Correlation between medical student empathy and a Korean nationwide comprehensive clinical assessment score at a medical school in Korea

Min Kyu Jung, MD, PhD, Sanghee Yeo, PhD, Won Kee Lee, PhD

Abstract
Empathy is the ability to understand and communicate a patient’s situation, perspective, and feelings. When demonstrated by healthcare professionals, this can improve patient adherence, satisfaction, and treatment outcomes. Empathic students have stronger affective skills and can acquire, develop, reinforce, and display strong affective behaviors, abilities, and attitudes.

We measured student empathy using the Student Version of the Jefferson Scale of Empathy (JSE-S) and assessed 3-year sequential clinical comprehensive assessment scores conducted by the Korean Medical Education Assessment Corporation to determine the relationship between JSE-S and clinical comprehensive assessment scores.

The study population comprised of 80 males (74%) and 28 females (26%), among which 38 (35%) and 62 (67%) students wanted to become private physicians and attending faculty, respectively. Regarding future majors, 58 students (54%) considered medical fields, whereas 40 students (37%) considered surgical fields. No significant differences in Korean JSE-S were observed according to medical student gender, career aspirations, or future major fields.

The modified Korean version of the JSE-S has 18 items. Item-total score correlations and Cronbach α evaluated the internal consistency reliability of the scale. The reliability of the Korean JSE-S was 0.910 by Cronbach α coefficient.

Female students had better scores than males. Students who wanted to be an attending faculty had better scores than others who wanted to be private physicians; however, these findings were not statistically significant. Significantly higher scores were seen among students aspired to work in the medical field (65.6 ± 8.8) versus in the surgical field (60.4 ± 8.2) in their 5th year (P < .01).

We were unable to show the positive correlations between the empathy scale and comprehensive assessment results. Among female medical students, comprehensive assessment results were inversely correlated with empathy toward the patient, but this was not statistically significant.

The modified Korean JSE-S has acceptable reliability. Every student had a better comprehensive assessment after studying the medical curriculum between the 4th and 6th years. The current nationwide assessment tool does not measure student empathy.

A list of abbreviations: JSE-S = Student Version of the Jefferson Scale of Empathy, KAMC = Korea Association of Medical Colleges, KNUSM = Kyungpook National University School of Medicine, MEAC = Medical Education Assessment Corporation

Keywords: empathy, medical education, educational measurement, emotional intelligence

1. Introduction
Empathy is the ability to understand and communicate a patient’s situation, perspective, and feelings. Empathy plays an important role in a positive physician–patient relationship, wherein patient satisfaction can contribute to optimal clinical outcomes. Because of this, medical education has always valued empathy as an essential professional attribute of physicians. However, recent studies have found that empathy scores decline in medical school. Unfortunately, current medical education focuses more on detachment and objectivity rather than on the physician-patient relationship.

Empathy for the patient could motivate students to study hard in order to take care of their own patients, as well as their clinical curiosity to solve the patients’ problems. It can be a very strong motive to learn about clinical diseases.
The Student Version of the Jefferson Scale of Empathy (JSE-S) was specifically developed as a self-reported scale for assessing empathy in medical students.\[^{[7]}\] The JSE-S includes 20 items that measure 3 underlying empathy constructs (i.e., perspective taking, compassionate care, and standing in patient’s shoes) that have been proven to have good psychometric properties.\[^{[7–9]}\] In South Korea, the Korean JSE-S is used to measure empathy toward patients.\[^{[10–12]}\] After a statistical item analysis, 2 items were not deemed useful because of Korean cultural influences.\[^{[12]}\] This study used the 18 items from the original Korean JSE-S.\[^{[12]}\]

Korea has 40 medical schools with approximately 3000 students. Each medical school voluntarily participates in the Korea Association of Medical Colleges (KAMC). The KAMC supports the Medical Education Assessment Corporation (MEAC) as they handle the clinical comprehensive assessment twice a year since 2009. In fact, 40 medical schools have used these assessments to identify students with learning difficulties.

We tried to evaluate the correlation between students’ empathy and clinical competence to solve the patients’ problems. This study aimed to determine the relationship between Korean JSE-S and clinical comprehensive assessment scores from the MEAC.

