REVIEWS

Educational interventions to improve emotional intelligence in nursing and medical students: A systematic review

Molly Taylor*, Johanna Hoch, Ke'La Porter

Sports Medicine Research Institute, College of Health Sciences, Department of Athletic Training and Clinical Nutrition, University of Kentucky, Lexington, Kentucky, USA

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ABSTRACT

Purpose: Emotional intelligence (EI) is a trainable skillset and has been shown to have a positive impact on clinician wellbeing, patient outcomes, and other personal and professional factors. This review aimed to evaluate and summarize current intervention strategies designed to improve EI in nursing and medical students.
Results: Interventions varied by theme, content, learning activities, and duration. Nine different EI measurement instruments were utilized; learning outcomes were assessed by modified Kirkpatrick classifications. Nine out of 12 studies showed significant positive improvements in EI outcome measures post-intervention. Our review demonstrated moderate to high quality OCEBM level 1b and 2b evidence, moderate quality MERSQI/NOS-E risk of bias appraisal, and GRADE-defined desirable intervention effects with respect to positive modifications in Kirkpatrick identified learner perceptions and attitudes.
Conclusions: Nearly all interventions resulted in positive change in EI. The greatest improvements resulted from intervention content relating to self-awareness, empathy, problem-solving, stress coping, and use/management of emotions, involved group-based learning activities, and were delivered in 10-15 hours spread over 8-12 weeks. No specific recommendations can be made about timing of interventions within nursing or medical professional curricula. Further research and development of objective behavioral EI skill assessments and patient outcomes is warranted.

Key Words: Emotional competence, Emotional development, Health professions, Healthcare students, Professional students, Curriculum

1. INTRODUCTION

Emotional intelligence (EI) is a multi-dimensional construct that involves an individual's ability to perceive, use, understand, and regulate emotions, both in oneself and others, and constructively integrate those abilities to enhance thinking and manage environmental demands and stressors.[1–3] EI is a trainable and beneficial professional skillset, notably valued in health care professionals with positive correlations to both clinician well-being and patient outcomes.[3,4] Clinicians suffer from higher rates of perceived stress, role strain, compassion fatigue, and burnout than the general population.[5,6] Burnout is a psychological syndrome characterized by emotional exhaustion, depersonalization, and reduced perception of personal accomplishment.[5,7–10] A meta-analysis evaluating data from almost 30,000 physicians revealed emotional exhaustion as the most influential driver of burnout

*Correspondence: Molly Taylor; Email: molly.taylor@uky.edu; Address: Department of Rehabilitation and Health Sciences, University of Kentucky, Lexington, Kentucky, USA.

prevalence.[11] These findings suggest a greater need for social and emotional skills in these populations and effective preparatory strategies throughout professional clinical education programs. Additional literature has concluded that higher EI is associated with lower perceived stress, improved social interaction, and improved mental health, and is protective against burnout, mental health problems, and psychosomatic symptoms.[6,12] Researchers have also linked EI to improvements in the patient-doctor relationship, higher patient satisfaction and trust, and increased rates of patient follow up.[4] Various medical education and nursing programs have implemented EI concepts and proficiencies found to correlate with mandated competencies within their professional curriculums.[13,14] Across disciplines, higher EI has also been associated with higher rates of positive emotional states, increased happiness and meaningfulness at work, improved conflict/stress management, higher job satisfaction, and improved academic performance.[15]

The consideration and study of EI has developed rapidly since its introduction in 1990 by psychologists Salovey and Mayer, with various models emerging that continue to inspire debate in education, research, and the workforce.[16] Early definitions separated models into two broad categories: trait- and ability-models. The trait-model defines EI as a quality much like a personality trait, separate from cognitive ability and comprised of facets related to emotional affect.[17] The ability-model conceptualizes EI as a set of cognitive abilities and trainability relating to the perception, processing, and management of emotional information.[18] Over time, mixed-model definitions have emerged, viewing EI as a combination of both inherent traits and adaptable abilities, integrating cognitive and noncognitive affect into an individual's character and performance.[3,13,16,18,19] While many instruments are labeled as trait-EI measures, they are consistently utilized in research to quantify change or growth, negating the premise of EI as a stable and fixed trait, and aligning more with a mixed-model approach. Thus, it is necessary to evaluate the use of trait, ability, and mixed-model outcome measures in the existing literature to continue to expand our understanding of EI assessment and intervention strategies.

There have been multiple systematic reviews that have summarized the existing EI literature. Satterfield and Hughes summarized the literature specific to emotion skills training; however, the authors were unable to make specific recommendations due to the heterogeneity of curricular content across studies.[20] A subsequent review by Cherry et al. built on the review by Satterfield and Hughes by dissecting the impact and outcomes of EI education, concluding that self-reported EI can be measurably improved through structured education settings.[21] Finally, a more recent systematic review demonstrated the utilization and effects of EI interventions in medical, educational, and business/corporate sectors, but found scarce reporting of intervention content or methodology.[22] Collectively, these reviews identified a number of intervention characteristics that resulted in improvements in EI. Alternatively, these reviews also identified various gaps and recommendations for future research including the need for identification and dissemination of psychometrically valid assessment instruments as well as the establishment of a unifying theory of emotional intelligence or emotion-based skills.[20] Researchers also identified a need to assess associations between EI and both patient and provider outcomes by identifying objective, behavioral outcomes that can be translatable to the clinical setting (i.e. evaluations of intervention efficacy via clinical performance measures).[20,21] Therefore, the purpose of this systematic review is to systematically search, critically evaluate, and summarize more recent studies to update the body of knowledge specific to EI interventions and associated outcomes in medical and nursing students.

