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Emotional Intelligence Instruments Used in Health Care Education

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ABSTRACT

Background: This article aims to describe the content and the psychometric properties of emotional intelligence instruments used in health care education and to examine the relationship between emotional intelligence and study success. Method: Six electronic databases were searched in spring 2020. Two researchers participated in the selection and quality assessment of the articles. Ultimately, 26 articles were included in the review. Results: From the included articles, 18 emotional intelligence instruments were identified. The content of the instruments focused on perception of emotions, understanding of emotions, emotional expression, managing emotions, using emotions, and social awareness and relations. In most of the studies, emotional intelligence was related to study success. Conclusion: The assessment of several important components of emotional intelligence was identified. Comprehensive assessment using the emotional intelligence total score seemed to be the best predictor of study success. [J Nurs Educ. 2022;61(1):6-11.]

Emotional intelligence (EI) is a set of skills that includes the appraisal, expression, and regulation of emotions as well as the ability to use feelings (Salovey & Mayer, 1990). EI is important in health care education because students engage in clinical practice early on in their studies. EI buffers stress and improves students' nursing performance in clinical practice (Lewis et al., 2017), suggesting that EI skills are needed to cope in emotionally challenging environments (Bulmer Smith et al., 2009; Lewis et al., 2017; McCloughen & Foster, 2018). Student selection is an important part of health care education. It should enable the selection of future health care professionals with commitment and resources to their studies and profession. In their study, Talman et al. (2018) found that nursing students enter their studies with varying emotional intelligence skills. This result indicates that there might be an increased risk for emotional exhaustion among applicants with low EI skills.

Success in health care education can be defined as successful academic performance (e.g., grade point average, end of year marks, course/examination grades), study progress (e.g., timely graduation and retention), and clinical performance (e.g., clinical practice examination/grade, clinical assessment). It is evident from previous literature that the relationship between EI and study success has been researched. According to the results, EI has been reported to have a positive impact on the overall academic performance of health care students (Beauvais et al., 2014; Naeem et al., 2014). Interestingly, it seems, that there are only a few studies that have included the assessment of EI in health care student selection. Studies on health care student selection have mainly focused on the assessment of traditional skills such as mathematics and problem solving (Hughes, 2002; Talman et al., 2018), even though skills such as EI are also recognized as important (Bulmer Smith et al., 2009) as they affect student success (MacKenzie et al., 2017). Furthermore, the assessment of EI has recently been identified as an important part of student selection for nursing (Haavisto et al., 2019).

In the literature, consensus for a single definition of EI is still lacking. EI is commonly divided into the following categories: ability EI (e.g., Mayer et al., 2003; Salovey & Mayer, 1990), trait EI (Petrides & Furnham, 2006), and mixed EI (Bar-On, 2006; Goleman, 1998). The use of different constructs of EI is also reflected in the development of EI instruments; thus, several instruments with different constructs exist.

According to a preliminary literature search, six previous literature reviews (Bulmer Smith et al., 2009; Cherry et al., 2014; Cleary et al., 2018; Haavisto et al., 2019; Johnson, 2015; Lewis et al., 2017) and one meta-analysis (Michelangelo, 2015) were identified that focused on the EI of undergraduate students in different health care disciplines. However, only one of the reviews included the relationship between EI and clinical performance (Lewis et al., 2017), and only one of the reviews described the contents of the EI instruments (Haavisto et al., 2019). Furthermore, only one of the reviews assessed the quality of the included studies (Cleary et al., 2018) and another reviewed the assessment of EI in the context of health care student selection (Haavisto et al., 2019). None of the reviews described the validity or reliability of the EI instruments.

METHOD

Aim of the Study

This article aims to describe the content and psychometric properties of EI instruments used in health care education. It also sought to examine the relationship between EI and study success. The ultimate goal was to identify a reliable method to assess EI in health care student selection. Study

Design

A systematic literature review was chosen to comprehensively search the research evidence and gather available knowledge about the research area (Grant & Booth, 2009). The retrieval of the studies was performed using an adapted version of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) flowchart (Moher et al., 2009) (Figure 1).

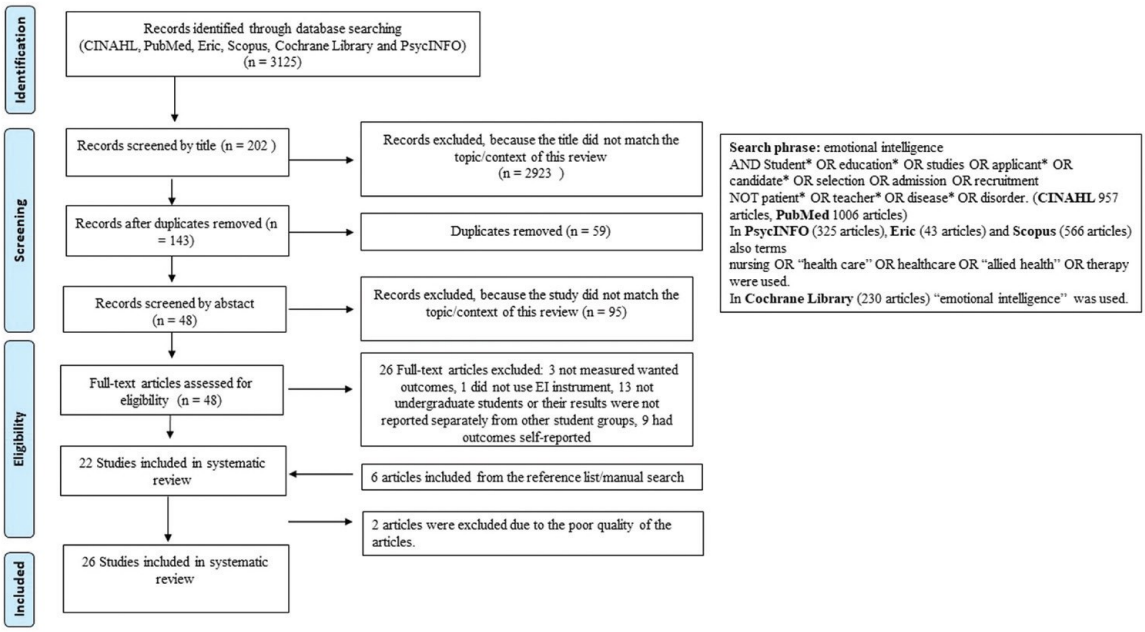

Figure 1. Flow chart of search and selection process.