## 2. Participants and Procedures

A total of 108 medical students in South Korea participated in this cross-sectional study conducted in May 2020. The study participants were 6th-year medical students enrolled in the 6-year medical course at Kyungpook National University School of Medicine (KNUSM). We also assessed future career aspirations. The response rate was 99%. The demographic data of all students and respondents are presented in Table 1. Clinical comprehensive assessments were performed 4 times: in November 2018, November 2019, August 2020, and December 2020. This study was approved by the Institutional Review Boards of Kyungpook National University. All methods were carried out in accordance with relevant institutional and national guidelines and regulations for human research standards. Informed consent was obtained from all participants, who were over 16 years of age.

The medical curriculum at KNUSM is comprised of 3 years of preclinical work followed by 3 years of clinical work. Major clinical rotations are scheduled during the 5th year, while minor clinical rotations happen during the 6th year. The curriculum at KNUSM is typical of most medical schools in South Korea and similar to those in the United States and Canada. However, unlike the United States and Canada where medical schools are graduate schools, most Korean medical schools are undergraduate schools. A 4-year medical curriculum is preceded by a 2-year premedical course, totaling 6 years of medical training. Therefore, Korean medical students are likely to be younger than US/Canadian medical students.

### 2.1. Study Questionnaire

The Korean JSE-S was used to measure physician empathy.\[^{[10–12]}\] A standard back-translation procedure was performed. The JSE-S was translated into Korean, then back-translated into English. Korean and English language specialists reevaluated the accuracy of the translation. The Korean-translated version was a self-reported questionnaire consisting of 18 items with a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree), including 8 reverse items scored from 1 (strongly agree) to 7 (strongly disagree). The original version has 20 items. However, 2 (items 18 and 19) were excluded in this measurement tool as they were considered inappropriate for cultural reasons, resulting in a final total of 18 items.\[^{[10–12]}\] The modified Korean version of the JSE-S has 18 items with the following 3 components: “perspective taking” (items 2, 4, 5, 9, 10, 13, 15, 16, 17, and 20); “compassionate care” (items 1, 7, 8, 11, 12, and 14); “standing in patient’s shoes” (items 3 and 6).\[^{[12]}\]

The total score was obtained by summing all items (maximum score = 126), where higher values indicated a higher degree of empathy.

We evaluated 3-year sequential clinical comprehensive assessment scores from written tests, with similar results to the Korean Medical Licensing Examination. The KAMC has been united to guide all medical school to build up the minimal requirements of medical education. It supports the MEAC when they carry out the comprehensive assessment, which consisted of 109 physician encounter situations. These include approaches to jaundice, chest pain, abdominal discomfort, headache, vaccination, weight loss, diarrhea, constipation, menorrhagia, and other clinical presentations. The clinical comprehensive assessment has been conducted twice a year since 2009. In 2019, a total of 10,357 students across 40 medical schools were tested. In KNUSM specifically, total of 108 medical students have taken the examination in their 4th, 5th, early- 6th, and late- 6th years of medical school.

### 2.2. Statistical Analyses

The mean JSE-S scores were compared using ANOVA or independent t-test. In cases of significance following ANOVA, post hoc comparisons were analyzed using the Tukey–Kramer method. Correlations between empathy and comprehensive assessment results were calculated via Pearson correlation coefficient. Tool reliability was evaluated via Cronbach’s α. SAS 9.4 (SAS Institute Inc., Cary, NC, USA) was used for the statistical analyses. P-values <0.05 were considered statistically significant.

### 3. Results

This study population comprised of 80 males (74%) and 28 females (26%). Among them 38 students (35%) wanted to become private physicians, while 62 (57%) wanted to become attending faculty. Regarding future majors, 58 students (54%) were interested in medical fields, whereas 40 students (37%) were interested in surgical fields. However, no significant differences in Korean JSE-S scores were observed between those with medical student gender, career aspirations, or future major fields (Table 1).

The modified Korean version of the JSE-S has 18 items with the following 3 components: “perspective taking”, “compassionate care”, “standing in patient’s shoes”.\[^{[12]}\] The 3-component Korean JSE-S is not different according to the basic characteristics (Table 2).