2. METHODS

2.1 Search strategy and selection process

The primary investigator (MJDT) performed a systematic search utilizing PubMed and EBSCO (CINAHL, MEDLINE, Psychology and Behavioral Sciences Collection, APA PsycInfo, Sociological Collection) from January 2010 through February 2022 (final search conducted 25 February 2022). A consistent Boolean phrase ("emotional intelligence" AND training OR intervention OR development AND nursing students OR medical students) was utilized for all database searches. The records identified through these searches were independently reviewed (MJDT) for inclusion. First, the titles and abstracts were reviewed for relevance, followed by full text screen for inclusion based on eligibility criteria listed below. A hand search was performed on the reference lists of all full text screened articles to identify any additional articles that should be screened for inclusion (see Figure 1).

2.2 Eligibility criteria

2.2.1 *Inclusion criteria*

- Studies published from January 2010 through February 2022
- Studies published in English
- Studies that included medical or nursing students
- Studies that utilized a learning/training intervention with the intention to improve EI
- Studies that utilized validated/established EI measures (e.g. EQ-i or MSCEIT) pre- and post-intervention

2.2.2 *Exclusion criteria*

- Studies that were non-experimental (cross-sectional analyses, reviews, systematic reviews, or scoping reviews)
- Studies that utilized an unvalidated/unestablished EI instrument
- Studies that utilized an intervention with duration longer than 1 semester
- Studies that failed to provide a description of intervention themes or content (major topics/activities applied within intervention/educational program)

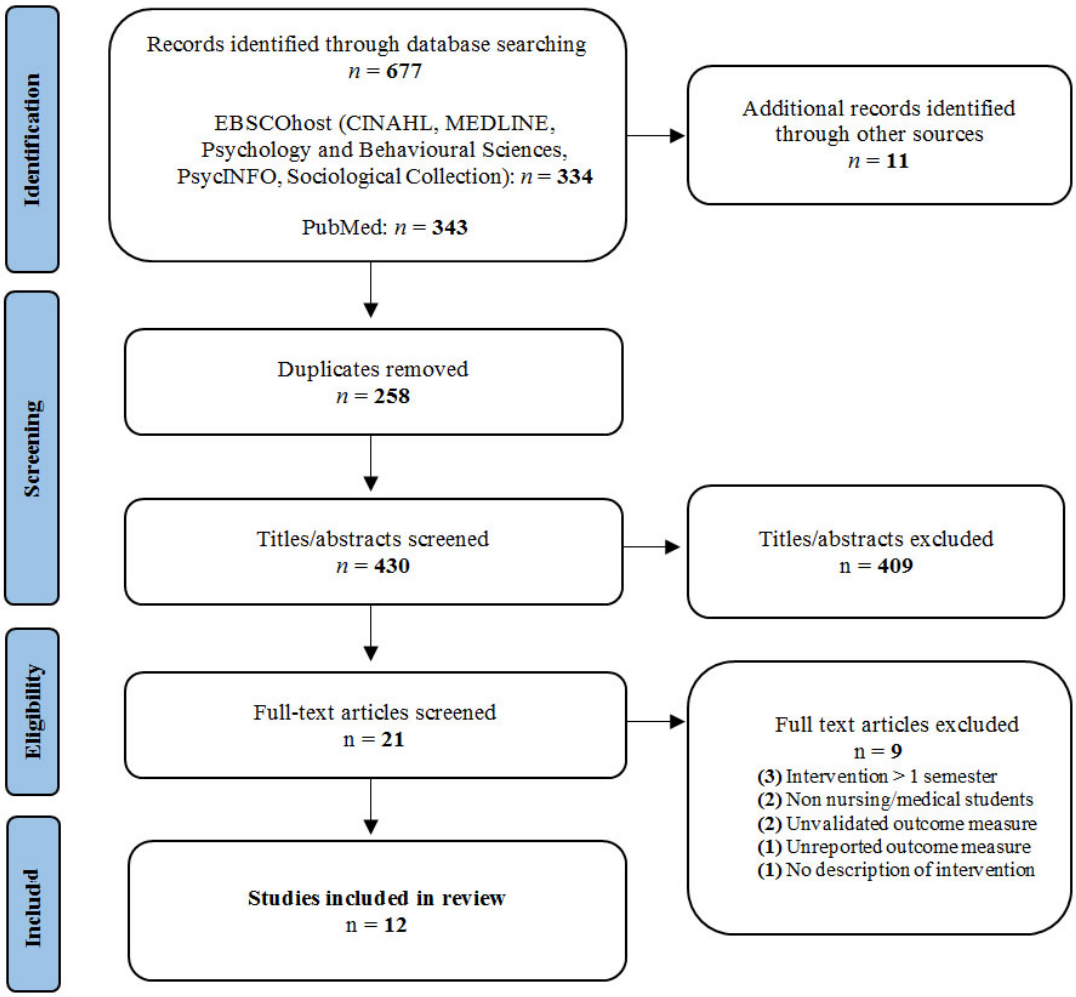

Figure 1. Summary of search strategy

2.3 Data collection process

Data from each included study were extracted and summarized. Key information retrieved included population, study design, intervention descriptions and content, outcome measures, and result summaries (see Appendix 1). Data was extracted, summarized, and compiled by the primary author (MJDT).

