Personality traits and emotional status affecting academic achievements of medical students: testifying mediating effect of learning strategies

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Purpose: The purpose of this study is to identify possible causal relationships among personality traits, emotional status, learning strategies, and academic achievements of medical students and to testify mediating effect of learning strategies in these relationships.

Methods: The study subjects are 424 medical students in the academic year of 2020 at the Gyeongsang National University, Jinju, Korea. Using the Multi-dimensional Learning Strategy Test-II, we assessed the students' academic achievements with personality traits, emotional status, and learning strategies. This study employed Structural Equation Modelling to explore the causal relationships among the latent variables.

Results: In the path model, personality traits directly affected academic achievements ($\beta=0.285$, $p<0.05$) and indirectly affected academic achievements via emotional status ($\beta=0.063$, $p<0.01$) and via learning strategies ($\beta=0.244$, $p<0.05$), respectively. Further, personality traits indirectly affected academic achievements via emotional status first and learning strategies next ($\beta=0.019$, $p<0.05$). Personality traits indirectly affected academic achievements through three multiple paths in the model ($\beta=0.326$, $p<0.05$). Learning strategies partially mediated the relationship between personality traits and academic achievements as well as the relationship between emotional status and academic achievements of medical students.

Conclusion: Study findings proved constructing the causal relationships among personality traits, emotional status, learning strategies, and academic achievements of medical students, thus supporting our hypotheses. Early habits of self-regulated learning are essential for the successful academic achievements of medical students. Therefore, medical students should know how to regulate personality traits and control emotional status, significantly affecting learning strategies.

Key Words: Personality, Emotions, Learning, Structural Equation Modelling, Medical students

Introduction

1. Background

Almost all medical students feel pressed to gain success in the academic program. Medical students are expected to complete academic requirements of class attendance, clinical practice, written and clinical performance exams, and seminars during the program. Students employ various learning strategies such as critical thinking and pre-testing to perform successfully, and personality traits and

emotional status work in this context. It is essential to identify how these variables interrelatedly affect the academic achievements of medical students to get positive outcomes both for learners and educators in medical schools. However, studies in Korea have not much explored the causal relationships among these variables.

2. Learning strategies and academic achievements

Self-regulated learning is one of the main ways of education in various academic fields. Learning strategies mean the clusters of related learning activities that students have at their disposal in reaction to a specific learning goal [1]. Medical students use a variety of learning strategies not only to cope with program requirements but also to gain academic success. Medical students control their thoughts and cognition and concentrate their minds to achieve academic success. Hence, using efficient learning strategies is essential for the successful academic achievement of medical students [2]. Strategic learning is also a prerequisite for academic success and high-quality patient care in the future [1].

Medical students generally employ multi-dimensional learning strategies. They mostly use three learning strategies among various learning strategies cognitive, meta-cognitive, and resource-oriented [1]. Cognitive strategies include organization, critical thinking, development, and rehearsal of learning material and serve as information collection at lectures and seminars. Meta-cognitive strategies consist of planning (setting goals), regulating, and monitoring the learning processes and help students to control and regulate their cognition. Resource-oriented strategies are effort regulation and time management (intrinsic) and managing the study environment, peer-learning, and the use of additional literature (extrinsic) [1].

Various learning strategies were significantly correlated with the academic success of the medical students [2,3]. Self-regulated learning directly correlates with academic achievement among undergraduate premedical students [2]. Self-regulated learning and meta-cognitive learning strategies positively affect medical students' academic performance [3]. Self-regulated learners independently plan to learn goals, control the study environment, and monitor their progress with an internal motivation to learn. Students' self-regulated learning leads to more successful academic achievements [2].

3. Personality traits and emotional status

While students employ learning strategies to gain academic achievements, personality and emotional traits work in this context. Personality traits and emotional status often impact the learning strategies and academic achievements of medical students.

