

Medical Education

Mastery avoidance: An overlooked aspect of medical students' motivation

NIR MADJAR, YAACOV G. BACHNER, TALMA KUSHNIR

ABSTRACT

Background. Previous research on medical students' motivation mostly overlooked an important concept, namely, mastery-avoidance goals. The mastery-avoidance goal is defined as engaging in a task to avoid losing knowledge or skills that have already been acquired. We aimed to explore the role of mastery-avoidance goals in changes occurring in low frustration tolerance (LFT) levels over a span of one academic year. This approach enables us to understand which type of motivational orientation is expected to explain most adaptive educational outcomes.

Methods. First year medical students ($n=241$) participating in a physician–patient communication course completed the surveys of motivational orientations and LFT at the beginning and at the end of the academic year. A confirmatory factor analysis supported the construct validity of the motivational orientations structure.

Results. Cross-lagged analysis using structural equation modelling revealed that the mastery-approach goal was negatively related to the progression of LFT while mastery-avoidance goal was positively related.

Conclusions. The findings suggest that what matters is not merely the level of motivation, but rather the type of motivational orientations that students pursue. Encouraging students to improve their current skills, while discouraging competitiveness and reducing fear of losing competence, may enhance the effectiveness of medical training programmes.

Natl Med J India 2019;32:298–302

INTRODUCTION

There is a growing interest among researchers in the field of medical education in conceptualizing the processes that characterize medical students' learning motivation and understanding the impact on professional training and practice.^{1,2} For instance, medical students' attendance can predict their course examination grades.³ Yet, there are several unique characteristics in medical education (e.g. low acceptance rate, high demands and academic expectations and extended and intense training), which result in higher levels of stress among

medical students compared to students from other domains.⁴ Therefore, the processes associated with medical students' learning motivation may differ from those found in other contexts. For instance, the type of motivation called 'controlled motivation' (where the individual engages in learning to avoid external negative consequences or experiencing a sense of shame and guilt) is often regarded as a maladaptive type of learning motivation.⁵ However, among medical students, controlled motivation was found to be positively related with their academic performance.⁶ Another example of the uniqueness of medical students' motivation is the new finding that although medical students' motivation has increased over time, other indicators of engagement and adaptive learning behaviours (e.g. use of learning strategies) have paradoxically decreased.⁷ Therefore, it is important to further explore the nature of learning motivation within the unique context of medical education.

Our study was based on a theoretical framework that was developed in the field of educational psychology, namely 'achievement goal orientations'.^{8,9} This theory has been used previously in the context of research of medical students training.¹⁰ According to the achievement goal orientations theory, motivation is defined as the general goals people pursue in a given setting (i.e. goal orientations). Four goal orientations have been identified as follows: (i) mastery-approach goal, in which the purpose is to obtain new knowledge or skills; (ii) mastery-avoidance goal, in which the purpose is to avoid losing knowledge or skills that have already been acquired or to avoid missing opportunities to learn something new; (iii) performance-approach goal, in which the purpose is to win positive evaluations of one's abilities; and (iv) performance-avoidance goal, in which the purpose is to avoid negative evaluations of one's abilities and skills.¹¹

To date, studies on medical education that implemented the achievement goal orientations theory as a conceptual framework focused on three goals and disregarded the mastery-avoidance goal.^{12,13} This is probably because the mastery-avoidance goal is the most complex to define and assess among all motivational goals.^{14,15} Both performance-avoidance and mastery-avoidance goals refer to attempts to avoid negative consequences. However, while performance-avoidance refers to avoiding consequences related to negative evaluations of one's abilities and skills, the mastery-avoidance goal denotes the wish to avoid the deterioration of previously acquired skill or knowledge (i.e. deskilling). Hence, it has been suggested that 'Although clarity was obtained regarding the antecedents of mastery-avoidance goals, clarity remained elusive regarding the consequences of these goals'.¹⁶

We address this concern by including the mastery-avoidance goal orientation along with the three other motivational orientations in a longitudinal study that examines the effects of motivational orientations on cognitive changes among medical

Bar-Ilan University, Ramat Gan 5290002, Israel
NIR MADJAR School of Education

Ben-Gurion University of the Negev, Beersheba, Israel
YAACOV G. BACHNER Department of Public Health

Ariel University, Ariel, Israel
TALMA KUSHNIR Department of Psychology and Adelson School of Medicine

Correspondence to NIR MADJAR; nir.madjar@biu.ac.il

© The National Medical Journal of India 2019

students in a setting of physician–patient communication training.

