores were indicative of a fixed mind-set of ability.

Achievement goals

Baranik *et al.*, 2 × 2 achievement goals instrument[38] was used in the present study, with some changes made in item wording to better reflect the nature of medical studies. The words "coworkers," "projects," and "work/job" were changed to "others in my program," "tasks," and "program," respectively. Students were asked to indicate the extent to which each statement was true of them in relation to their medical program. Students responded using a seven-point Likert-style scale (1 – not at all true of me; 7 – yes, very true of me). In total, 16 statements were used to measure the performance approach (e.g., "I prefer to work on tasks where I can show my competence to others"), performance avoidance (e.g., "I prefer to avoid situations in my program where I might perform poorly"), mastery approach (e.g., "I enjoy difficult tasks in my program where I will learn new skills"), and mastery avoidance (e.g., "In my program, I often feel that I am unable to master what is necessary to do my work") goals. Higher scores on each scale were indicative of a greater endorsement of those achievement goals.

Lifelong learning

Lifelong learning was assessed using the 14-item scale of medical students' orientation toward lifelong learning,[39] which is an adaptation of the Jefferson Scale of Physician Lifelong Learning (JeffSPLL).[40] According to the scale developers, the JeffSPLL encompasses self-initiated

activities (behavior); information-seeking skills (capabilities); sustained motivation to learn (motivation); and ability to identify one's own learning needs (cognition). Students responded using a four-point Likert-style scale (1 – strongly disagree; 4 – strongly agree). Higher scale scores were indicative of higher orientation toward lifelong learning and engagement in corresponding practices.

Exhaustion

Physical, cognitive, and emotional exhaustion was assessed using the 8-item exhaustion scale from the Oldenburg Burnout Inventory student version.[41] Students were asked to indicate the level of agreement with each statement in relation to their medical program. Students responded using a four-point Likert-style scale (1 – strongly disagree; 4 – strongly agree). Higher scale scores were indicative of greater levels of exhaustion.

Stress

Perceived stress was measured by the following item: "How would you rate the overall stress you have experienced in the past 3 months in your program?" Students responded using a five-point Likert-style scale (0 – no stress; 1 – low; 2 – moderate; 3 – high; and 4 – extremely high stress).

Analyses

Using SPSS 24.0 (IBM Corp., Armonk, NY, USA), the data were first screened for accuracy and missing values; descriptive statistics were computed to determine the demographic composition of the sample. Descriptive (means, standard deviation), reliability (Cronbach's alpha), and correlational (Pearson's correlations) analyses were performed for all variables. Using LISREL 9.20 (SSI Inc., Skokie, IL, USA), structural equation modeling (SEM) was performed to test the relationships among environmental (psychological need satisfaction) and personal (self-theories

of ability) factors, cognitions (achievement goals), and outcomes (stress, exhaustion, and lifelong learning).[42] Error variances were explicitly specified in the model to account for random and measurement errors in all the study variables as evident by Cronbach's alpha values; for the measure of stress, this was done to account for random errors (e.g., time of the day students participated in the survey). Considering that individuals can endorse multiple goals, correlations among the latent variables of achievement goals were freed for estimation. Maximum likelihood estimation was used to estimate the parameters in the model. Using Hu and Bentler's model fit guidelines and cutoff criteria,[43] several fit indices were considered to assess model fit, including a Chi-square test, the adjusted goodness of fit index (AGFI), and the root mean square error of approximation (RMSEA).

Results

A total of 267 medical students participated in the study (response rate 42%). Overall, 58% of the respondents were female, 96% of the respondents were 20–29-year-old (62% – 20–24 years; 34% – 25–29 years). The distribution of students by the year in the medical program was approximately even: 27% in year 1; 27% in year 2; 21% in year 3; and 26% in year 4. A MANOVA test showed no significant differences in psychological need satisfaction and self-theories of ability due to the year in the medical program (Wilks' Lambda = 0.975, $P > 0.05$). Table 1 presents descriptive statistics, reliability coefficients, and zero-order correlations. The reliability analysis indicated that, except for mastery avoidance, the reliabilities of the measures were acceptable [Table 1]; these varying levels of measurement errors were subsequently accounted for in the SEM analysis.