2.4 Study risk of bias assessment

The Medical Education Research Study Quality Instrument (MERSQI) was used in collaboration with the Newcastle-Ottawa Scale-Education (NOS-E) to appraise the risk of bias for the included studies (see Table 1).[23] Both tools were developed to assess methodological quality in medical education research. The MERSQI and NOS-E were reported as useful, reliable, complementary tools for appraisal of medical education research.[23] The MERSQI provides broad coverage of non-qualitative research appraisal and the NOS-E fills in potential gaps related to quantitative comparative research designs.[23] The MERSQI instrument has 10 individually scored items with varying scales ranging from 0.5-3 with a total possible score of 18. The NOS-E instrument has 5 individually scored items scored from 0-1 (4 items) or 0-2 (1 item), with a total possible score of 6. Previous research has found excellent interrater reliability of both instruments with an overall Intraclass Correlation Coefficient (ICC) of 0.79 for the MERSQI and an overall ICC of 0.82 for the

NOS-E with many individual items from both instruments deemed "almost perfect" (ICC > 0.80).[23] Researchers who appraised the quality of the MERSQI and NOS-E instruments recommended that interpretation of methodological quality should focus on item-specific comparisons rather than overall scores due to the heterogeneity of medical education study designs.[23] Therefore, this review reports overall scores but focuses on qualitative appraisal of item-specific scoring across studies.

Two primary reviewers (MJDT and KHP) met to review both instruments, ensure understanding of all items, and calibrate prior to appraisal of the twelve included studies. Both reviewers then independently appraised the included studies using the MERSQI and NOS-E. Any differences in opinion or interpretation of specific items were discussed and resolved via consensus, with a third reviewer (JMH) resolving any disagreements.

2.5 Effect measures

Cohen's d effect sizes and 95% confidence intervals (CIs) were calculated using means and standard deviations to examine the magnitude of differences between pre- and post-outcome measures in intervention groups (see Table 2) and between intervention and comparison groups (see Table 3). Effect sizes were interpreted as weak (0.2), moderate (0.5), or strong (0.8.)[24] To describe trends in the data we performed a qualitative assessment of effect sizes and CIs by examining differences in effect sizes between studies (within-group and between-group when applicable) and determining if the CI crossed zero.

2.6 Assessment of outcome measures

All included studies must have used an established outcome measure to assess EI pre- and post-intervention. Established EI instruments were operationally defined as those supported by any validity analysis, reliability analysis, or those whose validity/reliability could be corroborated with in-text citation. No assessment was made on outcome measures not directly related to EI (e.g. problem solving or communication measures).

Assessment of outcome measures was based on Barr and Colleague's 2005 extended version of Kirkpatrick's 1967 model of hierarchical outcomes (see Appendix 1). This model evaluates the impact of educational or training interventions, updated from its original hierarchical four level design to a non-hierarchical six level design: Level 1 (reaction/view of the learner to the delivery, content, and experience of the educational intervention), Level 2a (modification of attitudes and perceptions as a result of the intervention), Level 2b (acquisition of knowledge or skills as a result of the intervention), Level 3 (behavioral change as a result of the intervention), Level 4a (change in organizational practice as a result of the intervention), and Level 4b (benefits to patients/clients, families, and communities as a result of the intervention).[21,25] As all participants were students, no assessment was made for change in organizational practice or benefits to patients/clients, families, or communities (Level 4 outcomes). In addition to Kirkpatrick assessment, instruments were evaluated by model (trait, ability, mixed), psychometric support, and conceptual characteristics.

2.7 Certainty assessment

The Oxford Centre for Evidence-Based Medicine (OCEBM) 2009 guidelines were used to assess level of evidence: level 1a (systematic review of randomized controlled trials), level 1b (individual randomized controlled trial), level 1c (all or none study), level 2a (systematic review with homogeneity of cohort studies), level 2b (individual cohort study or low quality randomized controlled trial), level 2c (outcomes research or ecological study), level 3a (systematic review with homogeneity of case-control studies), level 3b (individual case-control study), level 4 (case-series and poor quality cohort and case-control studies), level 5 (expert opinion without critical appraisal, or based on physiology, bench research, or "first principles").[26] The GRADE Handbook strength of recommendations categories were used to determine overall confidence in the certainty of evidence.[27] The GRADE working group suggests using the terms strong or weak to define a recommendation based on the extent to which an individual is confident that the desirable effects of an intervention outweigh the undesirable effects.[27]

3. RESULTS

3.1 Study selection

The initial literature search yielded 677 peer-reviewed articles (see Figure 1). After duplicates were removed, 419 articles were screened by title and abstract. Of these 419 articles, 21 were selected for full text review. A hand search of the reference list of these 21 articles identified an additional 11 articles selected for title and abstract screening, resulting in a total of 430 articles screened by title and abstract (0 of 11 selected for full text review). Of the 21 articles, 12 met eligibility criteria and were included in the review.[28–39] Characteristics of the included studies can be found in Appendix 1. Of the 9 studies that were not included in the review, 3 utilized interventions lasting longer than one standard semester,[8,9,40] 2 were performed on non-nursing/medical students,[10,41] 2 utilized unestablished or unvalidated EI instruments,[42,43] 1 did not report the EI instrument utilized,[44] and 1 did not report any description of the intervention content.[45]