Achievement goal orientations in medical education

Achievement goal orientations is a prominent theoretical framework used in studies of motivation within achievement settings, such as formal education and sports.¹⁷ The theory suggests that although some students may hold several goal orientations at the same time (e.g. finding the learning materials most interesting while at the same time aiming to obtain the highest test scores in the class),¹⁸ one of these goal orientations may be dominant and has a stronger influence on academic outcomes. For example, it had been consistently found that students that hold dominant mastery-approach goals demonstrate more adaptive educational outcomes, such as emotional well-being, use of learning strategies and long-term retention of knowledge acquired.¹⁷ A student who constantly aspires to obtain knowledge and improve professional skills would be considered as mastery-approach oriented. Such a student is expected to experience more positive emotions, persist longer when facing a challenging task or actual failure, and be able to retrieve information after longer time, compared with a student who mainly aims to get the best grades in class or to graduate with honours (i.e. performance-approach goal).

Similar findings were reported in studies conducted within the context of medical education. In a new study, medical students were assigned to either mastery- or performance-goal settings when learning new surgical skills. In the mastery-goal setting, students were instructed to improve their own performance over time, and in the performance-goal setting, they were expected to improve their performance relative to others. Students in the mastery-goal setting reported higher task engagement and more frequent use of metacognitive strategies compared with students in the performance-goal setting.¹⁹ In another study, the mastery-approach goal was found a significant predictor of medical students' development of perceived psychosocial abilities over time.¹²

Yet, the above studies did not evaluate the effects of mastery-avoidance goal on educational outcomes. This topic was suggested for future research. A qualitative analysis of medical students' goal orientations revealed that a large proportion of medical students holds a mastery-goal orientation and does not distinguish it from the mastery-avoidance goal. Thus, when the students described in their own words the goals they pursue, most of the time they did not mention aspiration to maintain already-acquired skills, but rather focused on learning new knowledge.²⁰ A single published study that included mastery-avoidance goal indicated a unique correlational pattern; the mastery-avoidance goal was positively associated with tension and test anxiety while the mastery-approach goal was negatively related with these constructs.²¹ These findings further emphasize the importance of exploring the distinct role of mastery-avoidance goal in academic education, especially among medical students.

Low frustration tolerance (LFT)

For our study, we chose LFT (which is the equivalent of frustration intolerance), as an outcome for medical students' training in the context of a physician–patient communication course. On the other hand, frustration tolerance is an important personal and professional resource. LFT is defined as 'the tendency to view any form of discomfort as almost intolerable

and to be avoided whenever possible'.²² It is considered as one of the four major irrational belief patterns in the Rational–Emotive Behaviour Therapy approach,²³ beliefs that lead to emotional and behavioural dysfunctions. A reasonable recommendation for both medical training and practice, based on this model, is to strengthen frustration tolerance as much as possible which is akin to reducing LFT as low as possible.

Reducing LFT was found to improve adaptive coping and resilience. In a study, LFT was negatively associated with mental health in stressful life events such as coping with chronic pain.²⁴ Therefore, it is important to explore factors that can reduce LFT among medical students, who are expected to encounter and cope with highly demanding training and working environments.

Previous research has found that medical students' LFT predicts the development of maladaptive motivation over time. Thus, medical students that reported higher levels of LFT at the beginning of the academic year reported a high increase in performance-avoidance goal at the end of the year.¹² However, that study did not include mastery-avoidance goal orientation.

Our study

We focused on changes in medical students' motivation and LFT levels over the sequence of one academic year, in the context of a physician–patient communication course. The purpose of the study was two-fold: (i) to explore, for the first time, the relationships between mastery-avoidance goal and the other three-goal orientations that have been previously explored in the context of medical training; (ii) to examine whether mastery-avoidance goal either predicts or is predicted by the increase of LFT level among medical students attending an extended physician–patient communication course. We hypothesized that the mastery-avoidance goal will find a valid motivational construct among medical students and will be positively associated with the mastery-approach goal. We also expected that exploring the roles of all four goal orientations will reveal more complex patterns of associations between changes over time in motivation and LFT than what has been found so far.