As anticipated, psychological need satisfaction was positively correlated with mastery approach and lifelong learning and negatively correlated with mastery avoidance, performance avoidance,

exhaustion, and stress [Table 1]. The variable of self-theories of ability was positively correlated with the mastery approach and negatively correlated with mastery avoidance, performance avoidance, and performance approach.

Mastery avoidance was positively correlated with exhaustion and stress, which in turn, had the highest positive correlation with each other. Performance avoidance was positively correlated with exhaustion but not with stress. Mastery approach was positively correlated with lifelong learning and negatively correlated with exhaustion. A positive correlation emerged between performance approach and lifelong learning.

The observed bivariate relationships were next tested together. The model showed a suboptimal fit: χ^2 = 40.29, df = 16, P = 0.001, the AGFI (0.81) was <0.90, and the RMSEA (0.075) was >0.05.[43] Based on theoretical relevance and modification indices, the fit of the model was improved by: allowing direct paths from psychological need satisfaction to stress and exhaustion; allowing correlations between the latent variables of exhaustion with stress and lifelong learning; and by removing direct paths of mastery avoidance to exhaustion and performance avoidance to stress. The improved model yielded a good fit: the Chi-square result was not statistically significant (χ^2 = 12.84, df = 14, P = 0.539), the AGFI (0.97) was >0.90, and the RMSEA (0.01) was <0.05.[43] The results of this structural model are summarized in Figure 2. Psychological need satisfaction was positively associated with approach goals and negatively associated with avoidance goals. As expected, there was a direct negative association of psychological need satisfaction with stress and exhaustion. Self-theories of ability were positively associated with mastery-approach goals and negatively associated with both avoidance goals and performance approach, although the path between self-theories of ability and performance approach did not reach significance.

Mastery avoidance and performance avoidance goals were positively associated with stress and exhaustion, respectively. The endorsement of both approach goals by the students was related to greater orientation toward lifelong learning. With respect to the explanatory power, need satisfaction and self-theories of ability accounted for the following amounts of variance in the achievement goals: 20% in mastery avoidance, 15% in performance avoidance, 10% in mastery approach, and 4% in performance approach. Motivation constructs examined in this study accounted for 37% of the variance in the orientation toward lifelong learning, 30% in exhaustion, and 10% in stress.

Discussion

The pursuit of medical studies can be challenging. Medical programs are in a position to nurture adaptive motivations that will serve their learners well as they pursue training. In this study, we aimed to provide insights into the interplay of environmental and personal factors that professional education programs need to consider as they strive to cultivate resilient, inspired, and successful professionals. By drawing on three motivation theories, we observed that in medical students, unmet psychological needs and a fixed mindset were associated with maladaptive cognitions (i.e., the pursuit of avoidance goals) and psychological distress (i.e., high stress and exhaustion). In contrast, psychological need satisfaction and a growth mindset appeared to have distinct pathways to beneficial cognitions (i.e., mastery approach goals) and lifelong learning in medical students. We also observed significant negative correlations of mastery approach with both avoidance goals, indicating that students who endorsed mastery-approach goals were less likely to pursue maladaptive avoidance goals, which, in turn, were linked with stress and exhaustion.

To stay up-to-date with new evidence and guidelines, practicing health professionals must engage in ongoing learning over the course of their careers. To this end, professional education programs are mandated to provide training that enables their trainees to become lifelong learners. Hojat *et al.*[40] defined lifelong learning as "an attribute involving a set of self-initiated activities and information-seeking skills with sustained motivation to learn and the ability to recognize one's own learning needs." Our findings suggest that students with a growth mindset and fulfilled psychological needs were more likely to endorse mastery-approach goals and engage in lifelong learning practices in their program. To the best of our knowledge, this is the first study that examined pathways in developing and supporting lifelong learning specifically in medical students.

