

Research trends in studies of medical students' characteristics: a scoping review

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The purpose of this study is to investigate domestic and international research trends in studies of medical students' characteristics by using the scoping review methods. This study adopted the scoping review to assess papers on the characteristics of medical students. The procedure of research was carried out according to the five steps of the scoping review. The full texts of 100 papers are obtained and are read closely, after which suitable 88 papers are extracted by us for this research. The review is mapped by the year of the study, source, location, author, research design, research subject, objective, and key results. The frequency is analyzed by using Microsoft Excel and SPSS. We found 70 papers (79.5%) on a single medical school, 15 (17.0%) on multiple medical schools, and three (3.4%) on mixed schools, including medical and nonmedical schools. Sixty-nine (79.5%) were cross-sectional studies and 18 (20.5%) were longitudinal studies. Eighty-two papers (93.2%) adopted questionnaire surveys. We summarized research trends of studies on medical students in Korea and overseas by topic, and mapped them into physical health, mental health, psychological characteristics, cognitive characteristics, social characteristics, and career. This study provides insights into the future directions of research for the characteristics of medical students.

Key Words: Review, Medical students, Medical schools

Introduction

The three elements of education are teachers, learners, and contents. Since the subject of educational activities is for the learners, it is important to understand the characteristics of the learners before the educational activities are started. The characteristics of learners refer to behavior characteristics of them. This is largely

divided into cognitive and affective characteristics. Information on learner characteristics is important because it directly or indirectly influences the development of curriculum, deciding on teaching methods, and guiding students [1]. Meanwhile, students have different personalities or motivations depending on their generation to which they belong [2,3]; this affects teaching methods such as the use of media technology like video clips, or demand for the teacher's specific guidance and

Received: June 22, 2017 • Revised: July 26, 2017 • Accepted: July 31, 2017

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Korean J Med Educ 2017 Sep; 29(3): 137-152.

<https://doi.org/10.3946/kjme.2017.60>

eISSN: 2005-7288

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feedback [4,5]. Thus, research on the characteristics of learners is important in terms of providing the basic data required for the teachers to understand the learners.

Learner characteristics are an important research topic in all disciplines, and this is no exception in the field of medical education. In Korea, the departments of medical education have been established and the importance of medical education has increased [6,7]. Research on medical education, thus, has also become active. According to one study, in 386 papers about medical education studies from 1989 to 2010, most of them—about 106 (27.5%)—were related to medical curriculum, while about 27 (7%) were about the characteristics of medical students [8]. According to another study, there has been a dramatic increase in research on the characteristics of medical students for the last 10 years [9]. However, only one conducted a literature review presenting new trends by specifying the characteristics of medical students from cognitive, emotional, and social aspects [10]. This has limitations in that only the domestic papers are analyzed. Although there are also many other studies conducted in Korea on characteristics of medical students, but it is difficult to find articles that include comprehensive analysis about domestic and foreign study trends and that present study direction by comparatively analyzing domestic study trends with foreign ones.

To examine trends of research on medical students in Korea and overseas, this study adopted a literature review method called the scoping review. While the systematic review looks at empirical evidence for more specific and detailed research questions, the scoping review offers a clear and intelligible mapping of research areas, and is used for a literature review that has never been carried out extensively before. This is why it is often used as a preliminary step of systematic reviews [11]. To the best of our knowledge, no research has analyzed studies on characteristic of medical students of

Korean ones and those of overseas countries. Accordingly, this study will investigate domestic and international research trends, mapping them by research topic using the scoping review methods, execute an in-depth analysis of the findings of subtopics in this area and suggest directions for the future research.

Methods

1. Study design

This study adopted the scoping review method for reviewing papers on the characteristics of medical students. As previously mentioned, the scoping review is mostly used for the research of which review has never been conducted extensively and is used in order to provide basic data for beginning a new field of the study by mapping research areas and exploring the primary data and evidence of the research [11,12]. This study adopted such a method considering that it is suitable for the present situation in which no review exists on literature pertaining to the traits of medical students.