METHODS

Participants

The sample consisted of 241 first-year medical students (59.3% women; mean [SD] age 23.9 [2.14]). This included three cohorts of freshman students that were enrolled in the academic years 2012–13, 2013–14 and 2014–15 (*n*'s 81, 70 and 90, respectively).

Procedures

All participants attended a mandatory annual course regarding physician–patient communication skills. Students were asked to complete a brief survey twice, once at the beginning of the course that coincided with the start of the school year and another at the end of the course, approximately 8 months later. Participation in the study was voluntary, and the response rate was approximately 96%.

Instruments

Achievement goal orientations. The four types of achievement goal orientations were assessed using an adapted version of the Pattern of Adaptive Learning Scales.²⁵ The students were asked to indicate their level of agreement with each item on a scale ranging from 1 'strongly disagree' to 5

‘strongly agree’, while referring to the specific physician–patient communication course they were attending. The measure included four items for the mastery-approach goal (sample item: ‘I like class work that I’ll learn from even if I make a lot of mistakes’), four items for the mastery-avoidance goal (sample item: ‘One of my main goals in this course is not to forget what I have learned already’), four items for the performance-approach goal (sample item: ‘I want to do better than other students in my class’) and four items for the performance-avoidance goal (sample item: ‘It’s most important for me not to look stupid in my class’).

Confirmatory factor analysis (CFA) using structural equation modelling (SEM) supported a four-factor model for achievement goals, as indicated by acceptable model fit indices in both time 1 and 2 (CMIN/DF 1.48, comparative fit index [CFI] 0.945, Tucker–Lewis index [TLI] 0.932, root mean square error of approximation [RMSEA] 0.045; CMIN/DF 1.97, CFI 0.923, TLI 0.892, RMSEA 0.064, respectively).²⁶ Internal reliabilities and descriptive statistics are presented in Table I.

Low frustration tolerance. LFT was measured by a 14-item scale which was validated in previous research²² and had been used previously among medical students.¹² The students were asked to indicate their level of agreement with each item on a scale ranging from 1 ‘strongly disagree’ to 5 ‘strongly agree’ (sample item: ‘I find it difficult to tolerate discomfort or unpleasant conditions’).

Statistical analysis

The primary method of analysis was cross-lagged analysis based on SEM.²⁷ This method enables exploring whether a hypothesized factor can predict changes in another variable over time, by measuring both variables at two different time-points and modelling them together in the same structural model. If the path between one factor at time 1 and the other factor at time 2 is significant, that means that it predicted the change over time. Based on the proven utility of this method in analysing longitudinal data, it has been implemented in new studies on students’ motivation.^{28,29}

RESULTS

The preliminary analyses revealed distribution and correlational patterns that aligned with the theoretical framework (Table I). At both time-points, students typically reported higher levels of mastery-approach goal (t [240] 9.17, t [240] 7.37, $p < 0.001$) and performance-approach goal (t [240] 19.12, t [240] 17.27, $p < 0.001$)

compared with avoidance orientations. As expected, mastery-approach and mastery-avoidance goals were positively correlated, and performance-approach and performance-avoidance goals were also positively correlated.³⁰ LFT was negatively associated with mastery-approach goal but positively associated with performance-approach and performance-avoidance goals at both time-points.

Exploring the mean-level changes (Table I) revealed a significant decline in both mastery-approach and mastery-avoidance goals (t [240] 3.69, $p < 0.001$; t [240] 2.68, $p < 0.01$; respectively), and a significant increase in LFT (t [240] 5.49, $p < 0.001$). Both performance-approach and mastery-avoidance goals did not change significantly between the two time-points.

The cross-lagged analysis revealed that mastery-approach goal positively predicted change in students’ LFT over time, whereas mastery-avoidance goal negatively predicted change in LFT (Fig. 1). Performance-approach and performance-avoidance goals were positively related with LFT at each time-point; however, they did not predict changes over time. All factors that were included in the model were moderately stable, with coefficients ranging from 0.42 to 0.56.