---

**Table 1**

| Characteristic   | Frequency (%) | JSE-S score* |
|-----------------|--------------|--------------|
| Sex             |              |              |
| Man             | 80 (74.1)    | 92.7 ± 14.4  |
| Woman           | 28 (25.9)    | 91.2 ± 12.0  |
| Career aspirations |            |              |
| Private physician | 38 (35.2)   | 93.7 ± 13.5  |
| Attending faculty | 62 (57.4)   | 91.7 ± 13.7  |
| Others          | 8 (7.4)      | 89.8 ± 16.3  |
| Future major    |              |              |
| Medical         | 58 (53.7)    | 90.0 ± 13.2  |
| Surgical        | 40 (37.0)    | 95.3 ± 14.0  |
| Others          | 10 (9.3)     | 93.6 ± 14.8  |

JSE-S, Student Version of the Jefferson Scale of Empathy.

*Mean ± SD.
Compassionate care

Table 2

| Characteristic        | Standing in patient's shoes | Compassionate care | Perspective taking | Total       |
|-----------------------|-----------------------------|--------------------|-------------------|-------------|
|                       | Mean ± SD                   | t/F                | p                 | Mean ± SD   | t/F   | p     | Mean ± SD | t/F | p     |
| Gender                |                             |                    |                   |             |       |       |          |     |       |
| Man                   | 8.4 ± 2.3                   | -0.92              | 0.362             | 30.1 ± 6.3   | 1.08   | 0.283 | 54.3 ± 8.5 | 0.25 | 0.8   | 92.7 ± 14.4 | 0.49 | 0.627 |
| Woman                 | 8.5 ± 2.4                   |                    |                   |             |        |       |          |     |       | 91.7 ± 12.0 |
| Career aspirations    |                             |                    |                   |             |       |       |          |     |       | 93.7 ± 13.5 | 0.37 | 0.692 |
| Private physician     | 8.7 ± 2.4                   | 0.98               | 0.379             | 30.3 ± 6.0   | 0.33   | 0.722 | 54.7 ± 8.8 | 0.4  | 0.674 | 93.7 ± 13.5 | 0.37 | 0.692 |
| Attending Faculty     | 8.2 ± 2.3                   |                    |                   |             |        |       |          |     |       | 91.7 ± 13.7 |
| Others                | 9.3 ± 2.3                   |                    |                   |             |        |       |          |     |       | 89.8 ± 16.3  |
| Future major          |                             |                    |                   |             |       |       |          |     |       |             |     |       |
| Medical               | 8.3 ± 2.2                   | 0.44               | 0.648             | 28.7 ± 6.1   | 2.02   | 0.138 | 53.0 ± 8.2 | 1.26 | 0.289 | 90.0 ± 13.2 | 1.82 | 0.167 |
| Surgical              | 8.7 ± 2.5                   |                    |                   |             |        |       |          |     |       | 95.3 ± 14.0 |
| Others                | 8.7 ± 2.8                   |                    |                   |             |        |       |          |     |       | 93.6 ± 14.8 |

Table 3

| Characteristic        | Cronbach coefficient alpha |
|-----------------------|----------------------------|
|                       | Raw                        | Standardized       |
|                       | 0.901                      | 0.91              |

| Deleted variable | Correlation with total | Alpha | Correlation with total | Alpha |
|------------------|------------------------|-------|------------------------|-------|
| Item 1           | 0.322                  | 0.908 | 0.312                  | 0.913 |
| Item 2           | 0.628                  | 0.894 | 0.653                  | 0.903 |
| Item 3           | 0.547                  | 0.896 | 0.53                   | 0.907 |
| Item 4           | 0.652                  | 0.893 | 0.673                  | 0.903 |
| Item 5           | 0.406                  | 0.9    | 0.427                  | 0.909 |
| Item 6           | 0.303                  | 0.903 | 0.276                  | 0.914 |
| Item 7           | 0.627                  | 0.893 | 0.602                  | 0.905 |
| Item 8           | 0.66                   | 0.892 | 0.639                  | 0.904 |
| Item 9           | 0.682                  | 0.892 | 0.704                  | 0.902 |
| Item 10          | 0.391                  | 0.894 | 0.619                  | 0.904 |
| Item 11          | 0.622                  | 0.891 | 0.668                  | 0.903 |
| Item 12          | 0.643                  | 0.892 | 0.621                  | 0.904 |
| Item 13          | 0.807                  | 0.889 | 0.829                  | 0.898 |
| Item 14          | 0.205                  | 0.806 | 0.192                  | 0.916 |
| Item 15          | 0.479                  | 0.898 | 0.497                  | 0.908 |
| Item 16          | 0.742                  | 0.891 | 0.769                  | 0.9    |
| Item 17          | 0.667                  | 0.892 | 0.689                  | 0.902 |
| Item 18          | 0.6                    | 0.894 | 0.629                  | 0.904 |

JSE-S, Student Version of the Jefferson Scale of Empathy.
P value was the result of a t-test or ANOVA (analysis of variance).