Search Methods

A computerized search was performed to identify relevant research articles. Six electronic databases (CINAHL, PubMed, PsycINFO, Scopus, Eric, and Cochrane Library) were searched without restriction to publication years, using search terms and Boolean operators (Figure 1). Database-related subject headings and free text searches were employed. The search was limited to studies with an available abstract. Undergraduate health care student was defined as any student from medical, psychology, nursing, allied health, or therapy-related study fields. Study success was defined as (1) academic performance (grade point average, end of year marks, course/examination grades, continuous assessment), (2) study progress (credit points, timely graduation, retention, attrition), and (3) clinical performance (clinical practice examination/grade, clinical assessment). Objective assessment of study success was selected over the self-assessment of study success. Inclusion and exclusion criterias were used (Table 1).

Table 1. Inclusion and exclusion criteria

Inclusion criteria
Empirical and quantitative studies
Description of the use of an EI instrument
Sample includes undergraduate healthcare applicants and/or students from medical, psychology, nursing, allied health, or therapy-related study fields
Examination of correlations between EI and study success
Exclusion criteria
EI instrument not used in the study
Study does not include an objective evaluation of study success

Study participants are not undergraduate health care applicants or students
Published in language other than English
Note. EI=emotional intelligence

Search Outcome

Data screening was conducted in four steps. First, 3,125 citations were identified and screened based on the title and abstract, according to the inclusion/exclusion criteria (Table 1). A total of 202 articles were selected based on their title. Next, duplicates were removed, and 143 abstracts were screened. In the eligibility phase, 48 full text articles were read independently by 2 researchers and 22 of those articles were included in the study. The reference lists of the full text articles were searched, and 6 additional articles were included. After conducting a full text search, 28 studies were selected for the review (Figure 1).

Quality Appraisal

The quality of the studies was evaluated using the Joanna Briggs Institute's (2014) checklist for Analytical Crosssectional Studies. An adapted version of the cross-sectional studies' checklist was used to evaluate longitudinal studies by adding a question from the Case Series checklist (Table A; available in the online version of the article). Cross-sectional studies were rejected if their score was less than 3/7. Longitudinal studies were rejected if their score was less than 4/9 (Table A). Widely used and reliable evaluation criteria were selected to enable a valid and reliable evaluation. Four of the studies received full scores. Two studies were rejected due to their poor quality. Ultimately, 26 studies were included in the review (Figure 1).

Data Analysis

The extracted data included the basic information of the selected articles (Table A). Further data extraction included trustworthiness (Table B; available in the online version of the article) and the content of the EI instruments (Table C; available in the online version of the article). The content of EI was analyzed using inductive content analysis (Elo & Kyngäs, 2008). The relationship between EI and study success was analyzed using three categories (weak, r = 0.1-0.2; moderate, r = 0.3-0.4; strong, r = 0.5-1.0) to describe the strength of the effect (Polit & Beck, 2012). The results of moderate to strong relationships are reported in Tables D and E (available in the online version of the article).

RESULTS

Description of the Studies

The included articles (N = 26) were published between 2003 and 2019, and the majority (n = 22) were published in the 2010s (Table A). The studies were mainly conducted in the United States (n = 8) and in the United Kingdom (n = 5). The participants were mainly nursing (n = 1,428) or medical (n = 2,126) students. Only three studies focused on applicants. The mean number of participants in the studies was 183 (range, 19-868).

The Validity and Reliability of the EI Instruments

The EI of health care applicants or students was assessed using 18 different EI instruments (Table B). The used EI instruments were either ability-based instruments, measuring emotionally related cognitive skills, or trait-based instruments, measuring emotionally related behavioral and

selfperceived skills or mixed-EI instruments containing both ability and trait skills. About one-third of the studies (10 of 26) did not clearly indicate whether the used EI instrument was ability-, trait-, or mixed-EI instrument. The most often used instruments were the Mayer–Salovey–Caruso Emotional Intelligence Test (MSCEIT) (in six studies) and different versions of Schutte's Emotional Intelligence Test/ Scale (Assessing Emotions Scale, Schutte et al.'s Emotional Intelligence Scale, The Schutte Self-Report Emotional Intelligence Test [SSEIT], Schutte Self-Report Inventory) (in seven studies). The reliability reporting of the EI instruments varied considerably (Table B). The internal consistency of the complete scale was reported for 15 of the instruments, with Cronbach's alpha ranging from .68 to .92. For seven of the instruments, the alpha values of the subscales ranged from .37 to .85, indicating poor to strong reliability. Two studies reported the reliability results of a previous study (Brown et al., 2016; Rankin, 2013), and five studies did not report any reliability results (Table B). Content validity was reported in four studies for four instruments (Audiovisual Test of Emotional Intelligence [AVEI], SSEIT Arabic language version, MSCEIT, The Geneva Emotional Competence Test). Eight studies indicated that validity had previously been tested for eight instruments. Seventeen of the studies did not mention validity. MSCEIT and the different versions of Schutte's Emotional Intelligence Test were the most often used and validated instruments (Table B).