Self-efficacy is a person's belief in their capability to carry out specific tasks with success [2]. Self-efficacy is the principal capacity to organize study activities and mobilize the study environment. Self-efficacy motivates the students' capabilities to fulfill academic goals and tasks [3]. Self-efficacy is a crucial determinant of students' learning strategies because self-efficacy affects self-regulatory processes, including goal setting, self-surveillance, and self-assessment [4]. Further, self-efficacy affects academic emotions [5-7]. Thus, self-efficacy is the most distinguished personality trait affecting students' academic performance. High-level self-efficacy predicted a high academic performance of medical students [8,9].

Medical students commonly report negative emotions such as anxiety and depression with stress during the academic program. Anxiety is an emotional state consisting of feeling, tension, and apprehension which affects an individual's nervous system [10]. There are negative relationships between anxiety and academic achievements

among medical students [10] and between negative emotions and academic achievement among medical students [5]. Contrarily, positive emotions are positively associated with the academic performance of medical students [11]. Further, positive emotions such as en-joyment, hope, and pride motivate self-regulated learning strategies of medical students [12] and, consequently, high-level academic achievements of medical students [3].

4. Causal relationships among variables

The relationship between learning strategies, academic achievements, personality traits, and emotional status is complex. However, researchers in Korea have not re-cognized the interrelated relationships among these variables [13-18]. Prior studies on the academic achieve-ments of medical students in Korea have mainly examined the relationships between the variables [13-18]. The prior studies found that resilience [13], motivation and neu-roticism [14,15], integrity and extroversion [16], and self-regulation [18] of personality traits, test anxiety and academic burnout [13] among emotional status, and rehearsal strategy [16], organization, elaboration, critical thinking, and time management [17] as learning strategies were significantly related with academic achievements of medical students.

Therefore, most studies in Korea have neglected to explore the direct and indirect effects of these variables on the academic achievements of medical students. One study abroad highlighted that students' efficacy sig-nificantly impacted their learning-related emotions and meta-cognitive learning strategies, and meta-cognitive strategies significantly mediated the effect of the feelings on academic performance [3].

Based on the above discussions, we hypothesized as follows.

H1. Competent personality traits will reduce the negative emotional status, but encourage efficient learning strategies and improve academic achievements.

H2. Negative emotional status will discourage efficient learning strategies and reduce academic achievements.

H3. Efficient learning strategies will increase academic achievement, thus will mediate the relationships among personality traits, emotional status, and academic achieve-ments.

Methods

1. Study sample and measurement

We recruited the study sample using a cross-sectional research design. The sample was composed of 424 medical students in the academic year of 2020 at the Gyeongsang National University College of Medicine. The school program is a 6-year program consisting of a 2-year pre-medical course and a 4-year medical course.

All the 424 students participated in the survey and assessed their academic achievements with personality traits, emotional status, and learning strategies using the Multi-dimensional Learning Strategy Test-Ⅱ (MLST-Ⅱ). The MLST-Ⅱ is the instrument developed by professor DH Park (the Insight of Psychology, Seoul, Korea), made up of items assessing the students' traits and academic-related achievements.

Personality traits were assessed as percentiles of self-efficacy, expectation, and integrity. Emotional status was evaluated as percentiles of depression, anxiety, and petulance. Self-regulated learning strategies were eval-uated as percentiles of four strategies concentrating, reading, memorizing, and testing. Self-assessed perfor-mance and percentiles of satisfaction degree of per-formance assessed the academic achievements. Self-assessed performance was assessed as high (5), mid-high (4), middle (3), mid-low (2), and low (1).

This study analyzed the internal consistency for each scale in the questionnaire. A Cronbach's α value of at least 0.6 indicates acceptable. Reliability analyses resulted in 0.729 for personality traits, 0.870 for emotional status, and 0.792 for learning strategies.

2. Statistics

This study used t-test and analysis of variance to compare the levels of academic achievements of medical students according to gender and schooling year. A p-value of <0.05 was accepted to be statistically significant. This study used structural equation modeling (SEM) to identify the causal relationships among personality traits, emotional status, learning strategies, and academic achievements and to testify mediating effect of learning strategies in the relationships. The SEM is a valid and reliable statistical tool to construct causal relationships of the data collected on a cross-sectional design. The normality test found that all the variables are within the recommended criteria of skewness (<3.00) and kurtosis (<10.00).

