The application of team-based learning in emotional intelligence training for medical students: A pre–post-test study

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Abstract

Background Emotional intelligence represents a person's interpersonal and communication competencies, and influences medical students and their clinical careers. The aim is to evaluate the impact of team-based learning in an emotional intelligence training intervention among Chinese medical students. Methods This is a quasi-experimental, one-group pre–post-test assessment. A convenience sample of medical university students took an elective course in emotional management recruited for this study. An emotional management course was designed to provide college students with basic knowledge about emotional regulation and to provide opportunities for emotional management practice. The course composed of traditional face-to-face education and the new style of teamwork. They completed the educational modules using their personal computers or cell phones. Using the Emotional Intelligence Scale, Caring Ability Inventory, and a course evaluation questionnaire, two research assistants collected data before and after delivery of the intervention. Descriptive statistics were calculated for sociodemographic data. Categorical data were described as frequencies, and continuous data were expressed as means. Differences in respondent characteristics between the pre- and post-intervention assessments were investigated using the chi-squared test. The paired-samples t test was used to investigate differences between pre- and post-intervention. Ninety-eight students completed the pre-intervention questionnaire and 82 students completed the post-intervention questionnaire. Results The intervention improved students' emotional intelligence and caring ability, as indicated by increased scores in perceiving and expressing emotions ($t = 7.045$, $P < 0.01$), regulating emotions ($t = 6.094$, $P < 0.001$), knowing ($t = 4.268$, $P < 0.001$), and courage ($t = 4.842$, $P < 0.001$). Students' average course evaluation ratings were >4 points (The total score is 5.). Conclusions This intervention has the potential to influence medical students' emotional intelligence and caring behavior.

Background

In recent years, conflicts between doctors and patients have occurred from time to time. The sources of conflict are diverse. We can't teach students to change the concept of every patient, but we can teach students skills to help them better deal with clinical conflicts. After all, a good patient–physician relationship is an important component of the successful health care [1]. Understanding and compassion are more likely to improve the patient–physician relationship as well as patient trust, satisfaction, and compliance, and to lead to better outcomes in clinical practice [2, 3]. Corroborating the importance of caring in the medical profession, integrative reviews have shown that health care professionals with more emotional intelligence (EI) are more compassionate, considerate, caring, and able to manage emotions in others; they are thus more likely to create good patient–physician relationships [4]. As the abilities to form and maintain good patient–physician relationships and communicate effectively are important skills that medical students should possess, EI is gaining attention as an important aspect of medical education [5]. However, few studies focus on curriculum design and explore the impact of EI training on students based on medical education curriculum. Many researchers have highlighted the benefits of EI-based education, which may contribute to the teaching of professionalism and communication skills in medicine, although

some research has shown that the role of EI training in medical education remains uncertain [6]. Further research is needed before the wholesale adoption of EI education in any course can be recommended [7]. The aim of this study was thus to evaluate the impact of a team-based learning (TBL) EI intervention among undergraduate medical and nursing students.

Medical students may experience significant psychological and emotional challenges related to their future work environment, medical training, academic pressure [8], and the desire to achieve work–life balance [9], which manifests in some cases as burnout, depression, and/or anxiety. This risk is concerning because distressed medical students rarely seek help, and tend to have poor academic performance, misuse substances, have decreased empathy, and have suicidal ideation. Much research has shown that different grades, educational levels, and other factors are related to different EI levels, and that performance in the emotional management of others is a significant predictor of students' teamwork skills. Mayer and Salovey [10] considered EI to consist of a set of abilities, defining it as "the ability to monitor one's own and others' emotions, to discriminate among them and to use the information to guide one's thinking and actions" (p. 190). The Accreditation Council for Graduate Medical Education defined EI competency as assessment skills of interpersonal and communication competencies, professional behavior, and patient care. In general, EI is the ability to get along and build good relationships with others. EI is considered to be a predictor of effective communication, interpersonal sensitivity, stress perception, happiness enhancement, and the promotion of academic success and teamwork [11–13], and influenced by Personality and empathy [2]. Thus, EI is a crucial performance-related skill for medical students [14].

Current research shows that the emotional intelligence level of medical students changes with age and grade. A cross-sectional study conducted in Canada revealed a significant difference in total EI scores between nursing students in years 1 and 4, favoring the latter [15]. Foster, K et al [16] used an EI inventory to evaluate Australian health care students before registration, and found that their mean EI scores were lower than normative means. Another research demonstrated that females had higher mean EI scores. The EI score and the number of extracurricular activities is positively related [17]. EI is an ability-based skill that is malleable via training. It is conceptualized as an ability that can be taught, learned, and promoted. EI may be good to address the specific aspects of the patient–physician relationship that are not working well. In clinical work, medical students need better emotional intelligence to solve some non-technical problems. For this reason, various researchers have suggested that EI education is a crucial component that should be valued, even prior to medical education, to facilitate medical students' future skill development [14]. Some researchers have argued that EI has a protective effect against stress among health care students, and should be emphasized more in these students' curricula [16]. A class credit intervention based on the stress in intensive care units had a protective effect on nursing students through increased stress perception and communication skills [18]. However, that study was based on an EI intervention implemented in a specific stressful environment.