Analysing gender differences revealed significant differences only in mastery-avoidance goals at time 1 and time 2 (F [1240] 8.69, F [1240] 8.24, $p < 0.01$; respectively). Women consistently reported higher levels of mastery-avoidance goals at time 1 (mean [SD] 3.85 [0.60]) and time 2 (mean [SD] 3.75 [0.67]) compared with men (mean [SD] 3.61 [0.62]; mean [SD] 3.49 [0.67]; respectively). None of the other factors in this study were significantly different between women and men.

To examine gender differences in the complete model, we ran multiple group analyses using SEM. The results revealed no significant differences between unconstrained model and fully constrained model (χ^2 [$n=241$, 39]=40.99, $p=ns$). This means that although there were gender differences in the levels of mastery-avoidance goal, there were no gender differences in the associations between the variables included in the model.

DISCUSSION

Our study provides important empirical evidence of the longitudinal implications of medical students’ mastery-avoidance goal orientation, an underexplored concept in the research of medical students’ motivation.

So far researchers have been endeavouring to devise methods for improving medical training in general, as well as physician–patient communication skills in particular.^{31,32} Despite the prolific

TABLE I. Descriptive statistics and correlation matrix

Variable	Mean (SD)	α	1	2	3	4
<i>Time 1</i>						
1. Mastery-approach goal	4.15 (0.50)	0.67	–	–	–	–
2. Mastery-avoidance goal	3.75 (0.62)	0.65	0.29‡	–	–	–
3. Performance-approach goal	2.64 (0.79)	0.82	0.04	0.27‡	–	–
4. Performance-avoidance goal	1.68 (0.52)	0.64	0.03	0.18†	0.35‡	–
5. Low frustration tolerance	2.05 (0.45)	0.77	–0.16*	0.03	0.18†	0.12
<i>Time 2</i>						
1. Mastery-approach goal	4.01 (0.66)	0.78	–	–	–	–
2. Mastery-avoidance goal	3.64 (0.68)	0.63	0.33‡	–	–	–
3. Performance-approach goal	2.56 (0.86)	0.85	0.04	0.21†	–	–
4. Performance-avoidance goal	1.68 (0.61)	0.71	0.04	0.19†	0.47‡	–
5. Low frustration tolerance	2.20 (0.52)	0.81	–0.28‡	0.03	0.30‡	0.41‡

* $p < 0.05$ † $p < 0.01$ ‡ $p < 0.001$; two-tailed. α Cronbach’s internal reliability coefficient; all scales range from 1 to 5.