Goodness-of-fit indexes of the path model used the absolute fit measures such as chi-square (χ^2) and root mean squared error of approximation (RMSEA), and incremental fit measures such as normal fit index (NFI), Tucker-Lewis index (TLI), and comparative fit index (CFI) to show a good fit between the path model and the data. A Q (χ^2/pdf) below 2 is considered good, between 3–5 to be the reasonable cutoff criterion. RMSEA below 0.05 indicates a good fit, but below 0.08 shows a reasonable fit. NFI, TLI, and CFI greater than 0.90 indicate a good fit [19,20]. IBM SPSS Statistics ver. 25.00 (IBM Corp., Armonk, USA) was used to conduct statistical analyses.

3. Ethical approval

The Institutional Review Board of Gyeongsang National University Hospital approved our study (GNUH-IRB 2022-06-017). The survey was conducted with the informed consent of the students when they were enrolled.

Results

1. Mean differences in personality traits, emotional status, learning strategies, and academic achievements of medical students by gender and schooling year

Of the 424 students, male students comprised 63.4% and female students 36.6%. The first-year and second-year students of the premedical course consisted of 13.0% and 12.3%, and the first-year, second-year, third-year, and fourth-year students of the medical course consisted of 19.6%, 17.9%, 19.6%, and 17.7%, respectively.

Medical students showed higher integrity (mean=66.79) than self-efficacy (mean=65.41) and expectation (mean=49.32). Personality traits of medical students were not significantly different by gender but significantly different by schooling year. All the self-efficacy, expectation, and integrity reached the highest level in the first year of the premedical course but reduced to the lowest level in the first year of the medical course. The level rebounded in the second year of the medical course but decreased again in the third year (Table 1).

Medical students showed higher anxiety (mean=46.75) than depression (mean=44.43) and petulance (mean= 36.15). The emotional status of medical students was not significantly different by gender but significantly different by schooling year. All the depression, anxiety, and petulance were at the lowest level in the first year of the premedical course but increased to the highest level in the first year of the medical course. The level reduced in the second year but increased again in the third year of the medical course (Table 1).

Table 1. Mean Values of Personality Traits, Emotional Status, Learning Strategies, and Academic Achievements of Medical Students by Gender and Schooling Year (N=424)

Variable	Personality traits			Emotional status			Learning strategies				Academic achievements	
	Self-efficacy	Expectation	Integrity	Depression	Anxiety	Petulance	Concentrating	Reading	Memorizing	Testing	Self-assessed performance	Satisfaction degree of performance
Gender												
Male	64.26	50.5	65.22	45.51	46.53	37.24	62.99	59.59	57.77	59.52	2.94	52.12
Female	67.41	47.27	69.51	42.57	47.14	34.27	65.57	63.89	59.14	63.04	3.27	53.42
t-value	-1.170	1.076	-1.588	1.051	-0.203	1.050	-0.872	-1.603	-0.494	-1.282	-2.870**	-1.200
Schooling year												
1st Premed	77.49	64.24	74.29	39.37	39.02	28.93	76.97	78.07	73.13	74.43	3.45	59.14
2nd Premed	65.28	52.90	63.32	40.77	45.21	33.28	62.51	64.28	66.25	63.43	3.00	54.19
1st Med	56.56	43.68	59.99	55.22	54.51	45.49	56.49	53.52	47.07	52.64	2.86	51.25
2nd Med	67.63	43.78	73.15	42.09	45.29	33.31	64.67	61.27	54.43	58.61	3.13	51.41
3rd Med	61.23	45.06	63.62	44.68	49.35	37.17	60.50	54.00	53.99	57.31	2.95	51.11
4th Med	68.82	52.46	68.30	39.37	43.52	34.84	66.63	62.87	62.84	64.14	3.08	50.04
F-value	5.075***	4.738***	3.331**	3.490**	2.271*	2.959*	3.765**	7.803***	8.740***	5.162***	2.033	5.660***

Premed: Premedical course, Med: Medical course.
*$p<0.05$. **$p<0.01$. ***$p<0.001$.