Item-total score correlations and Cronbach α were used to evaluate the internal consistency reliability of the scale. The reliability of the Korean JSE-S was 0.910 by Cronbach α coefficient (Table 3), and the level of reliability was acceptable.

In general, female students had better scores than males (Table 4). Students who wanted to be an attending faculty also had better scores than others who wanted to be a private physician (Table 4). However, these findings were not statistical significant. On the other hand, students who aspired to work in the medical field (65.6 ± 8.8) had significantly higher scores than those who aspired to work in the surgical field (60.4 ± 8.2) when they were in their 4th year (P < .01). This trend was also seen in the 4th year (48.0 ± 9.0 vs 44.9 ± 8.2), early 6th year (79.1 ± 8.1 vs 75.5 ± 8.6), and late 6th year (78.3 ± 8.5 vs 74.8 ± 7.7), but these findings were not statistically significant. Students generally had better comprehensive assessment scores in their 6th year versus in their 4th year (Table 4). Students interested in medical fields achieved better results than those interested in surgical or other fields. Among female medical students, comprehensive assessment results were inversely correlated with empathy toward the patient, but this was not statistically significant (Table 5).

4. Discussion

This study utilized item-total score correlations and Cronbach α to evaluate the internal consistency reliability of the Korean JSE-S. This had a reliability of 0.910 by Cronbach α coefficient despite including only 18 items. All students had better comprehensive assessment scores in their 6th year compared to in their 4th year. Students interested in medical fields achieved better results than those interested in surgical or other fields. Among female medical students, comprehensive assessment results were inversely correlated with empathy toward the patient. However, we were unable to determine positive correlations between the empathy scale and comprehensive assessment results.

The Korean JSE-S appeared to have good quality and satisfactory factorial validity. Factor analyses confirmed that the Korean JSE-S had a 3-component figure structure comparative to that of the initial English version. Two items (items 18 and 19) were excluded from the original 20 items in the measurement tool used in this study since these were considered inappropriate for cultural reasons. However, the modified Korean JSE-S also had positive and statistically significant item-total score correlations, demonstrating that the direction of scoring was correct for all items, and each item significantly contributed to the total score. These results affirm that the Korean JSE-S is a valuable tool for surveying empathy in Korean medical students and can be used to recognize significant components for effective empathy education in future studies. A previous study reported a Cronbach α coefficient of 0.84, but the present study had a Cronbach α coefficient of 0.910, demonstrating its reliability despite including only 18 items.

The previous empathy scores of KNUSM students in 2014 and 2015 were remarkable different from those in 2020.
The empathy scores were higher than previous (92 vs 78), there was no clear explanation how the students improved their empathy scores. However, KNUSM adopted (1) a clinical communication skill program, which improved students' patient communication skills, as well as (2) a patient-physician relationship program, which improved their understanding and thinking as the patient's view in the clinical skill center. Nonetheless, the JSE-S scores of Korean medical students were lower than those of American, Mexican, and Polish students after adjusting the total score.[9,14,15] Cross-cultural differences in standards, ethnicity, devout convictions, and sex stereotyping can influence empathic engagement in clinical situations. Asians are suggested to have a more collectivistic and less individualistic social culture than Westerners.[16] Furthermore, Asian physicians also tend to adopt a more paternalistic role within the physician–patient relationship. Such sociocultural characteristics that extend to general medical practice in Asia may contribute to patients being less self-assured and physicians becoming more dictatorial. Potentially, this can result in a less patient-centered and empathic approach by such physicians. Previous studies have proposed that individual medical college cultures can also influence medical students' empathy,[17] similar to the findings of our study.