EI interventions have been demonstrated to affect aggression and empathy among adolescents, it could reduce aggression and enhance one's empathy. [19, 20]. Given the lengthy intervention periods, however,

the observed effects cannot be attributed definitively to the development of EI skills. There is a need for a flexible emotional curriculum intervention to help medical students effectively improve their EI.

TBL is an active learning strategy that focuses on teamwork, student accountability, and team application exercises. It is a structured form of small group learning that can be scaled up for delivery in large classes [21]. It was first developed by Larry Michaelsen in the late 1970s at the University of Oklahoma business school [22]. TBL keeps the class together while students apply the content to specific problems in small groups during the learning process. It consists of three stages: student preparation, readiness assurance, and application. Many studies have demonstrated the effects of such programs in preparing students for teamwork [23], clinical practice, and communication [24]. TBL is commonly applied in medical education and has been shown to increase confidence, leading to the development of professional and clinical behaviors that are characteristic in high-quality practice [25]. However, the effects of TBL in improving medical students' EI and communication ability and enhancing their interest in learning in medical courses should be further investigated.

Methods

Design

This study had a quasi-experimental, one-group pre–post-test design. An emotional management course developed by the first author served as the platform for the intervention study. The course was designed to provide college students with basic knowledge about emotional regulation and to provide opportunities for emotional management practice. The aim of this study was to determine whether the course had the intended effect on the study participants.

Participants and Setting

The course was provided electively to a convenience sample of 98 medical university students. Students were informed about the study during the first face-to-face lesson, and then were given an informational leaflet and invitation to participate voluntarily. Participating students were enrolled in a course composed of traditional face-to-face education (teaching theoretical knowledge) and the new style of teamwork (such as script design and video shooting, online discussion and cooperation to complete assignments). They completed the educational modules using their personal computers or cell phones, which included engaging in online discussions, watching videos, and completing online homework.

Research Instrument

Students' EI was measured using the 33-item Emotional Intelligence Scale (EIS) [26], which was designed to assess four dimensions of EI: perceiving and expressing emotions, regulating emotions, identifying other people's emotions, and utilizing emotions when solving problems. Each item is rated on a 5-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5). The EIS was translated into Chinese and has shown good reliability and validity. In the current study, the Cronbach alpha coefficients for the four subscales were 0.75, 0.67, 0.71, and 0.67, respectively.

The 37-item Caring Ability Inventory (CAI) [27] was used to measure participants' caring ability in three dimensions: knowing, courage, and patience. Each item is rated on a 7-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (7). The CAI was translated into Chinese has shown good reliability and validity. In the current study, the Cronbach alpha coefficients for the three subscales were 0.79, 0.72, and 0.75, respectively.

A questionnaire was designed to assess participants' satisfaction with the TBL curriculum. It was composed of five parts: evaluation of the TBL teaching method, evaluation of course content, self-evaluation after the course, opinions and suggestions, and your largest accomplishment. Each item is rated on a 5-point Likert scale ranging from "very dissatisfied" (1) to "very satisfied" (5).

For each student, pre- and post-intervention items within each scale were summed to yield a scale score. The scale score was not calculated in the case of any missing item.

Data Collection

Two research assistant who were not involved in the delivery of the intervention distributed and collected pre- and post-intervention questionnaires in November and December 2017, respectively. The first 30 minutes of the first course session was allocated for the distribution, completion, and collection of the questionnaire; the same procedure was followed at the end of the course.

Data Analysis

Data were analyzed using the IBM SPSS Statistics software (version 25; IBM Corporation, Armonk, NY, USA). Descriptive statistics were calculated for sociodemographic data. Categorical data were described as frequencies, and continuous data were expressed as means. Differences in respondent characteristics between the pre- and post-intervention assessments were investigated using the chi-squared test. The paired-samples *t* test was used to investigate diversity of students' values between pre- and post-intervention. The significance level was set at $P < 0.05$ (two-tailed).

Educational Intervention

Due to illness and other reasons, the researcher-designed educational intervention was finally offered to 82 college students. The overall aim of the course was to provide students with knowledge and understanding of EI using a TBL approach. The intervention was delivered over 2 months and involved 30 hours of contact with students (Table 1). Intervention content was provided in seven classroom modules: (1) why we should learn about emotions, (2) common emotional problems of college students, (3) how to adjust the mood, (4) how to identify negative emotions, (5) how to seek the help of a psychologist, (6) case analysis, and (7) production and display of sitcom. Students were divided into 10 groups and encouraged to complete all modules during every learning session. They were expected to spend 3–4 hours to complete one module, with a total time of 30 hours. After each class, they can freely use the online function to discuss and communicate.