Taken together, our results suggest that when medical students approach their studies with a growth mindset and have their psychological needs satisfied in the program, they choose more adaptive achievement goals and ultimately experience less psychological distress and a greater commitment to lifelong learning. This raises a critical question of what programs can do to create optimum learning environments and to nurture growth mind-sets in their students. Summing across motivation theories, several researchers[44,45] have proposed overarching principles and practices for instructional design that are argued to maximize the satisfaction of learners' basic psychological needs, encourage growth mind-sets, and orient students toward mastery goals and away from avoidance goals. These practices, however, have yet to be empirically tested for their efficacy within the medical school, making this an important avenue for future research. An important first step, however, might be for medical schools to discuss these issues explicitly with learners and to describe the importance of autonomy, competence, and relatedness in their programs. Further, students' autonomy can be supported by providing opportunities for choice

and encouraging personal responsibility for actions; competence can be fostered by optimal challenge and provision of constructive and frequent feedback; relatedness can be nurtured through mutual respect, safety, and genuine caring.[44,45] Educators could also explicitly discuss the types of mindsets which they wish to instill in learners (i.e., growth) by reframing mistakes as opportunities for learning and emphasizing effort as the path to mastery.

Medical students tend to be homogeneous in terms of academic achievement and are also highly competitive, and a number of studies indicate that students utilize social comparison information depending on the nature and focus of the learning environment.[2,3,46,47] In an experimental study of how mastery versus ability (i.e., performance) goal condition affects students' use of social comparison information, Butler[46] demonstrated that under the mastery goal condition, students were more likely to use social comparison information for the task-diagnostic purposes to improve on their own performance. In contrast, under the ability goal condition, students were more interested in ability-diagnostic information, that is, how well they performed relative to others. Similarly, results have been reported in natural academic settings[47] and have direct implications for instructional design and practices in professional education programs.

Limitations

Two important limitations need to be considered. First, due to the correlational nature of the data, causality cannot be inferred from the observed relationships. It is possible that some of the relationships are reciprocal or cyclical in nature (e.g., feeling stressed and exhausted can contribute to adopting avoidance goals). We choose to model the individual variables because these are targets for which interventions can be designed to help prevent the development of psychological distress in students in the first place. Second, participants in this study came from one medical school. Although our students are representative of the population of medical

students in Canada, we cannot generalize our findings to other medical programs and professional education contexts.

Competitive professional education programs such as medicine pose many pressures and challenges for individuals aspiring to professional careers. However, only some students in professional programs will experience high stress and exhaustion, whereas others will adaptively respond to schooling demands and engage in lifelong learning practices. Our findings indicate that adaptive motivations and cognitions, cultivated through personal and environmental factors, may help protect medical students from psychological distress and enhance their growth as lifelong learners.

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Conflicts of interest

There are no conflicts of interest.

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Table

Table 1: Descriptive statistics, reliability, and correlation coefficients for the study variables (*n*=267)

Variables	Mean	SD	1	2	3	4	5	6	7	8	9
Psychological need satisfaction	54.14	6.11	*0.83*								
Self-theories of ability	16.04	3.89	0.10	*0.93*							
Mastery avoidance	16.32	3.31	−0.24**	−0.18**	*0.42*						
Performance avoidance	13.97	4.29	−0.19**	−0.24**	0.49**	*0.81*					
Mastery approach	22.36	3.04	0.17**	0.14*	−0.31**	−0.53**	*0.79*				
Performance approach	16.85	4.43	0.09	−0.13*	0.11	0.20**	0.13*	*0.76*			
Lifelong learning	41.61	4.34	0.17**	−0.11	−0.11	−0.23**	0.47**	0.16*	*0.74*		
Exhaustion	20.69	3.35	−0.38**	−0.06	0.24**	0.25**	−0.22**	0.01	−0.24**	*0.77*	
Stress	2.46	0.75	−0.20**	0.03	0.23**	0.12	−0.08	0.03	−0.01	0.54**	-

**P<0.01; *P<0.05. In the correlation matrix, reliability coefficients (Cronbach's alpha) are shown in italics on the main diagonal.