2. Procedure

The procedure of research was carried out according to the five steps of the scoping review [12,13]: (1) identifying the research question; (2) identifying relevant studies; (3) study selection; (4) charting the data; (5) collating, summarizing, and reporting the results. The study methods are described up to Step 4, while Step 5 includes the Results.

1) Research question

A considerable literature can be found if the research questions are selected in a broad range via the scoping review [11]. Since 2005, there has been a significant increase in the studies on characteristic of medical

students in Korea [9]. Accordingly, it is necessary to examine the directions of such studies in Korea comparing those of other countries, and also to determine the results of such investigations. Therefore, the research question in this study is “What is the direction of studies on characteristic of medical students in Korea and overseas, and what the differences are?”

2) Search strategy of relevant studies

The relevant studies used are those related to the characteristics of medical students published in Korea and overseas from January 2010 to February 2016. The reason of choosing the year 2010 as the starting point is to actively reflect the recent status to research studies that include the latest medical students born since the 1990s.

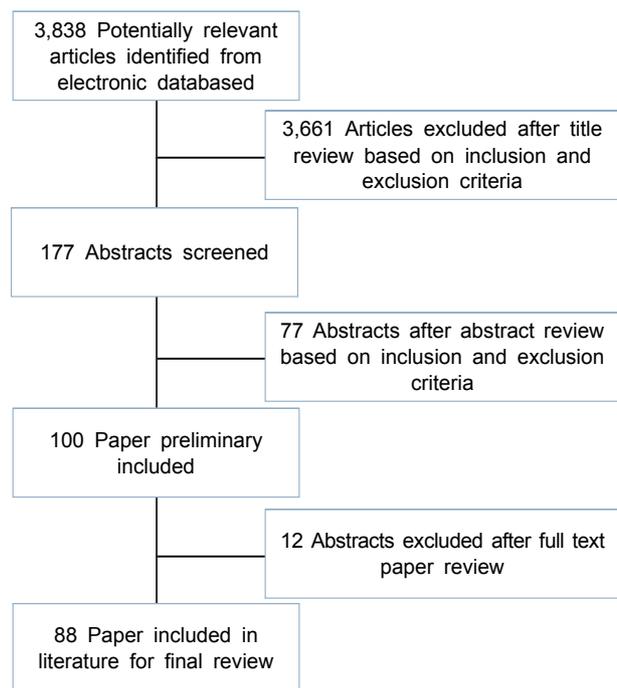
The databases used include PubMed, Scopus, EBSCO, DBpia, RISS, and KISS. The search keywords that are set up are “(medical AND student) or (medical AND school)” in titles and abstracts. We also searched for limited keywords that can be considered attributes of medical students along with AND. We perused data March 3 to 5, 2016. We excluded papers, contributions, or text books in languages other than Korean or English.

- a. Inclusion criteria: vision, goal, idealism, applicants, admission, selection, motive (or motivation), personality, characteristics, learning, learning style, achievement, performance, smoking, drinking, sleeping, mental health, stress, burnout, (life) quality, psychological support, professionalism, attitude, perceptions, environment, career selection, specialty choice, licensing (license)
- b. Exclusion criteria: curriculum design, educational methods, educational evaluation, medical education environment, admission variable

3) Study selection

The process of collecting and selecting the data is as follows. When “(medical AND student) or (medical AND school)” is searched in the databases, 3,838 papers are

Fig. 1. Study Selection Process



found. One hundred seventy-seven papers are extracted after eliminating redundant papers by looking at the titles applying the inclusion and exclusion criteria. After reading the abstracts, 100 papers are selected and 77 that were unrelated to the research are excluded, which are about an exclusion criterion of this study. The full texts of the 100 papers are obtained and read closely, after 88 suitable for research are extracted. The data collection, selection, and extraction processes are as follows (Fig. 1).