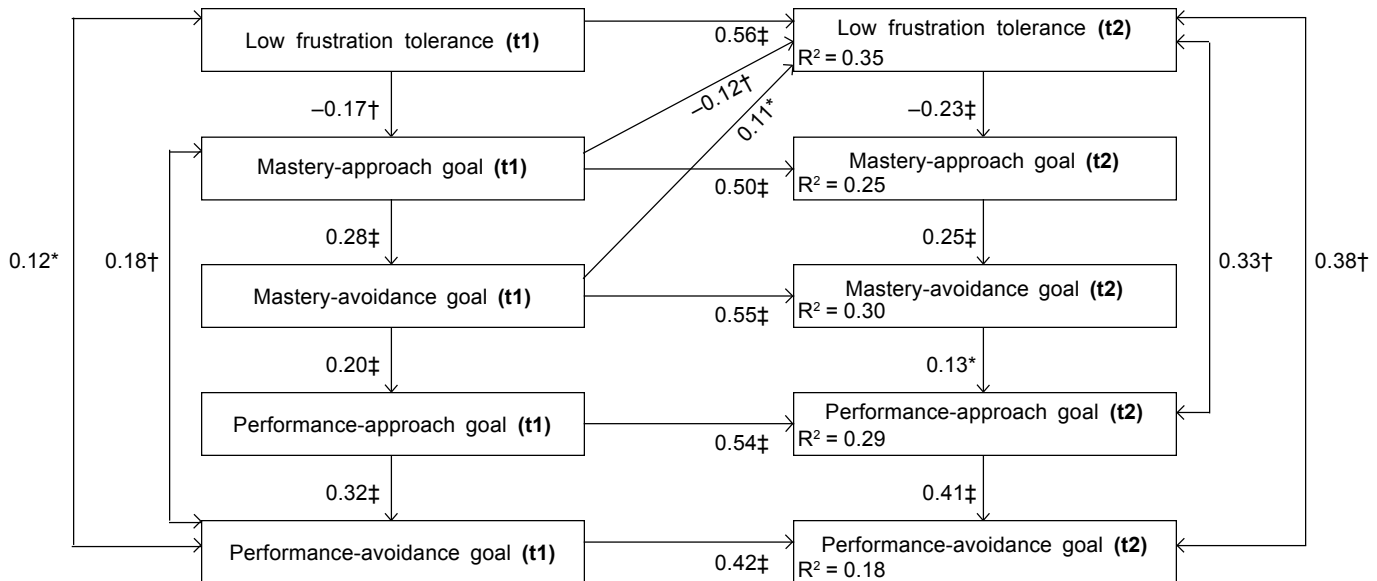


FIG 1. Cross-lagged analysis results. Note: *p<0.05; †p<0.01, ‡p<0.001

body of research demonstrating the importance of medical students' learning motivation and the growing attention given to this subject in medical training programmes internationally,^{33,34} it is still not regarded as an important factor for curriculum development.³⁵ Further research is required to establish our understanding of the nature, antecedents and consequences of learning motivation within the context of medical education.

Our study focused specifically on the effects of medical students' motivation toward acquiring physician-patient communication skills (i.e. achievement-goal orientations) on the changes in LFT over time. Our findings provide some important insights. First, the CFA supported the structure validity of the motivational orientations. As hypothesized, four motivational factors were as suggested by the goal orientations theoretical framework.^{14,16} Our important finding is that students' responses to mastery-avoidance items differed from their responses to the other three orientation goals, suggesting that the students conceptually distinguished between the mastery-avoidance goal and all three previously validated goal orientations.

One of the interesting finding was that the levels of mastery-avoidance goals were generally lower than the levels of mastery-approach goals and higher than both performance-approach and -avoidance goals. These results are consistent with current findings in research on motivation among medical students that generally reveal high levels of adaptive motivation.^{36,37} This finding suggests that in addition to the stronger aspiration to gain new knowledge and skills, medical students also aspire to maintain their acquired skills and aim to avoid losing acquired knowledge.

Second, our findings underscore the importance of including mastery-avoidance in research models in studies of learning motivation among medical students, an orientation that has usually been overlooked until now.

Although previous research indicated that LFT may be a precursor of maladaptive motivational orientation over time, namely increased levels of performance-avoidance goals,¹² in our study, after adding mastery-avoidance to the model, it

appears that this goal becomes a significant predictor of changes in LFT. Thus, over a 1-year time span, students with higher levels of mastery-avoidance goals experienced higher increase in their LFT (frustration intolerance). This finding suggests that although LFT may enhance a specific motivational orientation over time, i.e. the performance-avoidance goal,¹² another motivational orientation (i.e. mastery-avoidance goal) in turn affects changes in LFT. In other words, the initial levels of students' LFT may over time increase their fear of being evaluated as incompetent (i.e. performance-avoidance) while their initial levels of aspiration to preserve their knowledge or skills (i.e. mastery-avoidance) may become a personal disposition that in turn increases LFT as academic pressures accumulate over time.

The findings imply that while academic education professionals should be aware of students' motivational orientations, encourage meaningful learning and emphasize self-improvement, at the same time, they should discourage competitiveness and act to prevent a sense of anxiety over deterioration of skills or knowledge.³⁸

Gender differences in students' motivation are currently under dispute in the literature.³⁹ Our study indicated that women hold higher levels of mastery-avoidance goals than men whereas all the other three goal orientations were not subject to significant gender differences. This means that women may be at a higher risk of increasing LFT levels (frustration intolerance) over time compared with men. Further research is still required to more precisely reveal gender differences associated with motivational processes among medical students.