| Table 4 | Korean nationwide clinical comprehensive assessment results according to basic characteristics. |
|---------|---------------------------------------------------------------------------------------------|
|         | 4th year | 5th year | Early 6th | Late 6th |
|         | Mean ± SD | t/F | P | Mean ± SD | t/F | P | Mean ± SD | t/F | P | Mean ± SD | t/F | P |
| Gender  | Man | 45.9 ± 9.3 | -1.69 0.096 | 62.7 ± 9.5 | -0.73 0.467 | 77.0 ± 8.8 | -0.94 0.35 | 76.0 ± 8.2 | -1.06 0.291 |
|         | Woman | 48.6 ± 6.5 | 1.68 0.191 | 64.2 ± 8.4 | 0.5 0.609 | 78.9 ± 9.4 | 1.93 0.15 | 76.2 ± 8.2 | 1.63 0.166 |
| Career aspirations | Private physician | 45.0 ± 7.1 | 0.5 0.609 | 62.3 ± 9.2 | 0.5 0.609 | 77.5 ± 9.0 | 1.93 0.15 | 77.4 ± 7.8 | 1.93 0.15 |
|         | Attending faculty | 47.9 ± 8.7 | 0.5 0.609 | 63.8 ± 8.6 | 0.5 0.609 | 78.3 ± 8.1 | 1.93 0.15 | 71.4 ± 13.9 | 1.93 0.15 |
|         | Others | 44.3 ± 14.0 | 0.5 0.609 | 61.4 ± 13.4 | 0.5 0.609 | 71.7 ± 13.9 | 1.93 0.15 | 71.4 ± 13.9 | 1.93 0.15 |
| Future major | Medical | 48.0 ± 9.0 | 0.5 0.609 | 65.6 ± 8.2 | 0.5 0.609 | 79.1 ± 9.1 | 2.01 0.14 | 78.3 ± 8.5 | 2.71 0.071 |
|         | Surgical | 44.9 ± 8.2 | 0.5 0.609 | 60.4 ± 8.2 | 0.5 0.609 | 75.5 ± 8.6 | 2.71 0.071 | 74.8 ± 7.7 | 2.71 0.071 |
|         | Others | 45.7 ± 8.4 | 0.5 0.609 | 59.7 ± 11.8 | 0.5 0.609 | 76.5 ± 8.5 | 2.71 0.071 | 73.7 ± 10.0 | 2.71 0.071 |

P-value was the result of a t-test or ANOVA (analysis of variance). The superscripted character was the result of the Tukey's post hoc comparison.

Table 5: Correlation between the empathy and comprehensive assessment results according to basic characteristics.