4) Data recording

A scoping review can be mapped by author, year of publication, location, number of research subjects, research objective, research method, result measurement, results, and conclusion [12]. We mapped our review by the year of publication, location of research, research design, research subject, objective, research method, and key results. The topic was categorized by discussion of six researchers. The researchers reviewed key results and made a list of subtopics based on them. And similar subtopic lists were categorized into six research areas.

5) Data summary and synthesis

After inputting data into Microsoft Excel based on the mapping criteria, the frequency is analyzed and the percentage using the IBM SPSS ver. 23.0 (IBM Corp., Armonk, USA) is obtained.

Results

1. Analysis of the general traits of studies on medical students in Korea and overseas

Using the year of study, we found 12 papers (13.6%) from 2010, 8 (9.1%) from 2011, 12 (13.6%) from 2012, 18 (20.5%) from 2013, 12 (13.6%) from 2014, 20 (22.7%)

from 2015, and 6 (6.8%) from 2016. Using the study situation, we found 70 papers (79.5%) on a single medical school, 15 (17.0%) on multiple medical schools, and 3 (3.4%) on mixed schools, including medical and non-medical schools. Sixty-nine (79.5%) were cross-sectional studies and 18 (20.5%) were longitudinal studies. As for methods, 82 papers (93.2%) adopted questionnaire surveys (Table 1). Moreover, by location, excluding Korea, 22 studies were conducted in Asia, 14 in European countries including the United Kingdom, 9 in North America, 2 in Austria, and 4 in South America.

Table 1. General Characteristics of Research

Characteristic	Domestic		International		Total
	No. (%)	Reference	No. (%)	Reference	
Year of publication					
2016	2 (5.4)	[15,19]	4 (7.8)	[14,16-18]	6 (6.8)
2015	7 (18.9)	[25,34-39]	13 (25.5)	[20-24,26-33]	20 (22.7)
2014	7 (18.9)	[45-51]	5 (9.8)	[72,78-81]	12 (13.6)
2013	7 (18.9)	[58,64-69]	11 (21.6)	[52-57,59-63]	18 (20.5)
2012	5 (13.5)	[72,78-81]	7 (13.7)	[70,71,73-77]	12 (13.6)
2011	4 (10.8)	[85,87-89]	4 (7.8)	[82-84,86]	8 (9.1)
2010	5 (13.5)	[97-101]	7 (13.7)	[90-96]	12 (13.6)
Research situation					
Single medical school	30 (81.1)	[15,19,25,34,36,38,39,45-47,49-51,58,64-69,78-81,85,87,97-100]	40 (78.4)	[15,19,25,34,36,38,39,45-47,49-51,58,64-69,78-81,85,87,97-100]	70 (79.5)
Multiple medical school	5 (13.5)	[37,48,72,88,89]	10 (19.6)	[16,18,23,31,41,43,71,74,90,96]	15 (17.0)
Mixed school	2 (5.4)	[35,101]	1 (2.0)	[94]	3 (3.4)
Research design					
Cross-sectional study	35 (94.6)	[19,25,34-39,45-51,64-69,72,78-81,85,87-89,97-101]	35 (68.6)	[14,17-21,23,26-28,30-32,41-44,52-55,57,59,62,74-77,82,84,91-96]	70 (79.5)
Longitudinal study	2 (5.4)	[15,58]	16 (31.4)	[16,22,24,29,33,40,56,60,61,63,70,71,73,83,86,90]	18 (20.5)
Research method					
Questionnaire	33 (89.2)	[15,19,25,35,37-39,45-51,58,65-69,72,78,80,81,85,87-89,97-101]	49 (96.1)	[14,16-18,20-24,26,28-33,40-44,52-57,59-63,70,71,73-77,82-84,86,90-92,94-96]	82 (93.2)
Interview	2 (5.4)	[34,36]	2 (3.9)	[27,93]	4 (4.5)
Mixed	1 (2.7)	[64]	0	-	1 (1.1)
Observation	1 (2.7)	[79]	0	-	1 (1.1)

2. Analysis of study topics on medical student characteristics

Research trends of studies on medical student characteristics in Korea and overseas by topic are summarized, and mapped into physical health, mental health, psychological characteristics, cognitive characteristics, social characteristics, and career (Table 2). Most studies were on medical students' mental health, 30 from Korea and 34 from overseas. Among subtopics in mental health,

investigations on stress comprised most papers, 10 from Korea and 13 from overseas. Regarding subtopics of mental health, in Korea, there are no studies about anxiety, drugs, or suicide.