Medical students employed concentrating strategy (mean=63.93) more than reading (mean=61.16), memorizing (mean=58.27), and testing (mean=60.81) strategies. Learning strategies of medical students were not significantly different by gender but significantly different by schooling year (concentrating, $p<0.01$; reading, $p<0.001$; memorizing, $p<0.001$; and testing, $p<0.001$). All the strategies reached the highest level in the first year of the premedical course but reduced to the lowest in the first year of the medical course. The level rebounded in the second year but decreased again in the third year of the medical course (Table 1).

Self-assessed performance of medical students was significantly different by gender, with female students assessing their performance higher (mean=3.27) than male students (mean=2.94). However, the satisfaction degree of performance did not show any group difference (female, 53.42 and male, 52.12; t=-1.200). Schooling year did not show any significant group difference for self-assessed performance (1st premed, 3.45; 2nd premed, 3.00; 1st med, 2.86; 2nd med, 3.13; 3rd med, 2.95; and 4th med, 3.08; F=2.033 and $p>0.5$). Still, the first-year students of the premedical course responded with the highest satisfaction degree of performance (mean=59.14) than any other students (2nd-year premedical course, 54.19; 1st medical course, 51.25; 2nd medical course, 51.41; 3rd medical course, 51.11; and 4th medical course, 50.04), which gradually decreased along with schooling years (F=5.660 and $p<0.001$) (Table 1).

2. Correlation analyses between variables

Correlation analyses showed that personality traits were negatively associated with emotional status (r=-0.275, $p<0.01$, and personality traits were positively associated with learning strategies (r=0.631, $p<0.01$). Personality traits were also positively related to self-assessed performance (r=0.367, $p<0.01$) and satisfaction degree of

performance (r=0.347, p<0.01) of medical students. The emotional status was negatively associated with learning strategies (r=−0.467, p<0.01), self-assessed performance (r=−0.187, p<0.01), and satisfaction degree of performance (r=−0.330, p<0.01) of medical students. Learning strategies were positively associated with self-assessed performance (r=0.385, p<0.01) and satisfaction degree of performance (r=0.372, p<0.01) of medical students (Table 2).

3. Causal relationships among latent variables

This study created a conceptual path model to identify the causal relationships among personality traits, emotional status, learning strategies, and academic achievements of medical students and to testify mediating effect of learning strategies on academic achievements of medical students using the SEM. This study constructed possible paths based on the discussion above. Goodness-of-fit indexes within the recommended criteria show a good fit between the path model and the data (χ^2=122.834, degrees of freedom [df]=44, χ^2/df=2.769, NFI=0.946, TLI=0.946, CFI=0.964, RMSEA=0.065) (Table 3).

The path model's coefficients (standardized regression weights) were statistically significant at the 0.05, 0.01, or 0.001 levels. The first path in the model demonstrates that personality traits directly affect academic achievements (β=0.299, p=0.010). The second path in the model demonstrates that personality traits affect emotional status (β=−0.321, p<0.001)) which in turn affect academic achievements (β=−0.184, p=0.008). Thus, personality traits indirectly affect academic achievements via emotional status, which partially mediates this relationship (β=0.059). The third path in the model demonstrates that personality traits affect learning strategies (β=0.723, p<0.001), which in turn affect academic achievements (β=0.302, p=0.021). Thus, personality traits indirectly affect academic achievements via learning strategies which partially mediates this relationship (β=0.218). The fourth path in the model demonstrates that personality traits first affect emotional status (β=−0.321, p<0.001), following emotional status affecting learning strategies (β=−0.213, p<0.001), and further, learning strategies involving academic achievements (β=0.302, p=0.021). Thus, personality traits indirectly affect academic achievements via emotional status and learning strategies which partially mediate this relationship (β=0.021).

All together, personality traits indirectly affect academic achievements through three multiple paths in the

Table 2. Pearson's Correlation Coefficients between Variables

	PT	ES	LS	SAP	SDP
PT	–	–	–	–	–
ES	−0.275**	–	–	–	–
LS	0.631**	−0.467**	–	–	–
SAP	0.367**	−0.187**	0.385**	–	–
SDP	0.347**	−0.330**	0.372**	0.443**	–

PT: Personality traits, ES: Emotional status, LS: Learning strategies, SAP: Self-assessed performance, SDP: Satisfaction degree of performance.
**p<0.01.