3.2 Study risk of bias

The results of the risk of bias assessment are located in Table 1. The reviewers (MJDT and KHP) initially agreed upon 95.6% of the assessment items (96.6% of MERSQI items and 93.3% of NOS-E items) and consulted a third reviewer (JMH) to reach consensus. Throughout the assessment, 8.3% of the total assessment items (5.8% of MERSQI items and 13.3% of NOS-E items) were discussed by all three reviewers (MJDT, KHP, and JMH) regarding interpretation and clarification of instrument specifications. For the 12 included studies, the average MERSQI score was 10.4 with a range of 9.5-11.5 and the average NOS-E score was 2 with a range of 0-3.

As recommended, we considered overall score but more finely explored comparisons across specific items.[23] Most studies effectively reported their study design, internal structure validity, data, and outcomes. Only 1 study adequately reported underlying content validity of their outcome measure[29] and none of the included studies provided evidence of relationships of their outcome measures to other variables. Previous literature has suggested that a MERSQI score of 10.7 predicted manuscript acceptance vs rejection, with those rejected scoring an average of 9[46] Our range was 9.5-11.5, indicating that not all of the included studies scored above the average rejection score. The NOS-E specifically appraises comparative studies, which resulted in reduced scores for the 8 OCEBM level 2b studies included in this review while the 4 OCEBM level 1b studies were all scored 3 out of 5.[23] Representativeness of intervention group (NOS-E) was unclear in 8 out of 12 studies due to the lack of information on the size of the eligible learning community that the sample was taken from.[28,31–34,36,37,39] Additionally, none of the included studies had potential to receive a point for assessment blinding due to the use of participant-reported outcomes. The 5 single cohort studies.[28,29,36,38,39] were not able to receive points for comparison group selection or comparability and while study retention and allocation concealment were implied in several two-cohort studies, points were not awarded unless explicitly stated. In a quality appraisal of both instruments, the average MERSQI and NOS-E scores were 11.3 and 3.22, respectively.[23] The average across the 12 studies in this review were 10.4 and 2 (3 for RCT's), suggesting that our studies fell just below what can tentatively be considered average.

3.3 Effect measures

Cohen's d effect sizes and 95% confidence intervals (CIs) are shown in Table 2 for within-group standard mean differences and Table 3 for between-group standard mean differences. Of the 34 effect sizes calculated, 6 were interpreted as strong,[28,31,32,35] 4 were interpreted as moderate,[30,33] and 7 were interpreted as weak[30,38,39] with 95% confidence intervals that did not encompass zero (bolded, table 2 and 3). A total of 6 effect sizes were interpreted as weak[28,33,35,37–39] with 95% confidence intervals that did cross zero.

3.4 Outcome measures

All 12 included studies demonstrated level 2a learning outcomes (modification of attitudes and perceptions as a result of the intervention). One study[36] utilized an ability-model outcome measure capable of demonstrating level 2b outcomes (acquisition of knowledge or skills as a result of the intervention), but failed to demonstrate statistically significant change as a result of the intervention.

Table 1. Study risk of bias assessment with MERSQI and NOS-E instruments

	[28]	[29]	[30]	[31]	[32]	[33]	[34]	[35]	[36]	[37]	[38]	[39]
MERSQI												
Study Design	1.5	1.5	2	3	3	3	2	3	1.5	2	1.5	1.5
Sampling: Institutions	1.5	0.5	1	0.5	1	0.5	0.5	1	0.5	0.5	0.5	1.5
Sampling: Response rate	1.5	1.5	1.5	1.5	0.5	1.5	1.5	1.5	1	1.5	1.5	0.5
Type of Data	1	1	1	1	1	1	1	1	1	1	1	1
Validity: Content	0	1	0	0	0	0	0	0	0	0	0	0
Validity: Internal Structure	1	1	1	1	1	1	1	1	1	1	1	1
Validity: Relationships	0	0	0	0	0	0	0	0	0	0	0	0
Data: Sophistication	2	2	2	2	2	2	2	2	2	2	2	2
Data: Appropriate	1	1	1	1	1	1	1	1	1	1	1	1
Outcome	1	1	1.5	1	1	1	1	1	1.5	1	1	1
Summation Score	10.5	10.5	11	11	10.5	11	10	11.5	9.5	10	9.5	9.5
NOS-E												
Representativeness: Intervention group	0	1	1	0	0	0	0	1	0	0	1	0
Selection of Comparison group	0	0	0	1	0	1	1	1	0	1	0	0
Comparability: Comparison group	0	0	1	1	1	1	1	1	0	1	0	0
Study Retention	1	1	1	1	0	1	1	0	0	1	1	0
Blinding of assessment	0	0	0	0	0	0	0	0	0	0	0	0
Summation Score	1	2	3	3	1	3	3	3	0	3	2	0

Table 2. Cohen's d effect sizes and confidence intervals for pre- vs post-intervention