There were 18 studies on psychological features from Korea and five other countries from overseas, as well as 14 on cognitive attributes from Korea and nine countries from overseas, indicating that both areas were studied more in Korea. There were four studies in Korea on self-efficacy (a subtopic of psychological character-

Table 2. Categorization of Research Themes

Theme	Domestic	International	Total
Physical health	6	9	15
Health perception	-	2	2
Sleep	4	3	7
Drinking	-	2	2
Fatigue	1	-	1
Smoking	1	2	3
Mental health	30	34	64
Quality of life	4	1	5
Mental	1	2	3
Burn out	5	2	7
Anxiety	-	3	3
Stress	10	13	23
Substance	-	1	1
Depression	6	9	15
Suicide	-	3	3
Adjustment	3	-	3
Happiness	1	-	1
Affective	18	5	23
Empathy	2	1	3
Attribution	1	-	1
Self-efficacy	4	-	4
Ethical belief	1	-	1
Motivation	-	1	1
Personality	4	1	5
Perfectionism	1	-	1
Self-esteem	3	1	4
Ego resilience	1	-	1
Emotion intelligence	1	1	2

(Continued to the next page)

Table 2. (Continued)

Theme	Domestic	International	Total
Cognitive/learning	14	9	23
Performance goal	1	1	2
Drop out	3	1	4
Learning motivation	1	4	5
Learning style	1	3	4
Learning strategy	5	-	5
Learning attitude	3	-	3
Social	7	8	15
Interrelationship	4	1	5
Coping	1	2	3
Leadership	-	1	1
Social support	2	2	4
Professional behavior	-	2	2
Career	4	14	18
Family variable	-	1	1
Preference	1	8	9
Personality/trait	1	2	3
Entering motivation	-	3	3
Career value	1	-	1
Major satisfaction	1	-	1
Total	79	79	158

istics), four on personality, and three on self-esteem. As for the subtopics of cognitive traits, five studies were on learning strategies, three on learning attitudes, and three on flunking. Three studies in Korea and 14 overseas were on careers, showing that more overseas studies were about this topic.

3. Analysis of the results by topics regarding studies on medical student characteristics

Our analysis of the results and the study traits are presented based on subtopics that were frequently appeared in both Korea and overseas and are sorted into six research areas.

1) Analysis of the research results related to physical health

Studies about physical health covered topics such as health awareness, sleep, drinking, fatigue, and smoking. The quality of sleep was not favorable for medical

students in Korea or overseas [14,65]. The average hours of sleep on weekdays for medical students in both Korea and overseas was less than 6 hours, indicating that medical students are suffering lack of sleep. There were also cases in which the hours of sleep were 5 hours or less (27.8%) [32]. As for sleeping patterns, most students (95.3%) were either afternoon types or evening types and the latter kind was more common among male students [66]. A third of the students complained of daytime sleepiness [32]. The interesting thing about Korean medical students is that they sleep less but tend to have a higher quality of sleep as they move on to their later years in school [20,65]. There were no gender differences regarding hours of sleep, but that female students sleep longer on weekdays was shown, while male students sleep longer on weekends [65]. There is an extremely low rate of seeking counseling for lack of sleep, despite the many issues related to it. Only 13.5% of students

received counseling for sleeping pattern problems [20]. About two-thirds of medical students complained of fatigue, which is more frequent than general adults. There was no relevance between medical students and fatigue in terms of ages or genders [46]. As for drinking alcohol in overseas studies, at least 80% of students drank for 1 month, one-third of whom were involved in heavy drinking [54]. Fourteen percent of the students took part in hazardous drinking during their school years, and among those who showed severe drinking behaviors (since they were students), about one-fourth were also constantly involved in hazardous drinking, even after becoming doctors [16]. However, no studies in Korea have covered issues related to drinking alcohol. As for smoking, the ratio of smokers among graduate entry medical students was at least twice (25.9%) higher than those in the United States at 9% [65].