Table 3. Goodness-of-Fit Indexes of the Path Model

Results	χ^2	df	p-value	χ^2/df	NFI	TLI	CFI	RMSEA
Recommended criteria			>0.05	<3.00	>0.90	>0.90	>0.90	<0.08
Path model	121.834	44	0.000	2.769	0.946	0.946	0.964	0.065

df: Degrees of freedom, NFI: Normal fit index, TLI: Tucker-Lewis index, CFI: Comparative fit index, RMSEA: Root mean squared error of approximation.

Table 4. Estimates of the Latent Variables in the Path Model

Path	Latent variables	b	β	SE	CR	p-value	Mediating effect
1	Personality→achievements	0.012	0.299	0.005	2.584	0.010	
2	Personality→emotionality	−0.420	−0.321	0.072	−5.810	<0.001***	Partial
	Emotionality→achievements	−0.006	−0.184	0.002	−2.650	0.008	
3	Personality→strategies	0.612	0.723	0.062	9.804	<0.001***	Partial
	Strategies→achievements	0.015	0.302	0.006	2.302	0.021	
4	Personality→emotionality	−0.420	−0.321	0.072	−5.810	<0.001***	Partial
	Emotionality→strategies	−0.138	−0.213	0.031	−4.394	<0.001***	
	Strategies→achievements	0.015	0.302	0.006	2.302	0.021	

SE: standard error, CR: Critical ratio.
***p<0.001.

Fig. 1. Path Model of Latent Variables
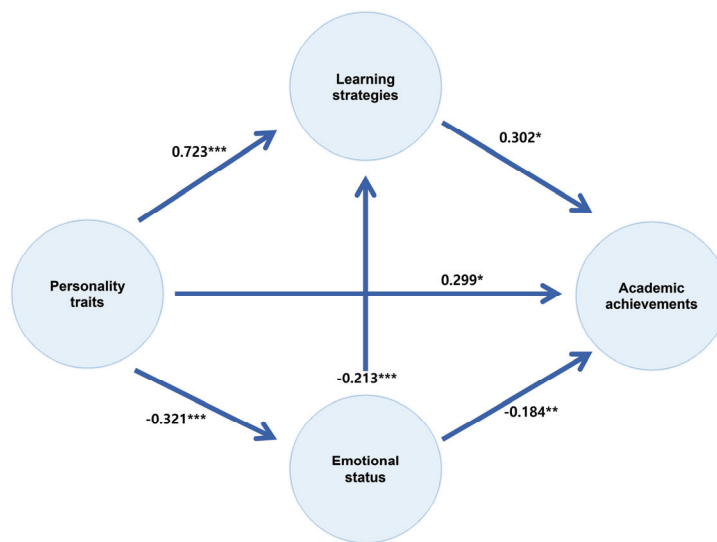
**p<0.01. ***p<0.001.

model, where learning strategies mediate the relationship between personality traits and academic achievements and the relationship between emotional status and academic achievements of medical students. Indirect effect (β =0.298) is calculated with [(−0.321×−0.184)+(0.723× 0.302)+(−0.321×−0.213×0.302)] (Table 4). Therefore, it could explain that the more competent personality traits are, the less negative emotional status is, the more efficient learning strategies are, and the higher academic achieve- ments are. All these findings support our hypotheses. Fig. 1 illustrates the path model integrating three multiple paths with all latent variables.

Discussion

The main objective of this study was to explore causal relationships among personality traits, emotional status, learning strategies, and academic achievements of medical students and to testify mediating effect of learning strategies in the relationships by constructing a conceptual path model using the SEM.

According to schooling year, medical students showed differences in personality traits, emotional status, and learning strategies. They showed the highest level of positive personality traits and learning strategies and the

lowest level of negative emotional states in the first year of the premedical course, but vice versa in the first year of the medical course. It might be related to the 6-year medical school curriculum, where the premedical course curriculum is similar to that of other colleges. Still, the study subjects and amounts of the first year of medical course drastically increase compared to other medical school grades.