Author	Outcome Measure	Time point	Pre	Post	Effect Size (95% CI)
Abe et al., 2013[28]	TEIQue-SF	Post	141.92 ± 18.84	143.69 ± 19.44	0.09 (-0.11, 0.30)
	TEIQue-SF *(Student subgroup)*	1 yr	143.69 ± 18.82	150.45 ± 20.35	0.34 (-0.03, 0.72)
	TEIQue-SF(*F Japanese)*	1 yr	134.46 ± 14.19	154.46 ± 18.49	**1.21 (0.34, 2.01)**
Borges et al., 2012[29]	WEIP-S: *Awareness*	Post	17.36 ± 7.12	18.54 ± 7.31	0.16 (-0.11, 0.43)
	WEIP-S: *Control*	Post	21.43 ± 7.85	21.69 ± 7.97	0.03 (-0.24, 0.30)
	WEIP-S: *Recognition*	Post	17.89 ± 6.82	18.84 ± 5.74	0.15 (-0.12, 0.42)
	WEIP-S: *Management*	Post	17.70 ± 6.87	18.85 ± 7.28	0.16 (-0.11, 0.43)
Choi et al., 2015[30]	AEQT: Intervention group	Post	151.29 ± 8.92	156.11 ± 11.61	**0.47 (0.04. 0.88)**
Erkayiran & Demirkiran, 2018[31]	EQ-i: Intervention group	Post	186.19 ± 34.54	233.53 ± 42.14	**1.23 (0.71, 1.73)**
Goudarzian et al., 2019[32]	BGS-EIQ: Intervention group	Post	75.33 ± 7.23	125.7 ± 7.79	**6.70 (5.33, 7.90)**
Kim & Lee, 2021[33]	WLEIS: Intervention group	Post	5.08 ± 0.68	5.47 ± 0.68	**0.57 (0.03, 1.10)**
		3 wk	5.08 ± 0.68	5.69 ± 0.87	**0.78 (0.23, 1.31)**
Orak et al., 2016[34]	MSEIS: Intervention group	Post	3.67 ± 0.41	3.72 ± 0.36	0.13 (0.37, 0.63)
Shahbazi et al., 2018[35]	EQ-i: Intervention group	Post	101.22 ± 10.93	105.87 ± 9.82	0.06 (-0.56, 0.68)
		2 mo	101.22 ± 10.93	109.44 ± 9.56	**0.80 (0.14, 1.43)**
Szeles, 2015[36]	MSCEIT V2^^	Post^^	100.67 ± 8.00^^	100.56 ± 11.25^^	-0.01 (-0.93, 0.91)
Teskereci et al., 2020[37]	EIES: Intervention group	Post	137.30 ± 25.80	143.38 ± 13.12	0.30 (-0.16. 0.75)
West et al., 2020[38]	EQ-i 2.0: *Happiness*	Post	101.68 ± 12.45‡	105.35 ± 13‡	0.29 (-0.01, 0.58)
	EQ-i 2.0: *Self Perception*	Post	102.65 ± 10.29‡	106.61 ± 10.29‡	**0.38 (0.09, 0.68)**
	EQ-i 2.0: *Stress Management*	Post	101.79 ± 14.08‡	107.07 ± 14.35‡	**0.37 (0.07, 0.67)**
	EQ-i 2.0: *Total Score*	Post	103.40 ± 11.65‡	107.24 ± 11.91‡	**0.33 (0.03, 0.62)**
White et al., 2020[39]	EQ-i 2.0: *Stress Management*	Post	104.21 ± 13.68	108.76 ± 14.41	0.32 (-0.02, 0.66)
	EQ-i 2.0: *Self-Perception*	Post	104.50 ± 10.54	108.53 ± 10.83	**0.38 (0.04. 0.71)**
	EQ-i 2.0: *Interpersonal*	Post	103.94 ± 10.83	107.69 ± 9.887	**0.36 (0.02, 0.70)**
	EQ-i 2.0: *Total Score*	Post	104.57 ± 10.76	108.65 ± 12.21	**0.35 (0.01, 0.69)**

Note. All values are mean ± SD. For elaboration of abbreviated outcome measures, see Appendix 2. Post indicates measure collected immediately post intervention. Bold indicates 95% confidence intervals that did not encompass zero. ^^ indicates standard deviations estimated by range rule. ‡ indicates mean estimates derived from bar graph data mining and standard deviations estimated from bar graph standard errors (web plot digitizer).

Table 3. Cohen's d effect sizes and confidence intervals for intervention vs control

Author	Outcome Measure	Time point	Intervention	Control	Effect Size (95% CI)
Choi et al., 2015[30]	AEQT	Post	156.11 ± 11.61	146.79 ± 13.76	**0.73 (0.29, 1.16)**
Erkayiran & Demirkiran, 2018[31]	EQ-i	Post	233.53 ± 42.14	199.40 ± 30.22	**0.93 (0.43, 1.41)**
Goudarzian et al., 2019[32]	BGS-EIQ	Post	125.70 ± 7.79	78.73 ± 6.54	**6.53 (5.19, 7.71)**
Kim & Lee, 2021[33]	WLEIS	Post	5.47 ± 0.68	5.06 ± 0.98	0.48 (-0.04, 0.98)
		3 wk	5.69 ± 0.87	5.06 ± 0.86	**0.73 (0.20, 1.24)**
Orak et al., 2016[34]	MSEIS	Post	3.72 ± 0.36	3.74 ± 0.36	-0.06 (-0.54, 0.43)
Shahbazi et al., 2018[35]	EQ-i	Post	105.87 ± 9.82	102.90 ± 11.55	0.28 (-0.33, 0.87)
		2 mo	109.44 ± 9.56	103.33 ± 11.93	0.56 (-0.06, 1.16)
Teskereci et al., 2020[37]	EIES	Post	143.38 ± 13.12	140.42 ± 20.8	0.17 (-0.29, 0.63)