2) Analysis of the results related to mental health

Mental health was the most commonly covered issue in Korea and overseas, including topics such as stress, burnout, depression, anxiety, suicide, and quality of life. The key stress factors of medical students included academic achievement and excessive exams [35,44,60], excessive extracurricular activities, competition with fellow students and family matters [44], financial issues [60], changes in social life [35], experiencing a death [35], and marriage [60]. Some studies claim that female students suffer more from stress [88], while others maintain that male students suffer more [60]. Female students feel more stress in teaching-learning situations, interpersonal relations, and group activities [92], whereas male students show greater stress due to social expectations [60]. Subjective stress was higher for pre-medical school students and medical students than graduate-entry medical students [85]. By year, the studies showed inconsistent results, with some asserting that stress is greatest in the third year [29,52,80,92], and

others claiming that stress decreases as the year gets higher [60,68].

Academic stress is the main source of stress for medical students [44], about 56% of students constantly suffered from this [32]. This number decrease as the year gets higher [68,80]. Some studies show that academic stress is higher for first-year students [80], while others show that it is greater among higher-year students. Academic stress makes no difference according to gender and educational system [37].

As for burnout, at least one-fourth of graduate entry medical students in Korea experience a high level of it, which is lower than the United States but higher than the United Kingdom and Spain [25]. Female students show more emotional exhaustion [25,39], but there are no gender differences in some results [38,50]. Burnout is also linked with depression, poor grades, concerns flunking, academic self-efficacy, and the burden of one's studies [38,39,50].

Around 10% of medical students express symptoms of depression [73]. Twenty-eight percent score at least 16 points for risk of depression [29,31]. Male students show much more serious symptoms [30,63], with 2.2% exhibiting a severe level of depression [80]. Students that are flunked or took time off from school suffer greatly from psychological anxiety and depression [81]. Depression tends to decline as the year gets higher [63,73,80].

No study on suicide conducted in Korea is found. Medical students demonstrate a low level of suicide attempts in overseas studies, but suicidal ideation is high at 23% [30]. The ideation of suicide attempts is higher among females [43]. Students who tried to commit suicide the previous year tend to repeat and the ratio increase among students in the lower years [30].

3) Analysis of the results related to psychological (affective) characteristics

Studies on psychological characteristics cover topics

such as empathy, self-efficacy, personality, perfectionism, self-esteem, and motivation. There is a greater difference in psychological qualities based on educational system or gender rather than year.

Lower-year students show higher scores for empathy, while female students expressed higher empathic abilities in Korea and overseas [70]. Medical students have lower academic self-efficacy than non-medical students [19,101], academic self-efficacy is also linked with academic achievement [75]. Studies on personality types reveal that medical students mostly demonstrated remarkable results in terms of being introverted sensing thinking judging and extroverted sensing thinking judging according to the Myers-Briggs Type Indicator [69], and are focused on "body" with the highest rate of Type 9 in the Enneagram. In terms of mental state, about half (51.7%) of the students are stressed out [89]. Medical students have low positive expectations for themselves compared to non-medical students [101]. Compared with graduate entry medical students, they exhibit lower self-esteem and more narcissism, and tend to compare themselves with others more often [85].

4) Analysis of the study results related to cognitive characteristics (learning)

Studies on how medical students learn cover topics such as achievement goals, being held back, learning motives, and learning styles and strategies.

Regarding achievement goals, medical students show an average level of performance-approach goals, a slight tendency toward performance-avoidance goals, and a strong level of mastery-approach goals. Students with higher performance-approach and mastery-approach goals and lower performance-avoidance goals used more diverse learning strategies and performed best academically [47,53].