Ethical Considerations

The study was approved by the ethics committee of the university that students attended. The usual teacher is the head of this project, the 2 research assistants are graduate students. The teacher and all students participated voluntarily. The students' questionnaire was collected anonymously and all the teaching texts and audiovisual materials were collected for teaching archives. Participants were informed that their work and assessment results may be cited in research papers, and provided informed consent.

Results

Participant Characteristics

Of 98 students who took the course, 82 students completed the entire intervention and comprised the study sample. Demographic data for the participants is presented in Table 2. No significant difference was found from participants' characteristics.

Primary Outcome

The independent-samples *t* test was used to investigate pre-intervention differences in EI level between male and female students. Significant differences between pre- and post-intervention scores were identified for some scales and dimensions. The total EIS score ($t = 6.133$, $P < 0.001$), perceiving and expressing emotions dimension score ($t = 7.045$, $P < 0.01$), and regulating emotions subscale score ($t = 6.094$, $P < 0.001$) were higher post-intervention (Table 3).

Secondary Outcome

The same statistical method was used to analyze differences between pre- and post-intervention scores. Significant differences were observed in the knowing ($t = 4.268$, $P < 0.001$) and courage ($t = 4.842$, $P < 0.001$) CAI subscale scores. After intervention, the CAI score of medical students was significantly higher than that before intervention. In addition, the overall CAI score was higher post-intervention than pre-intervention ($t = 2.585$, $P < 0.05$). (Table 4)

Descriptive statistical analysis was applied to students' evaluations of the intervention, and a mean > 4 for each part was found. As the maximum score was 5, the scores indicated that students were quite satisfied with the course. (Table 5)

Discussion

The educational intervention implemented in this study improved medical students' EI and caring ability, as evidenced by significant differences between pre- and post-intervention scores for some scales. This suggests that PBL based emotional intelligence curriculum intervention is meaningful, and the quantitative and qualitative feedback of medical students has certain guiding significance for improving the curriculum intervention program and developing EI education of medical students.

Emotional Intelligence

Overall, students’ EI scores were higher post-intervention. The results of this study show that this kind of educational intervention for medical students can effectively improve EI, particularly in terms of perceiving, expressing, and regulating emotions. This discovery reflects EI can be increased with deliberate practice and training, unlike Intelligence Quotient [17]. These findings are consistent with those of Holman et al [6]. The evidence of this study also shows that teachers' in-depth analysis of various emotions in the classroom, good use of various media, and proper guidance of students to experience emotion can promote medical students’ emotional management and enhance their understanding of emotions. As medical students’ future work will require them to deal with patients with various emotional characteristics, learning to identify other people's emotions will facilitate the timely adoption of coping strategies to ensure the smooth progression of clinical work [4]. The results show that the intervention based on emotional curriculum may help medical students enhance their emotional knowledge and skills.

All the students in this study were in team shared accommodation. They participated in TBL, which may have helped them to get along with others and chose the appropriate timing and language for communication. However, the abilities to identify other people's emotions and to use emotions when solving problems were not significantly improved by the intervention, perhaps due to the classroom-based intervention can only use cases and PBL teaching to guide students to understand how to use emotions reasonably and recognize others' emotions. Students can only use these skills in real life to feel changes. Therefore, we need to observe and track the capabilities of this part.

Caring Ability

Anne [28] reported that nurses engage in emotional work, fostering caring relationships with patients, in a literature search. Caring has long been emphasized as an important ability that medical staff should acquire. An integrative review [4] suggested that caring ability and EI are related. Doctors’ and nurses’ development of EI may positively impact certain medical behaviors. In this study, the intervention increased scores in the caring dimension, as well as those in the knowing dimension and overall CAI scores, but did not affect their ability to be patient. These results may reflect the inclusion of case discussions in this TBL course, which mainly guided students to think and speak about clinical cases, and improve their understanding of the hospital environment, the disease in question, and caring, making them more confident in carrying out their own work. However, due to the limit in class hours, fewer classroom hours were devoted to patience-related education, the patience dimension was not changed after intervention. Therefore, further exploration is needed to identify effective ways in which to improve medical students' EI and caring ability, stimulate their thinking, guide them in understanding patients’ words and actions in clinical practice, and improve their empathy. At present, many researchers use professional intervention methods such as mindfulness meditation to enhance individuals’ EI and caring ability [29]. The results of this study suggest that a TBL intervention implemented during the regular school period can also improve medical students’ caring ability, which may ultimately improve the overall level of caring among medical workers.