The Content of the EI Instruments Used in the Undergraduate Health Care Programs

The content of the EI instruments (Table C) focused on six main components: perception of emotions, understanding of emotions, emotional expression, managing emotions, utilizing emotions, and social awareness and relations. In seven of the articles (Table C), the description of the components was limited or were not reported at all. Furthermore, four EI instruments (AVEI, Levels of Emotional Awareness scale, Situational Test of Emotional Management [STEM], and Situational Test of Emotional Understanding) only have total score to use; thus, the instruments do not have subcomponents.

The Relationship Between EI and Study Success in Undergraduate Health Care Students

Most of the studies (22 of 26) found a significant positive relationship between EI and study success. In this review, the results concentrate on moderate-to-strong relationships ($r \leq .30$) between EI and study success (Tables D and E). The relationship between EI and academic performance was evaluated in 20 studies; in 17 of the studies, the correlation was found to be positive. In 11 studies, the relationship was at least moderate ($r < .30$). The EI total scores especially had a positive relationship with academic performance in different phases of studies and at matriculation (Table D). The relationship between EI and study progress was evaluated in three studies; the correlation was found to be positive in two of the studies. The EI total score was positively related to retention and program completion (Rankin, 2013; Snowden et al., 2018) Also, social connection subscale score had a positive relationship with program completion (Snowden et al., 2018) (Table D). The relationship between EI and clinical performance was evaluated in nine studies, eight of these identified positive correlations. In five studies, the relationship was at least moderate ($r < .30$). The EI total score was most often related to the clinical performance. Also, seven of the EI subscales had a positive significant relationship with clinical performance (Table E).

DISCUSSION

Most of the literature included in this article were published in the 2010s, indicating that the research about EI's relationship with study success in health care students has only recently been

considered an important topic. The reason for this might be the increase in reporting of emotional exhaustion, high emotional demands of work, and workrelated stress are listed as stressors in social and health care work, and they seem to be relevant causes behind the intent to leave the profession (Clendon & Walker, 2012; Kim & Stoner, 2008; Laschinger, 2012). Furthermore, there seems to be a demand to study how to ensure that health care students and professionals have the skills needed to cope with the stressors in health care environments.

In this article, we aim to describe the contents and the psychometric properties of the EI instruments used in health care education and to evaluate the relationships between emotional intelligence and study success. The results indicated that six main components of EI have been used in the evaluation of health care applicants or students (perception of emotions, understanding of emotions, emotional expression, managing emotions, utilizing emotions, and social awareness and relations). The most used subcomponents of the EI instruments were emotional management and perception of emotions (Table C). The instruments generally included 3 to 4 of the identified components. None of the instruments included all six components possible because the instruments assess different concepts of EI (ability, trait, or mixed).

Most of the included studies (22 of 26) reported positive relationships between EI (most often the total score) and overall study success (Tables D and E). The preferred use of the EI total scores and their positive relationship to study success was also reported in a previous meta-analysis (Michelangelo, 2015). Also, as the result of this review, it can be concluded that the comprehensive assessment of EI has a stronger relationship with study success than a single subscale. It is also noteworthy that the results did not indicate whether some subcomponents/subscales had a stronger impact on study success than others. This is because most of the studies only reported the use of total scores and not the results or the use of the subscale scores. More research is needed to further establish the impact of the EI subscales on study success. The EI subscales that would predict success in clinical practice are especially important because clinical environments are emotionally demanding for students and coping in these environments is crucial (Bulmer Smith et al., 2009). In the future, it may also be beneficial to separate the results of EI instruments (trait, ability, mixed) when examining the relationship between EI and study success to establish any possible differences between different EI concepts with regard to study success in health care studies.

The assessment of EI has recently been identified as an important part of student selection for nursing education (Haavisto et al., 2019). Thus, the ultimate goal was to identify a reliable and valid method to assess EI in the health care student selection process. In a high-stakes process such as student selection, it is vital to use objective, reliable, and valid measures (Rankin, 2013). According to the results, only three of the included studies evaluated EI in the student selection phase. In a study by Rankin (2013), the total EI score was positively related to retention and clinical performance, whereas Humphrey-Murto et al. (2014) and Knorr et al. (2018) found that EI was not related to clinical performance. This contradiction may result from the use of different instruments. The study by Humphrey-Murto et al. (2014) utilised the MSCEIT ability instrument and the study by Knorr et al. (2018) used the Trait EI Questionnaire Short Form instrument and STEM ability instrument that concentrates only on one aspect of EI: emotional management. However, Rankin (2013) used the AES mixed EI instrument. Another explanation may be the use of different outcomes to measure clinical performance. Even though only three studies reported assessment of EI in the selection phase, the other studies indicated that including EI in the selection of health care students may bring added value to health care programs (e.g., Aithal et al., 2016; Chew et al., 2013;

Rode & Brown, 2019; Zysberg et al., 2011). More research is needed to evaluate the predictive value of EI on the study success of healthcare students in the selection phase.

The evaluation and reporting of the reliability and validity of the EI instruments varied considerably. The MSCEIT and different versions of Schutte's Emotional Intelligence Test were the instruments that were most often reported, and thus their validity and reliability in the health care student context was most comprehensively validated. Of the 26 studies, five did not report reliability results, and only four reported validity results for four instruments. Therefore, it can be concluded that the psychometric properties of the instruments were not adequately described in the included articles.

CONCLUSION

The assessment of several important components of EI was identified. Furthermore, most of the studies reported a moderately positive relationship with study success, especially with clinical performance. Comprehensive assessment using the EI total score seemed to be the best predictor of study success. These results establish that EI could be an important component to assess in the health care student selection. However, only three of the studies reported the assessment of EI in the student selection phase. More research is needed to establish the predictive value of EI in the selection phase.