| Basic characteristics | School year | Standing in patient's shoes | Compassionate care | Perspective taking | Total |
|-----------------------|-------------|-----------------------------|--------------------|--------------------|-------|
| Total                 | 4th | 0.025 | 0.111 | 0.048 | 0.084 |
|                       | 5th | 0.068 | 0.145 | -0.101 | 0.016 |
|                       | Early 6th | -0.013 | 0.024 | -0.093 | -0.048 |
|                       | Late 6th | -0.014 | 0.029 | -0.109 | -0.055 |
| Gender                | Man | 4th | -0.06 | 0.095 | 0.09 | 0.085 |
|                       | 5th | -0.111 | 0.067 | -0.064 | -0.031 |
|                       | Early 6th | -0.09 | 0.036 | 0.022 | 0.014 |
|                       | Late 6th | -0.123 | 0.03 | 0.016 | 0.003 |
|                       | Woman | 4th | 0.309 | 0.269 | -0.115 | 0.122 |
|                       | 5th | 0.626* | 0.474* | -0.221 | 0.22 |
|                       | Early 6th | 0.17 | 0.018 | -0.418* | -0.238 |
|                       | Late 6th | 0.234 | 0.057 | -0.444* | -0.223 |
| Career aspirations    | Private physician | 4th | 0.366* | 0.367 | -0.19 | 0.092 |
|                       | 5th | 0.242 | 0.322 | -0.195 | 0.049 |
|                       | Early 6th | 0.183 | 0.066 | -0.153 | -0.039 |
|                       | Late 6th | 0.242 | 0.189 | -0.069 | 0.081 |
|                       | Attending faculty | 4th | 0.006 | 0.125 | 0.164 | 0.155 |
|                       | 5th | 0.049 | 0.15 | 0.02 | 0.092 |
|                       | Early 6th | 0.005 | 0.084 | 0.107 | 0.103 |
|                       | Late 6th | -0.024 | 0.043 | 0.024 | 0.03 |
|                       | Others | 4th | -0.585 | -0.276 | -0.363 | -0.394 |
|                       | 5th | -0.324 | -0.468 | -0.364 | -0.419 |
|                       | Early 6th | -0.599 | -0.572 | -0.836† | -0.783† |
|                       | Late 6th | -0.582 | -0.65 | -0.837† | -0.806* |
| Future major          | Medical | 4th | 0.095 | 0.201 | 0.138 | 0.195 |
|                       | 5th | 0.152 | 0.254 | 0.06 | 0.18 |
|                       | Early 6th | 0.023 | 0.003 | -0.125 | -0.079 |
|                       | Surgical | 4th | 0.006 | 0.042 | -0.124 | -0.057 |
|                       | 5th | -0.153 | 0.049 | -0.054 | -0.04 |
|                       | Early 6th | -0.094 | 0.18 | 0.108 | 0.115 |
|                       | Late 6th | -0.077 | 0.14 | 0.082 | 0.087 |
|                       | Others | 4th | 0.654* | 0.367 | -0.064 | 0.309 |
|                       | 5th | 0.596 | 0.31 | -0.544 | -0.06 |
|                       | Early 6th | 0.298 | 0.015 | -0.317 | -0.148 |
|                       | Late 6th | 0.260 | -0.010 | -0.311 | -0.166 |

*P < .05.
†P < .01.
Clinical comprehensive assessment scores conducted by the Korean MEAC at every Korean medical school are typically used to evaluate the ability of medical students to perform physician encounters. The test is held at most Korean medical institutes twice a year. Thus, it represents a well-established, nationwide assessment tool for medical students. However, in this study, the written test results did not reflect students’ empathy toward patients despite the ability of the test to differentiate talented from underachieving students.

KNUSM is a typical medical school in Korea that demands high student competence, fosters high levels of competitiveness among colleagues, and emphasizes research and charitable care. Such institutional characteristics may have been a contributing factor to the low empathy scores of students enrolled in this study. Indeed, empathy scale results were found to be inversely correlated with the assessment results among female medical students. This finding may be due to the excessive study load, a lack of time, and an educational environment that emphasizes objective and scientific-based thought and reasoning.[1]

Women have greater empathy than men, possibly as they esteem interpersonal relationships and have a more thoughtful understanding of emotions and caring attitude in many studies.[2,3,4] Moreover, women outscored men in a US physician study of empathy, in spite of the fact that the difference observed was not statistically significant.[5] On the other hand, there was no difference between female and male medical students and dentistry students in a Polish study.[6,7] In contrast, the present study showed that female students had lower empathy scores than male students, although the difference was not statistically significant.

This study has some limitations. First, the survey was conducted at a single medical school in Korea, which possibly limits the generalization of our results to Korean medical students. However, the medical educational program in KNUSM is common among most medical schools in South Korea. The Korean students also have a single ethnicity and similar educational background. Thus, our results could be generalized to other Korean medical schools in this aspect. Second, we utilized only a self-rating of empathy. Despite the fact that the JSE is reported to be well-correlated with observer ratings, self-reported results may have been subjected to biases and inconsistencies between self-reflection and actual behavior.[8] Third, this study didn’t conduct longitudinally. However, it was follow up study of every student who sent the agreement of participation in this study. We reviewed the student’s clinical comprehensive assessment score when they were 4th year. We evaluated the student’s Korean JSE-S and their clinical comprehensive assessment score when they were 5th year. One year later we checked their clinical comprehensive assessment score when they were 6th year. Their clinical comprehensive assessment score with Korean JSE-S were compared. Future studies are required to explain the role of culture and the impact of the medical educational programs on empathy.