Note. All values are mean ± SD. For elaboration of abbreviated outcome measures, see Appendix 2. Post indicates measure collected immediately post intervention. Bold indicates 95% confidence intervals that did not encompass zero. 5 studies utilized single group design and are unlisted in table 4 (Abe et al., 2013; Borges et al., 2012; Szeles, 2014; West et al., 2020; White et al., 2020)

3.5 Certainty of evidence

Level of evidence was assessed as described by the OCEBM.[26] A total of 8 included studies were quasi-experimental cohort studies with one- (n = 5) or two-group (n = 3) pre- and post-measure designs and were therefore considered level 2b evidence (see Appendix 1).[28–30, 34, 36–39] The remaining 4 studies were randomized controlled trials and therefore considered level 1b evidence (see Appendix 1).[31–33, 35]

Based on Cochrane's GRADE strength recommendations guidelines, a strong recommendation can be made if desirable effects of an intervention outweigh undesirable effects.[27] A total of 9 out of 12[28–33, 35, 38, 39] included studies revealed statistically significant improvements in EI following structured educational intervention, with 6 out of 12[28, 30–33, 35] studies demonstrating medium to strong effect sizes with confidence intervals that did not cross zero. In addition, 5 out of the 6 effect sizes were considered strong for the level 1b studies representing moderate to high quality RCT's.[31–33, 35] There were no undesirable outcomes, negative emotional experi-

ences, adverse learning consequences, or decreased scores reported. Therefore, the current review demonstrates moderate to high quality level 1b and 2b evidence, moderate quality risk of bias appraisal, and desirable intervention effects with respect to positive modifications in learner perceptions and attitudes based on calculated effect sizes.

4. DISCUSSION

The purpose of this review is to search, evaluate, and summarize the current body of knowledge specific to EI interventions and associated outcomes in medical and nursing students. The current review demonstrates moderate to high quality evidence that interventions aimed to improve EI result in positive changes in this population of learners' perceptions and attitudes of EI. The use of self-report EI measurement instruments limits the ability to assess learning changes in knowledge, skills, behavior, or practice. Notable themes and trends emerged regarding types of learners, intervention content, and duration.

4.1 Learners

The population of learners in the current review includes first to fourth year nursing students from South Korea,[30] Turkey,[31,37] Iran,[32,34,35] Korea,[33] and the United States[36] and first to sixth year medical students from Japan[28] and the United States.[29,38,39] The greatest EI score improvements occurred in Iranian nursing students, ranging from their first to sixth terms, participating in psychologist led self-care sessions.[32] The vast majority of moderate to strong effect sizes were demonstrated in nursing students; only 1 study examining medical students demonstrated a strong effect size,[28] suggesting that further research is needed to examine the influence of these interventions in medical student populations. The heterogeneity of age/year of the learners makes it difficult to assess the effect of timing of interventions within a four- or six-year curriculum. Further research is needed to assess when EI interventions have the most positive effect throughout the duration of a professional medical or nursing education program. Additionally, there is evidence of efficacious interventions in medical populations beyond professional schooling, providing support for continued efforts into research and promotion of these skills throughout a professional's career.[22,47–51]

Only 1 study explored cultural differences, demonstrating an increased longitudinal effect size specifically in female Japanese students.[28] Future research may choose to explore cultural differences and societal emotional norms in context with evaluation of EI and propensity for improvement. Furthermore, previous literature associated amplified post-intervention EI improvements in individuals with lower starting EI scores, necessitating further research into who will benefit most from these types of interventions.[22]

4.2 Intervention content

The 9 studies that reported statistically significant improvements in EI utilized interventions of varying themes, suggesting that educators aiming to promote EI have space for creativity within their curriculums when designing effective educational strategies. However, several themes emerged that educators and researchers should consider including in future interventions to promote the most meaningful improvements in EI. The intervention themes associated with the greatest effect sizes included emotional intelligence dimensions and theories,[31,32] social or interpersonal themes,[35] communication,[30] group problem-solving,[33,35] or themes relating to self-awareness.[33] Significant positive changes and medium effect sizes were also associated with video role-play activities involving empathy, active listening, self-disclosure, and conflict resolution.[30] Clinically tailored high-stress simulation scenarios showed promise in improving specific dimensions of EI in medical students including stress management and themes of self-actualization, self-perception, self-awareness, and hardiness with small effect sizes.[38,39] Specific learning activities associated with the primary themes included group discussion/brainstorming or peer interaction,[31–35,37] sharing/expressing of feelings or self-report of emotions,[28,31,37] role-play,[31,37] and scenario-based learning.[33] The activities that trended with the greatest improvements and were present in nearly all interventions were interactive group or peer activities, specifically those that engaged with self-awareness,[30,33] empathy,[30,32] problem-solving,[33,35] and stress coping and/or emotion management.[31,32] The peer-coaching program intervention was the only intervention to fail to demonstrate any improvement in EI scores, but was also the only intervention that provided no supervision or evidence of consistent student participation.[36] To ensure compliance with the curriculum of this type of intervention, future iterations may consider more structure, supervision, and whole class collaboration to reap the benefits that other communication and interpersonal interaction themed interventions demonstrated.[30,35]