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Table A. Studies included in the review.

Authors, year, country	Aim	Study design	Participants	Measured outcomes	Quality (JBI) c
Abdel-Fatah, et al., 2016; Egypt	To identify the relationship between EI and clinical performance during practical training	A descriptive correlational research	Third-year female students (n=98) registered to reproductive health nursing course	Final practical exam using a performance checklist for different obs and gynecologic nursing procedures. Supportive clinical performance skills including nursing care plan, communication, clinical reasoning/ problem solving, professional & ethical conduct, and oral/written presentations.	6/7
Austin et al., 2005; UK	To measure EI and exam performance	NR	156 first-year medical students	Exam performance in Health and Society, and in Biomedical Science modules.	3/7
Austin et al., 2007; UK	To investigate EI and academic success	a	273 medical students in years 1, 2 and 5	End-of-year overall academic performance. First year students' mark on communication skills exercise.	6/7
Aithal et al., 2016; India	To examine EI and academic performance	a	200 undergraduate medical students	1st year MBBS examination average marks range.	4/7
Brown et al., 2016; Australia	To examine EI and predictors of students' practice performance	Survey	114 second- and third-year occupational therapy students	Performance in practice evaluated by fieldwork supervisors using Student Practice Evaluation Form: 1) professional behavior, 2) self-management, 3) co-worker communication, 4) communication skills, 5) documentation, 6) information gathering, 7) service provision, 8) service evaluation.	6/9
Barchard, 2003; USA	To examine the predictive validity of EI on study success	NR	150 undergraduate psychology students	Year-end grades (mean percentage of all courses attempted during the academic year).	6/9
Chew et al., 2013; Malaysia	To examine the effect of EI on academic performance	a	163 (84 first-year and 79 fifth-year) undergraduate medical students	1) Continuous assessment (first year students: average percentage of total 5 examinations on basic medical sciences final year students, 2) average percentage of total 6 surgical and medical postings, 3) final examination results (first and final year students).	7/7
Chew et al., 2015; Malaysia	To examine the relationship between the social management of EI and academic performance	a	163 undergraduate medical students (84 first year and 79 final year)	Continuous assessment and final examination marks.	7/7
Cheshire et al., 2015; USA	To examine the relationship between EI scores and programme evaluation	Descriptive study	85 (second semester) BSc nursing students.	Final grade for fundamentals of Professional Nursing Practice, Pharmacology of Nursing Practice and Final Clinical Evaluation in Fundamentals of Professional Nursing Practice.	6/7
Holman et al., 2016; USA	To determine EI as a predictor of academic performance	NR	42 medical students	A composite score of the individually graded assessment in the Gross Anatomy course.	6/9
Humphrey-Murto et al., 2014; Canada	To explore EI as a measure of applicants' noncognitive skills at admission	NR	206 medical applicants at admission, 226 medical students at matriculation	Written exams, objective structured clinical examinations, nominations for excellence in clinical performance and failures recorded over the four years.	5/9
Knorr et al., 2018; Germany	To examine the validity evidence for the Hamburg MMI	NR	164 applicants to medical school (2014 cohort of applicants)	Practical performance: GP (general practitioner) evaluation. Academic performance OSCE score	7/7
Libbrecht et al., 2014; Belgium	To examine whether EI predicts the performance in medical school courses on communication and interpersonal sensitivity	NR	367 undergraduate medical students	Official data on students' scores on all courses in their first, second and third year of medical study. Two facets of academic performance: intellectual and interpersonal performance	5/7
Mintle et al., 2019; USA	To assess the EI of students as they progress through the preclinical years of medical school	b	62 undergraduate medical students from the 2019 incoming class at an eastern US college of osteopathic medicine	Preadmission MCAT scores, final preclinical GPA and Comprehensive osteopathic Medical Self-Assessment Examination (COMSAE) score	6/9
Partido and Stafford 2018; USA	To determine any associations between EI scores and academic and clinical performance	a	63 first- and second-year dental hygiene students	Overall GPA calculated using course grades on a four-point scale in the required core dental hygiene courses. Clinical GPA was calculated using daily grades based on the ten criteria in the clinical rubric.	7/7
Pope et al., 2012; UK	To explore EI competencies at the beginning of a degree course to	b	135 first-year undergraduate psychology students	Academic progress (whether students complete their degree), academic performance final average percentage mark three years later	4/9

	predict academic progress and final academic performance				
Ranasinghe et al., 2017; Sri Lanka	To explore the relationship between EI, perceived stress, academic performance and associated factors	a	471 medical undergraduates of second, fourth and final year	Clinical Sciences examination (pass/fail)	5/7
Rankin, 2013; UK	To examine the predictive relationship between EI and program outcomes	b	307 student nurse applicants of which total participation was 178 participants.	Outcomes of retention (enrolment in the second year of the programme) and academic performance. Practice performance measured with an existing clinical assessment tool. Academic performance measured by mean score for all programme assignments in year one.	6/9
Rode and Brown 2018; USA	To examine the relationship of EI to two standardized measures of nursing student performance	A descriptive cohort design	53 undergraduate nursing students	Kaplan senior-level NAT and NCLEX-RN pass rate.	6/7
Schlegel and Mortillaro 2019; Switzerland	To develop and validate a new test: the Geneva Emotional Competence test (GECo)	NR	113 undergraduate psychology students	Grades of all exams that the students had taken prior to the course in which the study was conducted(self-report). Written exam of the psychological assessment course (objective assessment).	5/7
Sharon and Grinberg, 2018; Israel	To review the relation between EI and success	a	110 (first and second year) academic nursing students	Grade transcripts (yearly average: course credit points and the achieved score).	5/7
Snowden et al., 2018; UK.	To examine the relationship between EI and successful program completion	b	868 BSc student nurses and midwives	Successful completion of the program on schedule.	4/9
Stratton et al., 2005; USA	To examine the relationship between EI and clinical skills	NR	166 medical students	Clinical performance examination using standardised patients in an objective structured clinical examination	5/7
Strickland and Cheshire, 2017; USA	To examine the identified variables to predict success	b	112 junior level undergraduate nursing students	Pathophysiology HESI scores, pathophysiology course GPA, fundamentals of nursing practice specialty HESI score and fundamental course GPA grade	4/9
Tafazoli et al., 2012; Iran	To determine the relationship between EI and clinical performance	a descriptive-correlation study	19 (eighth semester) midwifery students	Clinical performance in maternity ward evaluated by researchers and trainers	5/7
Zysberg et al., 2011; Israel	To examine the added value of EI in predicting academic and professional performance	NR	102 nursing students (freshmen 29%, sophomores 50%, remainder juniors and seniors)	GPA at the time point the study was conducted, clinical practice grade, interpersonal skills workshop grade	6/7

