Original Article

Effects of problem-solving skill training on emotional intelligence of nursing students: An experimental study

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Abstract:

BACKGROUND: Nursing students are generally trained to acquire the knowledge, skills, and approaches required for solving problems and contradictions in life and at work. In fact, problem-solving skills are the core of effective nursing activities. Therefore, the aim of this study is to evaluate the effectiveness of problem-solving training on the promotion of emotional intelligence in nursing students.

MATERIALS AND METHODS: This interventional case–control study used a pretest-posttest design. All senior nursing students ($n = 43$) attending the seventh semester of their undergraduate studies at Hazrat Fatemeh School of Nursing and Midwifery of Shiraz University of Medical Sciences were recruited in the present study. The participants were randomly allocated to either the intervention group ($n = 20$) or the control group ($n = 23$). The collected data were analyzed with SPSS software version 16.

RESULTS: While the mean standardized scores of Emotional Quotient Inventory of the two groups were not significantly different before the intervention, the scores were significantly higher in the intervention group both immediately and 2 months after the intervention. Comparison of the standardized emotional intelligence scores revealed the intervention group to have significantly higher mean scores immediately and 2 months after the intervention compared to baseline scores (105.87 ± 9.82 and 109.44 ± 9.56 vs. 101.22 ± 10.93; $P < 0.001$). Such significant differences were absent in the control group.

CONCLUSION: Using the results of this research in nursing education, it is possible to improve the level of nurses' knowledge and personal skills and to increase the level of services and increase the satisfaction of the clients.

Keywords:
Education, emotional intelligence, nursing, problem-solving

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Introduction

During the recent 40 years, research has demonstrated the benefits of problem-solving skills on psychological, social, cultural, and educational aspects of human life.[1] Hence, professionals of all fields are currently recommended to use such skills as a necessity in dealing with not only problematic, but also normal general and technical tasks.[2,3]

Problem-solving skills are essential in nursing education as undergraduate and graduate nursing schools are faced with the critical challenge of preparing students to safely and effectively perform nursing tasks in a complex, ever-changing health-care environment. However, since these skills have not been systematically integrated in nursing curriculum,[4,5] nurses who are expected to offer the best and fastest solutions in response to patient needs and problems have been reported to lack sufficient problem-solving skills.[1,6,7]

Nurses' ability to handle difficult health situations depends on their knowledge, skills, and also attitude.[6,8]

In other words, nurses can sustain creativity in nurse–patient relationships and overcome personal and professional restrictions by moderating acceptable emotions and thought, probably through emotional intelligence.[9] Emotional intelligence is the ability to understand, control, and evaluate one's feelings and emotions and to maintain constructive emotions to promote emotional knowledge and cognitive activities.[10-12] Emotional intelligence abilities in the success of health-care organizations are important and ultimately help individuals think better under difficult conditions.[13,14] Nurses with high emotional intelligence can manage their feelings and emotions and make goal-oriented decisions. Low emotional intelligence, on the other hand, reduces the levels of happiness and health and problem-solving ability in nurses.[15,16]

Since numerous studies have highlighted the relation of emotional intelligence and problem-solving,[17] professional nurses are required to expand their emotional intelligence skills in order to properly recognize and solve problems[14,18] because emotional intelligence plays an important role in the formation of successful human relationships. It is very important to establish the relationship between nurse and patient treatment which plays a key role in the decision-making and problem-solving processes and as emotional intelligence is higher, the problem-solving power is greater.[19,20]

Freshwater and Stickley introduced emotional intelligence in nursing education as the heart of art and states that the vacancy of emotional intelligence in the nursing curriculum is quite tangible.[9] Considering the role of nurses in managing the society's health, we can emphasize the importance of entering basic skills such as problem-solving in the formularized programs of education of all nurses to catch the best individual and social services.

Furthermore, in the primary health-care system, well-informed and capable personnel who can identify and provide solutions on time and provide the best services to the people with an awareness of the community's culture and context is one of the main pillars of implementation of the right goal. Considering that one of the main components of primary health care is health education, considering the health problems in society and the methods of prevention and promotion of health. The need for all health team workers to face up to the health system's problems, identify issues, prioritize and ultimately provide solutions and implement selected appropriate solutions. On the other hand, primary health care is a fair service delivery system for society, so health professionals, including nurses, need basic communication skills, mutual understanding, and

confidence building so that they can meet and better understand health problems. It is possible with the reinforcement of emotional intelligence.