The findings of this study demonstrate that empathy scale scores do not correlate with clinical comprehensive assessment scores. All Korean medical institutes emphasize teaching emotional intelligence and skills, including communicating and sympathizing with one another, but there is currently a lack of tools for assessing empathy. In these circumstances, a student may neglect the importance of ethics and empathy toward a patient. With medicine becoming increasingly dependent on artificial intelligence, current and future medical students will need to achieve high levels of empathy and emotional intelligence, which cannot be fully comprehended or substituted by artificial intelligence. Accordingly, there is a need to develop assessment tools to evaluate empathy and emotional intelligence among medical students.

Authors’ contributions
As the corresponding author Min Kyu Jung designed and conducted this study and wrote the entire manuscript. Sanghee Yeo contributed to the study design and assisted with manuscript preparation. Won Kee Lee prepared data tables and performed statistical analyses. All authors reviewed the manuscript.

References
[1] Bellini LM, Shea JA. Mood change and empathy decline persist during three years of internal medicine training. Acad Med. 2005;80:164–7.
[2] Glaser KM, Markham FW, Adler HM, et al. Relationships between scores on the jefferson scale of physician empathy, patient perceptions of physician empathy, and humanistic approaches to patient care: a validity study. Med Sci Monit. 2007;13:CR291–4.
[3] Yuguo O, Forne C, Esquerda M, et al. Empathy and burnout of emergency professionals of a health region: a cross-sectional study. Medicine (Baltim). 2017;96:e8030.
[4] Lown BA, Chou CL, Clark WD, et al. Caring attitudes in medical education: perceptions of deans and curriculum leaders. J Gen Intern Med. 2007;22:1514–22.
[5] Dzieker RA, Michielute R. An analysis of empathy in medical students before and following clinical experience. J Med Educ. 1981;56:1004–10.
[6] Hojat M, Mangione S, Nasca TJ, et al. An empirical study of decline in empathy in medical school. Med Educ. 2004;38:934–41.
[7] Hojat M, Gonnella JS, Mangione S, et al. Empathy in medical students as related to academic performance, clinical competence and gender. Med Educ. 2002;36:522–7.
[8] Hojat M, Gonnella JS, Nasca TJ, et al. The jefferson scale of physician empathy: further psychometric data and differences by gender and specialty at item level. Acad Med. 2002;77:10 Suppl:S58–60.
[9] Hojat M, Gonnella JS, Nasca TJ, et al. Physician empathy: definition, components, measurement, and relationship to gender and specialty. Am J Psychiatry. 2002;159:1563–9.
[10] Roh MS, Hahm BJ, Lee DH, et al. Evaluation of empathy among Korean medical students: a cross-sectional study using the Korean version of the jefferson scale of physician empathy. An investigation on reliability and validity of the Korean medical students’ empathy rating scale. Teach Learn Med. 2010;22:1679–17115.
[11] Yu J, Lee S, Kim M, et al. Relationships between perspective-taking, empathic concern, and self-rating of empathy as a physician among medical students. Acad Psychiatry. 2020;44:316–9.
[12] Yoo S. Differences and changes in the empathy of Korean medical students according to gender and vocational aptitude, before and after clerkship. Korean J Med Educ. 2019;31:343–53.
[13] Suh DH, Hong JS, Lee DH, et al. The jefferson scale of physician empathy: a preliminary psychometric study and group comparisons in Korean physicians. Med Teach. 2012;34:466–9.
[14] Klaszcz J, Nowicka-Sauer K, Trzciak B, et al. Empathy in health care providers—validation study of the polish version of the jefferson scale of empathy. Adv Med Sci. 2006;51:219–25.
[15] Mocny-Pachonska K, Lanowy P, Trzciakonka A, et al. Gender related changes of empathy level among polish dental students over the course of training. Medicine (Baltim). 2020;99:e18470.
[16] Morling B, Lamoreaux M. Measuring culture outside the head: a meta-analysis of individualism-collectivism in cultural products. Pers Soc Psychol Rev. 2008;12:199–221.
[17] West CP, Shanafelt TD. The influence of personal and environmental factors on professionalism in medical education. BMC Med Educ. 2007;7:29.
[18] Chen D, Lew R, Hershman W, et al. A cross-sectional measurement of medical student empathy. J Gen Intern Med. 2007;22:1434–8.
[19] Thomas MR, Dyrynb LN, Huntington JL, et al. How do distress and well-being relate to medical student empathy? A multicenter study. J Gen Intern Med. 2007;22:177–83.