This study found that personality traits and emotional states directly affect the academic achievements of medical students. Students who perceive their self-efficacy, goal expectation, and integrity more positively have higher outcomes. Students who perceive their emotional status as more negative have lower yields. And students who used more efficient learning strategies had high outcomes. All these findings support prior studies where self-efficacy [21,22], goal expectation [22], anxiety [21,23], depression [22,24], and learning strategies [23] directly affect the academic achievements of medical students. From the above findings, we could conclude that the more positive and active personality traits, the lower negative emotional status, the more efficient and effective learning strategies, and the higher academic achievements, as hypothesized.

Second, this study found that personality and emotional traits directly affect learning strategies, and students who used more efficient learning strategies had high outcomes. Thus, learning strategies play a mediating role in these relationships, supporting prior relevant studies. Therefore, we could construct the causal relationships between personality traits, emotional status, learning strategies, and academic achievements of medical students. The findings support a few prior studies abroad [3,19]. Hayat et al. [3] found that the students' personality traits like self-efficacy impacted their learning-related emotions and metacognitive learning strategies, which, in turn, affected their academic performance. Moreover, learning-related emotions influence the metacognitive learning strategies, which in turn mediate the effect of emotions on the academic performance of medical students.

It is essential to testify mediating effect of learning strategies between variables. Because we can intervene not just independent variables but also in mediating variables affecting academic achievements, this study found that learning strategies significantly mediated the relationships between personality traits, emotional status, and academic achievements of medical students. Educational researchers have argued that self-regulated learning is not a fixed trait and that students can improve their motivation and learning strategies. Therefore, we can turn our eyes to personality and emotional characteristics, which affect learning strategies [19].

In this study, we could find the dynamics between students' personality traits, emotional status, learning strategies, and academic achievements. But our study has a few limitations. First, the results of our study cannot extend generalizability to other universities. Further, these results cannot extend generalizability to different academic fields in higher education since the nature of each academic area differently affects the learning strategies of its students. Second, we could not consider other external factors that affect the learning strategies of medical students, such as social support [25] and the learning environment [26]. Third, this study did not classify different types of learning strategies.

This study could expand the research scope by identifying causal relationships among personality traits, emotional status, learning strategies, and academic achievements of medical students and by testifying to the mediating effect of learning strategies on academic achievements. Study results have important implications for learners and educators in medical education. First, medical students should know how to train their personality traits and control negative emotional states,

significantly affecting learning strategies. It is therefore essential to develop educational and training programs for personality traits and emotional status of medical students. Second, it is important to investigate what kinds of learning strategies medical students employ, because learning strategies not only directly affect academic achievements but also mediate the effects of personality traits and emotional status of medical students. Third, it is also necessary to study changes in personality traits, emotional status, learning strategies, and academic achievements of medical students from a long-term perspective.

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References

1. Hogh A, Müller-Hilke B. Learning strategies and their correlation with academic success in biology and physiology examinations during the preclinical years of medical school. PLoS One. 2021;16(1):e0245851.

2. Moghadari-Koosha M, Moghadasi-Amiri M, Cheraghi F, Mozafari H, Imani B, Zandieh M. Self-efficacy, self-regulated learning, and motivation as factors influencing academic achievement among paramedical students: a correlation study. J Allied Health. 2020;49(3):e145-e152.

3. Hayat AA, Shateri K, Amini M, Shokrpour N. Relationships between academic self-efficacy, learning-related emotions, and metacognitive learning strategies with academic performance in medical students: a structural equation model. BMC Med Educ. 2020;20(1):76.

4. Zimmerman BJ. Self-regulating academic learning and achievement: the emergence of a social cognitive perspective. Educ Psychol Rev. 1990;2(2):173-201.

5. Mega C, Ronconi L, De Beni R. What makes a good student?: how emotions, self-regulated learning, and motivation contribute to academic achievement. J Educ Psychol. 2014;106(1):121-131.

6. Pekrun R, Elliot AJ, Maier MA. Achievement goals and achievement emotions: testing a model of their joint relations with academic performance. J Educ Psychol. 2009;101(1):115-135.