4.3 Duration

The largest effect sizes were identified in the studies that included 10-15 hours of structured sessions spaced over 8-12 week timelines,[31,32,35] however, statistically significant improvements were also seen in a half-day workshop,[28] condensed 2-day course,[33] and 5- and 6-day courses,[38,39] though with small effect sizes. Previous literature demonstrated the greatest effects when interventions were delivered over a short space of time (less than a month);[21] in con-

trast, the current review demonstrated positive results from interventions delivered over varying timelines, but associated the greatest effects with interventions that lasted longer than one month. The current review limited inclusion to interventions no longer than one semester with the impetus to review strategies that could be feasibly implemented into clinical student populations across an average collegiate semester. These findings offer flexibility in intervention design and application to expand content over the course of a quarter or semester.

Additionally, all 3 studies that performed longitudinal reassessment of EI demonstrated further improvement of EI scores and greater effect sizes regardless of timing of reassessment (3 weeks, 2 months, or 1 year).[28,33,35] These results can be considered alongside previous findings that interventions that provided opportunity for practice of learned concepts as well as feedback accounted for average effect size growths of .75;[19] time may allow for improved application and practice of learned concepts and lead to amplification of positive EI changes. Apart from live surgical skill simulations[38,39] and an internal medicine clerkship,[29] the remaining included studies did not report whether students were active in clinical education experiences or rotations during the study period. Previous literature suggested that EI intervention may be more meaningful in the penultimate or final years of medical schooling but didn't deduce why.[21] Further research is needed to explore these findings and examine the relationship between learning and opportunity for application in a clinical setting. Researchers should also consider asking learners if they utilized any of the skills taught during the study time period, in order to account for opportunities to engage in EI techniques taught. Educators and researchers may consider including practice and structured feedback in their interventions as well as providing opportunities for follow-up to ensure that learning takes place. Length of intervention may be considered in tandem with this type of longitudinal reflective practice; further research is needed to examine the potential influence of practice and feedback as well as re-assessment over time to better understand duration of benefits of intervention courses.

4.4 Outcome measures

EI assessment instruments are developed, defined, and categorized in opposing fashions, much like the construct of EI overall. Some measures are categorized based solely on what their outcomes can feasibly represent while other researchers may categorize the same measures based on the theory with which they were developed. While a number of included instruments were developed based on underlying ability- or mixed-model definitions of EI, the use of Likert scored self-report frameworks limits the outcomes to trait-model self-perceptions vs objective skills. Therefore, for the purpose of this review, instruments were categorized based on their scales and outcomes. Extracted data includes model, number of items, scale type, themes or subscales, and psychometrics (see Appendix 2).

In agreement with a recent systematic review of EI instruments, we found various conceptual overlaps amongst the 10 different instruments included in this review.[52] A number of trends emerged regarding themes, factors, branches, domains, or subscales of emotional intelligence; all instruments assessed emotionality or emotional expression, perception or appraisal of emotions, self-awareness or control/management/use of own emotions, and sociability or interpersonal skills.[28–39] The most psychometrically supported and utilized instruments also included facets of well-being[28] or mood,[31,35] stress management,[38,39] or strategic performance characteristics of emotion identification, use, understanding, and management.[36]

Both versions of Bar-On's Emotional Quotient Inventory (EQ-i[31,35] and EQ-i 2.0[38,39]) were most utilized amongst the included studies. The most widely cited instruments in the literature include the Trait Emotional Intelligence Questionnaire Short Form (TEIQue-SF, > 2,000 citations[53]) and the original versions of both the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT, >1500 citations[53]) and the Emotional Quotient Inventory (EQ-i, > 1,000 citations[53]). These instruments also demonstrate the most robust psychometric support and capability for meta-analysis. The moderate to strong effect sizes correlated to the most psychometric support were demonstrated using the EQ-i[31,35] and the TEIQue-SF.[28]

Half of the included studies failed to report reliability findings, but the literature demonstrates internal consistency was acceptable (> 0.7),[30] good (> 0.8),[28,29,34,37] or excellent (> 0.9)[31,33,35,36,38,39] in 9 out of 10 included instruments. Validity constructs were absent or weakly reported in most studies but corroborated by psychometric analysis studies and systematic reviews.