Nurses are expected to have good problem solving skills, but studies have shown that this skill is low in nurses.[1,6,7]

Given the role of emotional intelligence in nurses' professional success, there arises a question of can the emotional intelligence score be increased by teaching problem-solving skills? Considering the importance of problem-solving and emotional intelligence in nursing, the present study sought to determine the effects of problem-solving skill education on the emotional intelligence of nursing students.

Materials and Methods

Study design
This was an experimental study with a pretest-posttest design to assess the effects of problem-solving skill education (independent variable) on the emotional intelligence of nursing students (dependent variable) of Hazrat Fatemeh School of Nursing and Midwifery of Shiraz University of Medical Sciences, Shiraz, Iran.

All senior nursing students (n = 43) attending the seventh semester of their undergraduate studies at Hazrat Fatemeh School of Nursing and Midwifery were recruited in the present study. The students were randomly allocated to either the intervention or the control group (n = 20 and 23, respectively). In order to confirm the homogeneity of the two groups in terms of factors affecting emotional intelligence, a questionnaire containing the participants' age, gender, marital status, overall grade point average (GPA), place of residence, history of psychiatric medications, history of participating in yoga classes, stress management, problem-solving and emotional intelligence skills, and parents' age and education level was completed. The Emotional Quotient Inventory (EQ-i), developed by Bar-On in 1997, was used to evaluate emotional intelligence. The EQ-i, the first reliable cross-cultural test to measure emotional intelligence, consists of 133 questions arranged in 15 subscales including emotional self-awareness, assertiveness, independence, self-regard, self-actualization, interpersonal relationship, social responsibility, empathy, problem-solving, reality testing, flexibility, stress tolerance, impulse control, optimism, and happiness.[21,22] Scores of all items (ranging from 1 to 5) are summed to obtain an individual's total score. In order to make comparisons possible, the raw scores have to be converted into standard scores based on a mean score of 100 and standard deviation of 15. The results are then interpreted according to the instructions provided by Bar-On [Table 1]. Administration of the

Table 1: Interpretation of the Emotional Quotient Inventory scores

Standard score	Level	Interpretation
>130	Extremely high	Extraordinarily high emotional intelligence
120-129	Very high	Very high emotional intelligence
110-119	High	High emotional intelligence
90-109	Moderate	Normal emotional intelligence
80-89	Poor	Lower than normal emotional intelligence, requiring progress
70-79	Very poor	Absence of noticeable emotional intelligence, requiring improvement
<70	Extremely poor	Impaired emotional intelligence, requiring improvement

EQ-i on fifty Iranian students revealed the test–retest reliability of the questionnaire (over a 2-week period) to be 0.87.[22] In this study, administration of the EQ-i on 15 nursing students revealed the test–retest reliability of the questionnaire (over a 2-week period) to be 0.83.

In order to evaluate the efficiency of the educational program, a problem-solving skill questionnaire was completed before and after the intervention, which was a researcher-made self-evaluation checklist, contained 19 items, and was designed based on the model proposed by D'zurilla and Goldfried. All items were scored on a 5-point Likert scale ranging from 1 (very low) to 5 (very high) leading to minimum and maximum scores of 95 and 19, respectively. Comments of ten participants and seven relevant professors were used to evaluate the face validity of the checklist. Content validity of the checklist was also confirmed by seven relevant experts. Moreover, in a pilot study, ten nursing students (attending the sixth semester) were asked to fill out the checklist twice (with a 2-week interval). Cronbach's alpha and the test–retest reliability of the checklist were calculated as 0.85 and 0.66, respectively.

After completing the questionnaire, the intervention group participated in an educational program on problem-solving. The program lasted for 2 months and comprised six 2-h sessions held at Hazrat Fatemeh School of Nursing and Midwifery. Various methods such as group discussions (in groups of four), brainstorming, JIGSAW method, and the application of educational aids (e.g., books, booklets, posters, and video projection) were used during the program. All the sessions were planned and performed based on the six-stage model developed by social problem-solving model developed by D'zurilla and Goldfried.[23] The training was conducted by two university faculty members and with the help of a researcher.

The model consisted of general directions, problem definition, producing initial solutions, decision-making, applying the solution, and revision. The sessions were planned as follows:
- First session (first phase): General directions, the ability to identify the problem and accept it as a natural, potentially manageable phenomenon, belief in the efficacy of the problem-solving framework in dealing with the problem, high perceived self-efficacy in completing all the stages of the model, and forming the habit of pausing and thinking before taking action to solve a problem
- Second session (second phase): Defining and formulating the problem, collecting all available information, discriminating between facts and hypotheses requiring further research, analyzing the problem, and determining real goals
- Third session (third phase): Developing alternative solutions, suggesting a variety of possible solutions, and selecting the most effective solution
- Fourth session (fourth phase): Decision-making and predicting the possible outcomes of each action and the benefits of each outcome
- Fifth session (fifth phase): Implementing the selected solution
- Sixth session (sixth phase): Revision and evaluation
- Members of both groups also took part in routine programs of the school, i.e., theoretical classes and internship programs. Since most nursing courses involve the problem-solving skill, the control group did not receive any additional education.