Males and smokers tend to have the experience of flunking and taking time off from school more [81].

According to a study in the United States, the average rate of discontinuing school is 0.55%. One-fourth (25.2%) of the students thought about discontinuing their studies and 44.1% of them considered this possibility very seriously. After flunking, students suffered from mental anxiety and expressed emotionally unstable mental conditions such as depression, paranoia, and neurotic tendencies [81,97].

As for learning motives of medical students, age is the most powerful predicting variable [95]. Learning motives were higher among graduate entry medical students than medical students and among females than males. This is closely linked with learning strategies or academic achievement [59,75]. In studies on learning styles, most medical students are divergers and assimilators shown in the Kolb's experiential learning cycle [91]. Moreover, their most preferred learning style is kinesthetic, followed by visual, auditory, and reading and writing. They also prefer a combined learning style instead of a single one [57].

Students claimed that the passive learning strategy that focused on memorization was natural in their 6 years of education. They tend not to ask many questions in class and limit the content and number of tasks by discussing them with fellow students [101]. Medical students with greater skills in learning strategies such as time management, test management, searching for data, writing reports, giving presentations, writing, and taking notes tend to exhibit higher enthusiasm for their studies, as well as higher academic stress and satisfaction in their department [87]. Graduate entry medical students tend to use more cognitive learning and time management approaches than medical students [99].

5) Analysis of the results related to social characteristics

Studies on the social characteristics of medical students cover topics such as interpersonal relations,

social support, and leadership. Medical students feel more comfortable when they work alone which is related to interpersonal relations. In other words, they feel it is difficult to solve problems if they have to discuss with others or could not share responsibilities, and feel uncomfortable with others when there are those who disagree with their opinions or criticizing their decisions [69]. Medical students show higher I-consciousness than We-consciousness compared to non-medical students. However, females express greater We-consciousness, which indicates that they place greater emphasis on personal relationships. Furthermore, students with high I-consciousness have more issues with interpersonal relations such as apathy, social avoidance, nonassertiveness and adaptability, and the desire for social acknowledgement [100].

Medical students consider their professors as superiors or targets of obedience that are challenging to deal with, and perceive the senior-junior relationship as a hierarchical one [101]. Thus, they do not consider professors or friends as someone they can seek advice from, which affected their satisfaction with school or adjustment [36]. Parents provided most of the social support for medical students, while not a single student thought of their professors as a source of social support [68,96]. Future research is needed on leadership, as there is currently none in Korea.

6) Analysis of the results related to career

Studies on the careers of medical students cover topics such as factors affecting career choices, preferred medical specialty field, motivation for entering school, and occupational values. Familiar attributes are involved in the motivation for entering medical school [22]. Students have a mixed motivation of altruistic (to help others) and intellectual reasons (interest in the study of medicine); the drive for career choices become stabilized in the students' course of study at their respective

medical schools [22]. Postgraduation career choices become more specified as they move on to the later years of their education [18,33]. Higher-year students tend to make choices on their medical specialty field by considering clerkships, the learning environment, the risks of legal action, and income [55]. The difference in occupational values were different depending on their educational system, gender, and preferred medical specialty field [48].

Discussion

In this study, we examined research trends of the papers in domestic and foreign, analyze study topics and based on those we intended to establish the future research direction. Based on the results of our analysis, authors activate studies about medical student characteristics. We discussed medical school curricula and student support program development in three aspects. First, in terms of methods, most studies were cross-sectional ones targeting a single medical school. In particular, Korea seriously lacked longitudinal studies in this field. Despite the remarkable recent increase in investigations on medical students [9], it is still necessary to seek changes and diversities in terms of research methods compared to overseas researches. Multiple universities need to conduct joint researches to increase the number of samples, and explore constant changes in the research subjects through longitudinal studies.