NR= Not reported
a= cross-sectional study
b= longitudinal study
c= Joanna Brigg's Institute Quality appraisal scale for longitudinal studies (questions 1–9, total score 9) and for cross-sectional studies (questions 1–4, 7–9, total score 7). 1. Were the criteria for inclusion in the sample clearly defined? 2. Were the study subjects and the setting described in detail? 3. Was the exposure measured in a valid and reliable way? 4. Were objective, standard criteria used for measurement of the condition? 5. Were confounding factors identified? 6. Were strategies to deal with confounding factors stated? 7. Were the outcomes measured in a valid and reliable way?,8.Was appropriate statistical analysis used? 9. Were the outcomes/follow-up results clearly reported?

Table B. Description of the emotional intelligence instruments reported in the selected articles.

Instrument	Source	Items and subscales	Validity/reliability
AES (Assessing Emotions Scale) (1), Self-report	Rankin, 2013	33 items, some negatively keyed. 5-point Likert scale, total score and scores for 4 individual subscales: using emotions, managing own emotions, perception of emotion, managing others' emotions.	Internal consistency (IC) α = 0.90, reliability coefficient for the complete scale 0.85. IC of each four subscales α =0.67-0.76. Previously tested in 35 studies: mean α 0.87, test-retest reliability r= 0.78 for total scale scores
AVEI (Audiovisual Test of Emotional Intelligence) (2), Ability-based	Zysberg et al., 2011	27 items consisting pictures or short video clips, 6 positive emotions (satisfaction, happiness, love, pride, comfort and caring), 6 negative emotions (sadness, fear, frustration, anger, envy, doubt) in both positive and negative categories half emotions were defined basic and half complex, 10-item multiple-choice scale, only one correct answer	Internal reliability: Intraclass correlations (ICCs) coefficient 0.67. Content validity (5 experts). Items retained if at least 80% agreement and average relevance grade 4.0 or more. Correct answer proportion range: 0.17–0.90. Discrimination coefficient range: 0.08–0.55.
Bar-On (Bar-On Emotional Intelligence Questionnaire) (3), Standardised in Iran	Tafazoli et al., 2012	90 questions. Total score and 5 ordinal criteria, and 15 sub-components of EI were also evaluated. 15 sub-components are problem solving, happiness, independence, stress tolerance, self-actualisation, reality testing, interpersonal relationship, impulse control, flexibility, social responsibility, empathy. assertiveness, emotional self-awareness, optimism and self-regard	The reliability and consistency of the questionnaire was tested in two dissertations. Internal consistency: α =0.82.
ECI-U II (Emotional Competence Inventory-University Edition Version 2) (4), Self-report	Pope et al., 2012	63 items, 21 EI competencies in 4 clusters: self-awareness (emotional self-awareness, accurate self-assessment, self-confidence), social awareness (empathy, organisational awareness, responsiveness to others), self-management (emotional self-control, transparency, adaptability, optimism, conscientiousness, initiative, achievement orientation) and relationship management (inspirational leadership, developing others, communication, conflict management, influence, building bonds, change catalyst, collaboration and team-work)	Reported that good reliability and validity has been previously measured; no data in this article reported.
EQSAC (Emotional quotient self-assessment checklist) (5), Kumar et al 2016 version used. Self-report	Partido and Stafford 2018	30 items, 5 questions in each of the six EI subsets: self-awareness, empathy, self-confidence, motivation, self-control and social competence. 5-point scale 1=virtually never and 5= virtually always.	ICC = 0.84, α= 0.83
GECo (The Geneva Emotional Competence Test) (6), Ability-based/ performance-based	Schlegel and Mortillaro 2019	GECo includes domains of interpersonal emotion-related scenarios involving different roles. 4 branches included are Emotion recognition ability, emotion understanding, emotion regulation in oneself and emotion management (ability to regulate other people's emotions). Total 146 items. **Emotion recognition subtest** includes 42 short videos presenting 14 emotions. **Emotion understanding subtest** includes items for 14 different emotions total 29 items. **Emotion regulation subtest** 31 items, 3 broad emotional categories 10 or 11 items for each categories. Each item contains 2 adaptive and 2 malaptive strategies. **Emotional management subtest** included 4 broad emotional categories and 5 behavioral strategies in 44 items.	Coefficient ω: Recognition subtest 0.65, Understanding subtest 0.72, Regulation subtest 0.82, Management subtest 0.43 and overall coefficient 0.77. In previous studies GECo has been compared to other EI instruments (total score): (STEM (.62), STEU (.65), MSCEIT (.73) and factorial structure of GECo. The one-factor CFA showed fit for the subtests of GECo and results are presented in the study.
Genos EI (Emotional Intelligence Inventory) 7, Self-report	Brown et al., 2016	31 items and seven subscales: Emotional Self-Awareness, Emotional Expression, Emotional awareness of others, Emotional Reasoning, Emotional Self-Management, Emotional Management of Others and Emotional Self-Control. Scored on a 5-point Likert scale from "Almost never" to "Almost always."	Reliability reported based on previous study results: -IC: α = 0.71-0.85. -Test-retest reliability: r = 0.83–0.72.
LEAS (Levels of Emotional Awareness scale) 8, Not clearly stated whether it is self-report or ability-based	Barchard, 2003	5 items, 20 emotionally evocative interpersonal situations and asks participants to describe the emotional responses of the self and the other person involved.	Internal consistency: α = 0.45–0.75.
MSCEIT, version or developer NR	Strickland and Cheshire, 2017	NR	NR
MSCEIT, version 1.1, (9) Ability-based	Barchard, 2003	The number of items was not reported. Six subscales used: emotional understanding, emotional integration, perception of emotions in others, perception of emotions in objects, managing emotions in self and managing emotions in others,	[1]IC: α = 0.38–0.93 as reported by Mayer–Salovey–Caruso.