Future research needs to address some of the limitations of this study. First, the research questions should be investigated in other domains of medical training. Further research is also required to support the validity of mastery-avoidance goal within the context of medical training in general. Future research should also include other factors that may affect students' motivational orientations, such as perceived stress⁴⁰ and instructors' emphasis on goals.⁹

Implications

Medical training practitioners and researchers may benefit from our longitudinal findings that included a multicohort sample of medical students. Some may argue that medical students are highly motivated, but have to cope within a demanding and challenging context.⁴ As a result, they may adjust their motivation and effort according to the demands of each specific domain, and this would be considered as an adaptive coping strategy. However, our study explored the implications of several types of motivational orientations within the same domain. We found that what matters is not merely the level of motivation, but rather the type of motivational orientations that students pursue while engaging in professional learning tasks. Therefore, it appears that encouraging students to continuously improve their skills while helping them reduce fear of losing competence or social comparison may enhance the effectiveness of medical training programmes.

Conflicts of interest. None declared

REFERENCES

- Wouters A, Croiset G, Galindo-Garre F, Kusrkar RA. Motivation of medical students: Selection by motivation or motivation by selection. *BMC Med Educ* 2016;**16**:37.
- Chen HC, Ten Cate O, O'Sullivan P, Boscardin C, Eidson-Ton WS, Basaviah P, et al. Students' goal orientations, perceptions of early clinical experiences and learning outcomes. *Med Educ* 2016;**50**:203–13.
- Dhaliwal U. Absenteeism and under-achievement in final year medical students. *Natl Med J India* 2003;**16**:34–7.
- Brazeau CM, Shanafelt T, Durning SJ, Massie FS, Eacker A, Moutier C, et al. Distress among matriculating medical students relative to the general population. *Acad Med* 2014;**89**:1520–5.
- Deci EL, Ryan RM. Self-determination theory: A macrotheory of human motivation, development, and health. *Can Psychol* 2008;**49**:182–5. <https://doi.org/10.1037/a0012801>
- Sobral DT. What kind of motivation drives medical students' learning quests? *Med Educ* 2004;**38**:950–7.
- Kim KJ, Jang HW. Changes in medical students' motivation and self-regulated learning: A preliminary study. *Int J Med Educ* 2015;**6**:213–15.
- Dweck CS. Motivational processes affecting learning. *Am Psychol* 1986;**41**:1040–8.
- Ames C. Classrooms: Goals, structures, and student motivation. *J Educ Psychol* 1992;**84**:261–71.
- Holland C. Critical review: Medical students' motivation after failure. *Adv Health Sci Educ Theory Pract* 2016;**21**:695–710.
- Elliot AJ, McGregor HA. A 2x2 achievement goal framework. *J Pers Soc Psychol* 2001;**80**:501–19.
- Madjar N, Kushnir T, Bachner YG. Communication skills training in medical students: Do motivational orientations predict changes over time in psychosocial attributes? *Adv Health Sci Educ Theory Pract* 2015;**20**:45–57.
- Madjar N, Bachner YG, Kushnir T. Can achievement goal theory provide a useful motivational perspective for explaining psychosocial attributes of medical students? *BMC Med Educ* 2012;**12**:4.
- Elliot AJ. A conceptual history of the achievement goal construct. In: Elliot AJ, Dweck C (eds). *Handbook of competence and motivation*. New York:Guilford Press; 2005:52–72.
- Madjar N, Kaplan A, Weinstock M. Clarifying mastery-avoidance goals in high school: Distinguishing between intrapersonal and task-based standards of competence. *Contemp Educ Psychol* 2011;**36**:268–79.
- Elliot AJ, Murayama K. On the measurement of achievement goals: Critique, illustration, and application. *J Educ Psychol* 2008;**100**:613.
- Kaplan A, Maehr ML. The contributions and prospects of goal orientation theory. *Educ Psychol Rev* 2007;**19**:141–84.