7. Artino AR Jr, Holmboe ES, Durning SJ. Control-value theory: using achievement emotions to improve understanding of motivation, learning, and performance in medical education: AMEE guide no. 64. Med Teach. 2012;34(3):e148-e160.

8. Diseth Å. Self-efficacy, goal orientations and learning strategies as mediators between preceding and subsequent academic achievement. Learn Individ Differ. 2011;21(2):191-195.

9. Yusuf M. The impact of self-efficacy, achievement motivation, and self-regulated learning strategies on students' academic achievement. Procedia Soc Behav Sci. 2011;15:2623-2626.

10. Mustafa N, Kanwal H. Does anxiety affect academic performance in medical health care professionals? Pak Armed Forces Med J. 2020;70(Suppl-1):S151-S155.

11. Chin EC, Williams MW, Taylor JE, Harvey ST. The influence of negative affect on test anxiety and academic performance: an examination of the tripartite model of emotions. Learn Individ Differ. 2017;54:1-8.

12. Ngwira FF, Gu C, Mapoma HW, Kondowe W. The role of academic emotions on medical and allied health students' motivated self-regulated learning strategies. J Contemp Med Educ. 2017;5(1):23-30.

13. Yune SJ, Im SJ, Lee SY, Baek SY, Kam BS. Relationships among test anxiety, academic burnout, resilience, and academic achievement of medical school students. J Educ Innov Res. 2018;28(4):173-188.

14. Noh OJ, Chung IS, Jung CH, Jung SW. Psychological factors affecting students' academic performance depending on the medical students' school periods. J Korean Soc Biol Ther Psychiatry. 2017;23(3):214-221.

15. Kim MH, Chung IS, Jung CH, Jung SW. Impact of psychological factors on the academic performance of medical students: focused on the MMPI-2. J Korean Soc Biol Ther Psychiatry. 2016;22(3):129-136.

16. Hwang IC, Park KH, Yim J, et al. Fatigue, personality traits, learning strategies, and academic achievement in graduate-entry medical students. J Korea Contents Assoc. 2016;16(4):231-240.

17. Shin HI, Jeon WT, Yang EB. Relationship between learning strategies and academic achievement in medical college and graduate medical school students. Korean J Med Educ. 2010;22(3):197-204.

18. Lee YM, Ham BJ, Lee KA, Ahn DS, Kim MK. The relation of self-efficacy with environmental factors, personality and academic achievement in medical students. Korean J Med Educ. 2006;18(3):249-257.

19. Kassab SE, Al-Shafei AI, Salem AH, Otoom S. Relationships between the quality of blended learning experience, self-regulated learning, and academic achievement of medical students: a path analysis. Adv Med Educ Pract. 2015;6:27-34.

20. Song T, Kim G. Structural equation modeling for health & welfare research. Seoul, Korea: Hannarae Publishing Co.; 2012.

21. Park CW, Park SH, Cho YR. The relationship between psychological characteristics and academic achievement in medical students. J Korean Neuropsychiatr Assoc. 1999; 38(5):985-996.

22. So Y. The effects of achievement goal orientation and self-efficacy on course interests and academic achievement in medical students. Korean J Med Educ. 2008;20(1): 37-49.

23. Nabizadeh S, Hajian S, Sheikhan Z, Rafiei F. Prediction of academic achievement based on learning strategies and outcome expectations among medical students. BMC Med Educ. 2019;19(1):99.

24. Yusoff MS, Esa AR, Mat Pa MN, Mey SC, Aziz RA, Abdul Rahim AF. A longitudinal study of relationships between previous academic achievement, emotional intelligence and personality traits with psychological health of medical students during stressful periods. Educ Health (Abingdon). 2013;26(1):39-47.

25. Seo JH, Kim HJ, Kim BJ, Lee SJ, Bae HO. Educational and relational stressors associated with burnout in Korean medical students. Psychiatry Investig. 2015;12(4):451-458.

26. Findyartini A, Greviana N, Putera AM, Sutanto RL, Saki VY, Felaza E. The relationships between resilience and student personal factors in an undergraduate medical program. BMC Med Educ. 2021;21(1):113.