MSCEIT, version 2.0, (10) Ability-based	Chew et al., 2013, 2015	141 items, total 15 scores, 2 Area scores: emotional experiencing and emotional reasoning. 4 Branch scores: perceiving emotion, using emotion, understanding emotion and managing emotion. 8 Task scores: faces, facilitation, changes, emotion management, pictures, sensation, blends and social management	Overall reliability of the test r=0.91 (Chew et al., 2013). Overall reliability of the test r=0.93 in a study reported by Chew et al. (2015).
MSCEIT, version 2.0 (10), Ability-based	Humphrey-Murto et al., 2014	141 items. Each item scored by a general consensus method in which a respondent's answer is scored according to the proportion of the reference sample (n=5,000).	Split-half reliability coefficient was 0.87/0.89 (admission/matriculation) and Cronbach's alpha was 0.86/0.87.
MSCEIT, version 2.0 (10), Ability-based	Rode and Brown 2019	141 items, 4-branch ability model providing both a global measure of EI and 4 individual branch scores of EI: perceiving emotions, using emotions, understanding emotions and managing emotions.	Reported that previous literature supports the internal consistency and reliability of the MSCEIT 2.0. In this study Crohnbach's α was 0.72.
MSCEIT, version not reported (11), Ability-based	Cheshire et al., 2015	Test that requires performance of emotional skills. This instrument is not classified as a self-reporting measure. 4 branch scores: managing emotions, understanding emotions, facilitating emotion in thought and perceiving and expressing emotion.	Reliability (consensus and expert scoring) r=0.77–0.93. Factorial validity reported in previous studies.
Six Seconds Emotional Intelligence (SEI) (12), Self-assessment	Mintle et al., 2019	Self-assessment measure delivered online and computer scored. Takes an average 16 minutes to complete. The SEI measures personal perception and impression at a given time in a person's life. It provides overall EI rating that represent a composite of 8 specific competency scales: enhanced emotional literacy, recognize patterns, apply consequential thinking, navigate emotions, engage intrinsic motivation exercise optimism, increase empathy and pursue noble goals.	Reported that assessment has been validated internationally for persons over 18 and older. Reported that according to the technical manual, the instrument has undergone 3 validation analyses through factor analysis with the 8 EU scales presenting fair construct validity and good concurrent validity. No reported data to support this.
SEIS (Schutte et al.'s Emotional Intelligence Scale) (13), Measure of ability EI	Snowden et al., 2018	33 items	Reported that good reliability and validity has been previously measured, but no data to support this.
SSEIT (The Schutte Self-Report Emotional Intelligence Test) (13), Self-assessment tool	Ranasinghe et al., 2017	33 item self-assessment tool, 5-point Likert scale.	Researchers report that SEIT is a validated instrument, but there is no data to support this.
SSEIT (13), Adapted and translated to Arabic language	Abdel-Fatah et al., 2016	33 items, rated on a five-point Likert scale, 3 categories: appraisal and expression of emotions (13 items), regulation of emotions (10 items) and utilisation of emotions (10 items).	Content validity tested by panel of five expertise in the obstetrics and gynecologic nursing, psychiatric and mental health nursing and one expert from the biostatistics field. IC = α 0.71
SSEIT (13), Self-report	Holman et al., 2016	33-items, self-report questionnaire assessing four subcategories: perception of own emotions, managing own emotions, managing others' emotions and using emotions.	Reported that good validity is previously measured, no data reported in this article.
SSRI (Schutte Self-Report Inventory SSRI) (13), Hebrew version, Self-report, trait measurement	Sharon and Grinberg, 2018	33 items, total scores 33–165, 5-point Likert scale, items 5, 28 and 3 reverse-coded	IC: α = 0.88
SSRI, Modified version (14),	Austin et al., 2005, 2007	41 items and 3 subscales: Optimism/mood, Appraisal of Emotions and Utilisation of Emotions	IC: α = 0.66–0.82.
STEM (the Situational Test of Emotional Management) (15)	Libbrecht et al. 2013	Based on the situational judgement test paradigm. STEM assess emotional management, specifically the ability to effectively manage emotional situations by choosing the most appropriate emotion regulation strategies. 30 multiple-choice items describing different emotional situation.	Reported that previous literature supports the validity. IC in previous studies ranging 0.61-0.72. In this study it was 0.57. Test-retest reliability in this study was 0.85. Significant correlation was found between STEM and STEU 0.22.
STEM (the Situational Test of Emotional Management) (15) Validated German version by Hilger et al.2012 was used.	Knorr et al. 2018	Measures emotional management. Situational judgement test with 44 scenarios describing an emotional situation. 4 possible responses. Respondents are asked to either select the most effective response (multiple-choice) or rate the effectiveness of each response.	IC for multiple-choice format was 0.68 and 0.92 for rate the effectiveness format in previous studies. Reliability in this study α= 0.94