Most studies in Korea and overseas employed surveys to gather data, while data collection methods such as interviews or observations were limited to a few investigations. Quantitative research faces limitations in terms of understanding the characteristics of medical students. Recently, qualitative research has been on the rise as an alternative in order to overcome the limitations of

quantitative research based on surveys [102]. However, the results of this paper show that qualitative research is not yet activated in the field of medical education studies. Since there are issues in generalizing the results of quantitative research from a specific research situation to other circumstances with different sociocultural contexts, it is necessary to use various methods by taking the reality of each situation into account [103]. As such, contemplating various research approaches (such as longitudinal studies and qualitative research) is a good way to minimize the limitations of generalizing study outcomes. Moreover, researchers who explore medical education must make joint efforts to establish a research environment and system to promote these techniques.

Second, topics about medical students' mental health were frequently looked into in Korea and overseas; most were about stress. This indicates that medical students face many mental obstacles in pursuing their education. Since issues of medical students' mental health can affect their studies as well as their medical behaviors (even after they become doctors). These matters are considered more important and will continue to remain a key research area in the future. However, studies in Korea did not cover drinking, smoking, drugs, or suicide at all; this may reflect cultural differences. Since these topics can be discovered in the qualitative studies such as in the process of interviewing students about students' mental health issues, it is necessary for Korean academic to pay more attention to these matters.

While there are many studies on psychological and cognitive characteristics in Korea, overseas investigations focus more on career; this shows a clear difference in research topics between the two. Studies on psychological and cognitive traits have been implemented in Korea before to develop teaching methods considering the attributes of graduate entry medical students when the system of graduate entry medical schools was

implemented. In the future, it will be necessary to execute more studies that reveal the features of medical students by diversifying the subjects and comparatively interviewing medical and non-medical students alike. Subtopics of psychological or cognitive characteristics are factors with theoretically high correlation, but there is still enough research that comprehensively covers the relevance among these elements. There must be more in-depth studies on the causal relations among multiple subtopics based on pedagogical theories. Furthermore, since, after graduating medical school, careers are considered a major stress factor for Korean students [104], this matter must be covered more seriously.

Third, it is necessary to conduct more studies that develop various student support programs by considering the attributes of medical students and analyzing their effects after the program. Most papers suggested the needs to expand development of student support programs such as academic and life counseling, psychological support, career guidance, mentoring, and learning consulting [19,20,32,33,35,36-38,46,50,63,64,68,69,87,88,90]. The articles we reviewed lacked research that actually implemented and validated such programs. It is necessary to build up these programs to help students overcome the difficulties they face in terms of their physical and mental health, psychological characteristics, academic features, interpersonal relations, and career, which are key topics of research in our study. Furthermore, students must be able to utilize these programs actively in formal education as well as their extracurricular courses. In other words, there must be a support system based on empirical results so that we can determine suitable measures for students who cannot receive help from schools or professors, and who have issues relating to their physical health or their studies. The ultimate outcome must not just be research, but lead to genuine results so that medical students can enjoy a satisfying school life and contribute to the

development of medical education.

We searched out for papers published in journals in Korea or overseas using leading article databases; however, there remains a possibility that some articles may have been omitted. However, our study is significant in that we attempted to conduct a scoping review of extensive literature from Korea and overseas. In addition, our study provides insights into the current state and future directions of research for scholars who want to explore the characteristics of medical students. We anticipate this will promote follow-up studies on the attributes of medical students and lead to the ongoing publication of high-quality investigations, thereby enriching basic data for student education.

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Acknowledgements: None.

Funding: This research was supported by the Korean Society of Medical Education and Korean Association of Medical Colleges.

Conflicts of interest: None.

Author contributions: SSSJ: conception or design of the work, data collection, data analysis and interpretation, drafting the article; KHP: conception or design of the work, data collection, data analysis and interpretation, drafting the article, critical revision of the article, final approval of the version to be published; HRR: conception or design of the work, data interpretation; SJY: conception or design of the work, data interpretation; GHL: conception or design of the work, data inter-

pretation; KHC: conception or design of the work, data interpretation.

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