- Pintrich PR. Multiple goals, multiple pathways: The role of goal orientation in learning and achievement. *J Educ Psychol* 2000;**92**:544.
- Gardner AK, Jabbar IJ, Williams BH, Huerta S. Different goals, different pathways: The role of metacognition and task engagement in surgical skill acquisition. *J Surg Educ* 2016;**73**:61–5.
- Horowitz G. It's not always just about the grade: Exploring the achievement goal orientations of pre-med students. *J Exp Educ* 2009;**78**:215–45.
- Jeon S, Lee YM, Park SH. The effects of medical students' achievement goal orientations on affective attitudes towards anatomy learning. *Korean J Med Educ* 2008;**20**:189–98.
- Kushnir T, Avin L, Neck A, Sviatochevski A, Polak S, Peretz C, et al. Dysfunctional thinking patterns and immigration status as predictors of hearing protection device usage. *Ann Behav Med* 2006;**32**:162–7.
- Ellis A. Discomfort anxiety: A new cognitive-behavioral construct (part I). *J Ration Emot Cogn Behav Ther* 2003;**21**:183–91.
- Suso-Ribera C, Jornet-Gibert M, Ribera Canudas MV, McCracken LM, Maydeu-Olivares A, Gallardo-Pujol D, et al. There's more than catastrophizing in chronic pain: Low frustration tolerance and self-downing also predict mental health in chronic pain patients. *J Clin Psychol Med Settings* 2016;**23**:192–206.
- Midgley C, Maehr ML, Hruda LZ, Anderman E, Anderman L, Freeman KE, et al. *Manual for the patterns of adaptive learning scales*. Ann Arbor:University of Michigan; 2000.
- Schreiber JB, Nora A, Stage FK, Barlow EA, King J. Reporting structural equation modeling and confirmatory factor analysis results: A review. *J Educ Res* 2006;**99**:323–38.
- Byrne BM. *Structural equation modeling with AMOS: Basic concepts, applications, and programming*. New York:Routledge; 2013.
- King RB, McInerney DM. Do goals lead to outcomes or can it be the other way around?: Causal ordering of mastery goals, metacognitive strategies, and achievement. *Br J Educ Psychol* 2016;**86**:296–312.
- Madjar N. Stability and change in social goals as related to goal structures and engagement in school. *J Exp Educ* 2017;**85**:259–77.
- Murayama K, Elliot AJ, Yamagata S. Separation of performance-approach and performance-avoidance achievement goals: A broader analysis. *J Educ Psychol* 2011;**103**:238.
- Bittner A, Bittner J, Jonietz A, Dybowski C, Harendza S. Translating medical documents improves students' communication skills in simulated physician-patient encounters. *BMC Med Educ* 2016;**16**:72.
- Sankarapandian V, Rehman SM, David KV, Christopher P, Ganesh A, Pricilla RA, et al. Sensitizing undergraduate medical students to consultation skills: A pilot study. *Natl Med J India* 2014;**27**:276–9.
- Hargie O, Boohan M, McCoy M, Murphy P. Current trends in communication skills training in UK schools of medicine. *Med Teach* 2010;**32**:385–91.
- Thomas PA, Kern DE, Hughes MT, Chen BY. *Curriculum development for medical education: A six-step approach*. Baltimore:JHU Press; 2010.
- Kusrkar RA, Croiset G, Mann KV, Custers E, Ten Cate O. Have motivation theories guided the development and reform of medical education curricula? A review of the literature. *Acad Med* 2012;**87**:735–43.
- Kusrkar RA, Croiset G, Galindo-Garré F, Ten Cate O. Motivational profiles of medical students: Association with study effort, academic performance and exhaustion. *BMC Med Educ* 2013;**13**:87.
- Cook DA, Thompson WG, Thomas KG. The motivated strategies for learning questionnaire: Score validity among medicine residents. *Med Educ* 2011;**45**:1230–40.
- Urdan T. The challenges and promise of research on classroom goal structures. In: Meece JL, Eccles JS (eds). *Handbook of research on schools, schooling, and human development*. New York:Routledge; 2010:92–108.
- Meece JL, Glienke BB, Burg S. Gender and motivation. *J Sch Psychol* 2006;**44**:351–73.
- Park J, Chung S, An H, Park S, Lee C, Kim SY, et al. A structural model of stress, motivation, and academic performance in medical students. *Psychiatry Investig* 2012;**9**:143–9.