STEU (the Situational Test of Emotional Understanding) (15)	Libbrecht et al. 2013	Based on the situational judgement test paradigm. STEU assess emotional understanding, specifically it sees the ability to identify and understand the emotions that are most likely to occur in specific situations. 42 multiple-choice items that each describes a different situation. Respondents identify which of five emotions is most likely to elicit by the situation.	Reported that previous literature supports the validity. Internal consistencies in previous studies ranging 0.43-0.71. In this study it was 0.40. Test-retest reliability in this study was 0.72. Significant correlation was found between STEM and STEU 0.22.
TEIQue-SF (Trait EI Questionnaire Short Form) (16), Self-report, revised version, trait based	Aithal et al., 2016	30 items and 5 subscales: Intrapersonal, Interpersonal, Stress management, Adaptability and General mood	NR
TEIQue-SF (17), Self-report, trait based	Snowden et al., 2018	30 items	Reported that good reliability and validity have been previously measured; no data reported
TEIQue-SF (16), Self-report, trait based A validated German translation was used	Knorr et al. 2018	30 item self-report questionnaire. Measures global trait EI.	Previous studies have reported IC $\alpha > 0.80$ Reliability in this study $\alpha = 0.86$
TEIS (Tett's Emotional Intelligence scale) (18) Self-report	Barchard, 2003	72 items and 6 subscales: Emotional Appropriateness, Regulation of Emotion in Self, Recognition of Emotion in Others, Regulation of Emotions in others, Flexible Planning and Empathy. Likert-type items, with half of the items reverse-scored.	IC: $\alpha = 0.37–0.85$.
TMMS (Trait Meta-Mood Scale), developer NR	Stratton et al., 2005	The 30-item short form version. Respondents rate on a five-point Likert scale their level of (dis)agreement.	IC: 0.74–0.90

α = Cronbach's alpha, ω =omega, IC=internal consistency, NR= not reported
1=developed by Schutte et al. (2007), 2=developed by Zysberg et al., 2011, 3=developed by Bar-On (1997), 4=developed by Boyatzis and Goleman (2005), 5=developed by Sterrett 2010, 6=developed by Schlegel and Mortillaro 2019, 7=developed by Gignac (2008), 8=developed by Lane et al., (1990), 9= developed by Mayer et al., (1999), 10= developed by Mayer et al., (2003), 11= developed by Mayer et al. (2002), 12= developed internationally (in conjunction with Six Seconds' offices worldwide, 13= developed by Schutte et al. (1998), 14= developed by Austin, Saklofske, Huang, and McKenney (2004), 15=developed by MacCann and Roberts (2008), 16=developed by Petrides and Furnham, (2006), 17= developed by Petrides and Furnham (2000), 18= developed by Tett, Wang, Gribler, and Martinez (1997)

Table C. The content of the EI instruments used in the undergraduate health care programs.

Main components of EI	Sub-components of EI	EI instrument (n=14) (authors)
Perception of emotions	Perception of emotions	AES (12); SSEIT (6)
	Perceiving Emotions	MSCEIT (5, 13)
	Emotional self-awareness	Genos (4)
	Emotional awareness of others	Genos (4)
	Recognition of emotion in others	TEIS (3)
	Attention to feelings	TMMS (15)
	Emotion recognition	GECo (14)
	Self-awareness	ECI-U II (11); EQSAC (10)
	Intrapersonal characteristics; self-awareness	Bar-On (16); TEIQue-SF (2)
	Self-confidence	EQSAC (10)
Understanding emotions	Understanding Emotion	MSCEIT (5; 13)
	Emotion understanding	GECo (14)
	Emotional understanding	STEU (8)
	Clarity of feelings	TMMS (15)
	Emotional appropriateness (ability to differentiate between similar emotions)	TEIS (3)
	Recognize patterns	SEI (9)
Emotional expression	Emotional expression	Genos (4)
	Appraisal and expression of emotions	SSEIT (1)
	Intrapersonal characteristics; self-expression	Bar-On (16)
Managing emotions	Managing own emotions	AES (12); SSEIT (6)
	Managing others' emotions	AES (12), SSEIT (6),
	Emotional management of others	Genos (4)
	Emotional self-management	Genos (4)
	Emotional self-control	Genos (4)
	Emotional Management/Managing emotions	MSCEIT (5; 13)
	Emotion management	GECo (14); STEM (7, 8)
	Fighting against pressure (emotional management and regulation)	Bar-On (16)
	Stress management	TEIQue-SF (2)
	Regulation of emotions	SSEIT (1)
	Emotion regulation	GECo (14)
	Regulation of Emotion in the self	TEIS (3)
	Regulation of Emotion in others	TEIS (3)
	Mood repair	TMMS (15)
	Total mood (self-motivation; happiness, optimism)	Bar-On (16)
	Exercise optimism	SEI (9)
	General mood	TEIQue-SF (2)
	Self-management	ECI-U II (11)
	Self-control	EQSAC (10)
	Coping (change management)	Bar-On (16)
	Adaptability (flexibility, problem solving)	TEIQue-SF (2)
Utilising emotions	Use of emotions	AES (12)
	Utilising of Emotions	SSEIT (6); SSEIT (1)
	Emotional reasoning	Genos(4)
	Using emotion	MSCEIT (5, 13)
	Navigate emotions	SEI (9)
	Flexible planning (preference to base life decisions on emotions rather than logic)	TEIS (3)
	Pursue noble goals	SEI (9)
Social awareness and relations	Social awareness	ECI-U II (11)
	Interpersonal characteristics (social awareness and interpersonal relationship)	Bar-On (16); TEIQue-SF (2)
	Relationship management	ECI-U II (11)
	Empathy (being concerned with and affected by others feelings)	TEIS (3); EQSAC (10)
	Increase empathy	SEI (9)
	Social competence	EQSAC (10)