SD=Standard deviation

Figure Legends

Figure 1: Hypothesized relationships between psychological need satisfaction, self-theories of ability, achievement goals, and outcomes. Dashed lines in the figure indicate negative associations

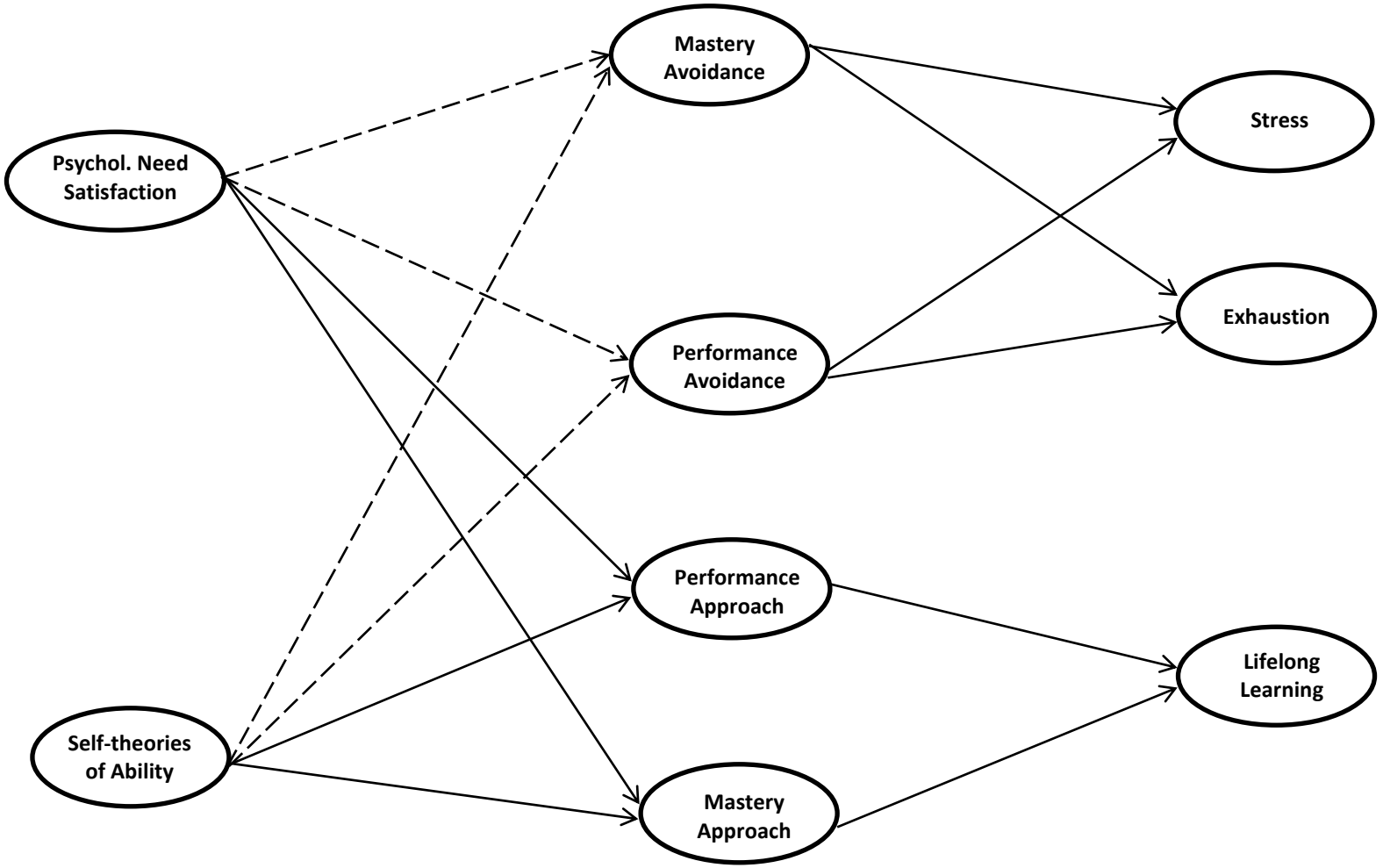

Figure 2: Structural equation model (final solution). The effect between self-theories of ability and performance approach (the dashed line) did not reach significance; however, it was retained in the model in light of fit indices. Dotted lines represent correlations. Correlations between latent variables of achievement goals are not shown for the sake of clarity