When considering which instruments to utilize, researchers or educators should first consider which model of EI they're aiming to assess. Trait-model instruments rely on self-report and self-perception of emotions. They generally exhibit higher convergent validity to personality constructs and predict typical behaviors.[53] Ability-model instruments aim to assess execution and cognitive integration of emotions, exhibiting higher convergent validity to cognitive performance or IQ tests and better ability to predict maximal performance.[53] Researchers looking to assess growth or change

or educators hoping to reliably assess improvement from a class/training should also highly consider test-retest reliability. If interested in trait-model EI, both the TEIQue-SF and EQ-i 2.0 are widely used and have strong reliability and validity constructs. The EQ-i 2.0 demonstrates excellent test-retest reliability in the 2-4 week range (0.92) and maintains good reliability after 8 weeks (0.81).[54] If seeking to measure ability-model EI, the MSCEIT V2 was the only ability-model instrument included in this review, but it also is widely cited with excellent test-retest reliability, high discriminant validity from measures of trait-EI, analytic intelligence, and personality constructs, as well as incremental validity associated with psychological well-being, depression, anxiety, quality of social interactions, and aspects of job performance.[52,53] Additional attention can be paid to construct validity of the varying instruments as researchers establish what specific characteristics of EI they're interested in exploring. The TEIQue-SF exhibits positive correlation to self-compassion and strong negative correlations to factors related to burnout and perceived stress,[55] the EQ-i was found to most accurately assess self-perception[53] and exhibit positive correlation to problem-solving skills,[35] and the EQ-i 2.0 demonstrated positive correlations to subscales of hardiness and grit.[39]

A number of instruments including the MSEIS, WLEIS, and WEIP-S demonstrate acceptable to good psychometric support and may also be considered for assessing trait-model EI.[52,56] However, as recommended by previous literature, establishing gold standards for assessment of trait-model EI and ability-model EI are warranted.[20,22] Utilization of the most cited and psychometrically supported instruments creates increased capability for meta-analysis in this field.

4.5 Limitations

After evaluating the findings of several reviews in the early 2000's,[20–22] we only included studies published from 2010 to 2022 to supplement these reviews and offer an updated summary of current experimental findings. We limited interventions to one semester and cannot extrapolate outcome effects to longer duration interventions. We may have missed studies that fit our inclusion criteria if published in journals found in databases other than PubMed or EBSCO (CINAHL, MEDLINE, Psychology and Behavioral Sciences Collection, APA PsycInfo, Sociological Collection). We also limited our population to nursing and medical students which restricts our findings and recommendations to these groups. Future research should expand into other populations to evaluate efficacy of the current review's recommendations in other students or professionals.

Few if any included studies discussed confounding influences on demonstrated improvements in EI. All of the included randomized controlled trials demonstrated moderate to strong effect sizes when comparing groups, suggesting that positive changes were attributable to the intervention itself, but did not discuss aspects of the pre-established curriculum and student schedule that could also be contributing to the demonstrated results.[31–33,35] Further research is needed to examine the potential changes in EI due to student's completion of existing medical and nursing school curriculum content without added emotional intelligence concepts or intervention. Additionally, we are unable to rule out positive changes in EI as a result of group interaction effects irrespective of the intervention content itself.

In agreement with previous reviews, our modified Kirkpatrick levels highlight the need for more objective measurements of emotional intelligence. The current review's assessment of learning outcomes limits translatability to real life scenarios or clinical behaviors. Additionally, our NOS-E scores demonstrate the need for more high quality comparative studies.[21]

4.6 Implications

Only 1 study utilized an instrument developed as an ability-model outcome measure,[36] therefore further research is needed to validate ability measures and allow EI to be assessed beyond self-report measures. To concretely demonstrate EI as a modifiable, improvable skillset with potential to objectively impact patient and provider outcomes, researchers must expand their outcome measures to provide findings that support the definition of EI beyond its construct as a trait. For EI to develop a unified definition in clinical professions as a mixed-model concept involving inherent emotional capacity as well as cognitive emotional understanding and input, outcomes must reflect both trait and ability dimensions. The ability to assess change across both trait and ability measures would provide stronger support for implementation of these types of skills into professional curriculums and mandated accreditation competencies.

5. Conclusion

Researchers have effectively demonstrated the value of increased levels of EI in healthcare professionals.[3,4,22,47–51] The current review corroborates previous literature's findings, demonstrating EI as a modifiable, improvable construct with potential to positively influence clinician behavior, well-being, and patient outcomes with further studies. Higher EI is associated with lower perceived stress, improved social interaction, and improved mental health, and has been shown to be protective against burnout, mental health problems, and psychosomatic symptoms.[6,12] Researchers have also linked

elevated EI to improvements in the patient-doctor relationship, higher patient satisfaction and trust, and increased rates of patient follow up.[4]

We recommend the utilization of educational interventions aimed to improve EI in nursing and medical student populations, but more widespread use of ability measures as well as development of objective, behavioral learning assessments are warranted. For optimal results, researchers and educators should consider utilizing content related to dimensions of EI including self-awareness,[30,33] empathy,[30,32] problem-solving,[33,35] stress coping,[31] and use/management of emotions.[31,32] Activities should engage peers to work together in group discussions and brainstorming and researchers may consider using scenario or simulation-based learning.[30,33,38,39] Varying contact hours and intervention durations produced significant outcomes, but interventions averaging 10-15 hours of structured sessions spaced over 8–12-week timelines demonstrated the greatest effects.[31,32,35] Findings suggest that time may be a factor in amplifying the benefits of interventions;[28,33,35] opportunity for practice and feedback as well as longitudinal reassessment may be favorable for producing and capturing improved outcomes and should be explored in future studies. Further research should aim to validate ability measures of EI, establish a unifying definition of EI for the healthcare setting, develop objective and clinically translatable assessment measures, and expand intervention investigations into other allied healthcare student and professional populations.

Conflicts of Interest Disclosure

The authors declare that there is no conflict of interest.

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