1. Abdel-Fatah et al., 2016 2. Aithal et al., 2016 3. Barchard, 2003 4.Brown et al., 2016 5. Chew et al., 2013 6. Holman et al., 2016 7. Knorr et al. 2018
8. Libbrecht et al.2014 9. Mintle et al. 2019 10. Partido and Stafford 2018 11. Pope et al., 2012 12. Rankin, 2013 13. Rode and Brown 2019 14. Schlegel and Mortillaro 2019 15. Stratton et al., 2005 16. Tafazoli et al., 2012
Limited description of EI instruments: Humphrey-Murto et al., 2014; Knorr et al. 2018; Ranasinghe et al., 2017; Sharon and Grinberg, 2018; Snowden et al., 2018; Stratton et al., 2005; Strickland and Cheshire, 2017

Table D. Relationship between emotional intelligence, academic performance and *study progress.*

Instrument	EI scores (total and sub-scales) (measured)	First or Second-year academic performance/ *study progress*	Continuous academic performance	Academic performance/*study progress* at matriculation
SSRI	Total score	First-year average grade (+) r=.305* (11) Second-year average grade (+) r=.401* (11)		
AES	Total score	*Retention in the second year (+) r=.30*** (8)*		
MSCEIT	Total score		Good result in continuous assessment (+) OR 1.01 (2) Poor result in continuous assessment (+) OR 0.97 (2)	Final exam (+) OR 1.07 r=.21* (2) Kaplan NAT (+) r=.31* NCLEX-RN(+) r=.35 * (9)
	Perceiving Emotions			NCLEX-RN (+) r=.43** (9)
	Understanding emotion			Kaplan NAT (+) r=.46** NCLEX-RN (+) r=.41** (9)
	Social Management		Poor result in continuous assessment (+) OR 1.06 (3)	
GECo	GECo management, understanding and recognition	Written exam grade of psychological assessment course (+) r=.32* (10)		
	Emotion understanding	Written exam grade of psychological assessment course (+) r=.30** (10)		
SEI	Engage intrinsic motivation	GPA (+) r=.30* (4)		
	Exercise optimism	GPA (+) r=.30* (4)		
SEIT	Total score			Final exam (+) d=1.18*** (7)
AVEI	Total score		Interpersonal skills workshop grade from different years (+) r=.43** (13)	
EQSAC	Total score		Overall GPA (+) r=.404** (5) Academic performance: F(3.41)=7.474*** R Square .354 (self-control + motivation + self-confidence) (5)	
	Self-confidence		Overall GPA (+) r=.563** (5)	
TEIQue-SF	Total score	First-year MBBS exam (+) r=.51*** (1)		*Programme completers Mean 5.36 (SD 0.57), Non-completers Mean 5.23 (SD0.68) p** (+) (12)*
	Social connection score			*Programme completers Mean 6.27 (SD 0.57), Non-completers Mean 6.203 (SD 0.68) p** (+) (12)*
	Social awareness			Final mark (+) conscientiousness r=.352***adaptability r=.308** Together 15% (F(6,90)=3.60**(6)

+ positive effect, - negative effect , SD=standard deviation
*p<0.05, **p<0.01, p≤0.001***
1=Aithal et al., 2016 2=Chew et al., 2013 3=Chew et al., 2015 4= Mintle et al., 2019 5=Partido and Stafford 2018 6= Pope et al., 2012 7=Ranasinghe et al., 2017 8=Rankin, 2013 9=Rode and Brown 2019 10=Schlegel and Mortillaro 2019 11=Sharon and Grinberg, 2018 12=Snowden et al., 2018 13=Zysberg et al., 2011

Table E. Relationship between emotional intelligence and clinical performance.

Instrument	EI scores (total and subscales) (measured)	Clinical practice exam or grade	Clinical practice assessment/evaluation
AES	Total score		Clinical assessment tool (+) R Sq=.68*** (3)
	Perception of emotions and Managing own emotions		Clinical assessment tool (+) R Sq=.39* (3)
	Managing others emotions		Clinical assessment tool (+) R Sq=.34* (3)
AVEI	Total score	Clinical practice grade (+) r=.39**(5)	
Bar- On	Total score		Performance assessment form in maternity ward (+) r=.639** (4)
	Intrapersonal characteristics		Performance assessment form in maternity ward (+) r=.544* (4)
	Emotional self-awareness		Performance assessment form in maternity ward (+) r=.522* (4)
	Optimism		Performance assessment form in maternity ward (+) r=.762*** (4)
	Self-regard		Performance assessment form in maternity ward (+) r=.610** (4)
EQSAC	Total score	Clinical performance: F(3,41)=6.727 *** R Square .330 (social competence +empathy +motivation) (2)	
MSCEIT	Total score	Objective Structured Clinical Examination at year 4 when EI measured in matriculation (+) r=.35***(1)	

+ positive effect, - negative effect
*p<0.05, **p<0.01, ***p<0.001
1=Humphrey-Murto et al., 2014 2=Partido and Stafford 2018 3=Rankin, 2013 4=Tafazoli et al., 2012 5=Zysberg et al., 2011