Students' Evaluation of the Course

TBL was a positive educational experience for the students [30].In this study, in the context of TBL, the researchers divided all participants into 10 groups, decomposed the contents of the curriculum, put forward questions in each teaching link, and asked all students to participate in the discussion and report collectively. This method effectively motivated the students to participate in the course modules. In this manner, emotional management can be taught using theoretical knowledge and consideration of relevant cases in the classroom setting. The effect of the course intervention is consolidated. Most students in this study were satisfied with the course, and felt that they had acquired the corresponding knowledge.

Limitations

Several limitations of this study must be addressed. It was conducted with a convenience sample of students at a single medical university. Thus, the Intervention program may not be generalizable to students in other fields. As is mentioned in the introduction and background, EI influences professional development. The interaction in this course, students' EI, caring ability and career should be further discussed. Whether the effects of such education and training persist until students become medical professionals should be tracked.

Conclusions

This study showed that an emotional management course based on TBL significantly improved medical students’ EI and caring ability. By incorporating the auxiliary teaching method of TBL in EI training, we could consolidate the better effect of the intervention. Scores in some dimensions assessed did not change, which could be addressed with the improvement of curriculum content. Further longitudinal research in this area, including the evaluation of participants’ skills in clinical practice, is recommended.

Declarations

Ethics approval and consent to participate

Information regarding the study was provided to all the participants and participation in the questionnaire study was voluntary. All students agree that researchers use the personal data in the course for research. This study was approved by the ethics committee of Southern Medical University.

Consent for publication

Not applicable.

Availability of data and materials

Yu Chen has full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request. All data generated or analyzed during this study are included in this published article.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

All authors listed in the manuscript contributed to the manuscript significantly. YC designed the study, and she is the teacher who intervened in the course. WJY assisted the research, YMG, JW, FF, JLX supervised the conduct of the data collection. Chen Yu and Yang Wen-Jiao drafted the manuscript and all authors contributed substantially to its revision. Chen Yu takes responsibility for the paper as a whole. All authors read and approved the final manuscript.

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Tables

Table 1 Course content distribution

Content of courses	Class hours	Organizer and executor	Form of learning
Why should we learn about emotion	5	A researcher and 2 assistant	• Introduce the learning content and put forward some question • Panel discussion • Team answers submitted and graded • Instructor feedback
Common emotional problems of college students	5	A researcher and 2 assistant	The same form of organization
How to adjust the mood	5	A researcher and 2 assistant	The same form of organization
How to identify bad emotions	4	A researcher and 2 assistant	The same form of organization
How to seek the help of a psychologist	4	A researcher and 2 assistant	The same form of organization
Case analysis	4	A researcher and 2 assistant	The same form of organization
Sitcom display	3	A researcher and 2 assistant	The same form of organization

Table 2 Participants demographics (n=82)

	n	%	*P*-value
Gender			0.603
Male	27	32.9	
Female	55	67.1	
Grade			0.851
Freshman	40	48.8	
Sophomore	38	46.3	
Junior	4	4.9	
Major			0.463
Clinical medicine	18	22	
Traditional Chinese Medicine	12	14.6	
Preventive medicine	6	7.3	
Pharmacy	7	8.5	
Nursing (midwifery)	4	4.9	
Medical engineering	9	11	
Other types	26	31.7	

Table 3 Comparison of EI subscales and dimensions pre- and post-intervention

	Pre-intervention			Post-intervention			*t*-test	*P*-value
	n	mean	SD	n	mean	SD		
Emotional intelligence								
Perceiving and expressing emotions	98	42.32	4.34	82	47.07	5.98	7.045	0.002
Regulating emotions	98	30.22	3.60	82	32.80	3.51	6.094	0.000
Identifying other People's emotions	98	24.48	2.54	82	24.98	2.60	1.688	0.095
Utilizing emotions When solving problems	98	28.80	3.11	82	29.32	3.21	1.559	0.123
Overall	98	125.56	11.00	82	133.98	12.65	6.113	0.000

Table 4 Comparison of CAI subscales and dimensions pre- and post-intervention

	Pre-intervention			Post-intervention			*t*-test	*P*-value
	n	mean	SD	n	mean	SD		
Caring ability								
Knowing	98	75.62	8.53	82	79.39	9.71	4.268	0.000
Courage	98	47.04	14.03	82	58.41	10.72	4.842	0.000
Patience	98	61.01	5.39	82	61.32	5.12	0.478	0.634
Overall	98	187.83	17.47	82	194.99	19.57	2.585	0.012

Table 5 Students' evaluation of the course(n=82)

	mean	Standard deviation	mean standard error
Your evaluation of the teaching method	4.5267	.44583	.03640
Your evaluation of teaching content	4.4293	.46249	.03776
Self-evaluation after the course of learning	4.0333	.64354	.05255
Your opinions and suggestions	4.2394	.52538	.04304