Data analysis
The EQ-i and problem-solving skill questionnaire were completed immediately and 2 months after the program. Considering the small sample size, the results were analyzed with Mann-Whitney U, Wilcoxon, and Chi-square tests, Pearson's correlation analysis, and repeated measures analysis of variance (ANOVA). Statistical analyses were performed using the Statistical Package for the Social Sciences version 16.0 (SPSS Inc., Released 2009. PASW Statistics for Windows, Chicago, IL, USA).

Results

This study was conducted on 43 nursing students in which 4 (9.3%) of them were male and 39 (90.7%) were females and all of them were senior students of nursing. The mean age of the participants was 21.74 ± 0.72 years. According to the results of Chi-square and Mann–Whitney U-tests, the two groups were not significantly different in terms of baseline characteristics.

In other words, the groups were homogeneous in factors affecting emotional intelligence (age, gender, marital status, GPA, place of residence, history of psychiatric medications, history of participating in yoga classes, stress management, problem-solving and emotional intelligence skills, and parents' age and education level).

While the mean standardized scores of EQ-i of the two groups were not significantly different before the intervention ($P > 0.05$), the scores were significantly higher in the intervention group both immediately and 2 months after the intervention ($P < 0.05$). The mean standardized scores of EQ-i of the intervention group before, immediately, and 2 months after the intervention were 101.22 ± 10.93, 105.87 ± 9.82, and 109.44 ± 9.56, respectively, while in control group, mean standardized scores of EQ-i before, immediately, and 2 months after the intervention were 103.58 ± 12.60, 102.90 ± 11.55, and 103.33 ± 11.93, respectively.

Moreover, Mann–Whitney U-tests revealed significant differences between the mean standardized scores of the two groups before and immediately after the intervention, before and 2 months after the intervention, and immediately and 2 months after the intervention. On the other hand, repeated measures ANOVA suggested significant increases in the mean scores of the intervention group throughout the study. In contrast, no such differences were observed in the control group [Table 2].

In order to evaluate the efficiency of the training program assessed a problem-solving skill and the mean scores of problem-solving skill of the intervention group before were (71.35 ± 11.95), immediately (77.75 ± 8.31), and 2 months after the intervention (78.75 ± 8.00). In control group, mean scores of problem-solving skill before, immediately, and 2 months after the intervention were 72.21 ± 7.84, 71.78 ± 7.29, and 71.25 ± 7.20, respectively.

Wilcoxon tests were performed to compare the mean self-evaluated problem-solving scores of the two groups before and immediately and 2 months after the intervention. The results indicated significant differences between the mean problem-solving scores of the intervention group before and immediately after the intervention ($Z = -3.47$; $P < 0.001$), before and 2 months after the intervention ($Z = -3.86$; $P < 0.001$), and immediately and 2 months after the intervention ($Z = -3.57$; $P < 0.001$). However, similar differences were not detected in the control group [Table 3]. Therefore, according to the results obtained, the effectiveness of the educational program can be more reliable than the overall results of the study.

Based on Spearman's correlation analysis, the relationship between the mean scores of emotional intelligence and the problem-solving skills was statistically significant ($r = 0.34$; $P < 0.001$). Finally, while most participants in the intervention group had moderate ($n = 13$, 65.3%) and high ($n = 4$, 20%) emotional intelligence before the intervention, the levels increased to high ($n = 8$, 40.2%) and very high ($n = 2$, 10.2%) 2 months after the intervention.

Result of the study showed that almost all the participants in intervention group did not stay on the extremely weak, very weak, and very high categories of emotional intelligence. Before the intervention, the highest percentage of participants of intervention group, 13 (65%), stayed in the moderate level of emotional intelligence category and 4 (20%) stayed in high emotional intelligence category. After the intervention, eight (40%) participants stayed in high emotional intelligence

Table 2: The mean standardized scores of the Emotional Quotient Inventory before the intervention and immediately and 2 months after it

Group	Mean±SD			Z	P
	Before the intervention	Immediately after the intervention	2 months after the intervention		
Intervention group	101.22±10.93	105.87±9.82	109.44±9.56	29.94 df=2	0.001
Control group	103.58±12.60	102.90±11.55	103.33±11.93	2.62 df=2	0.260

SD=Standard deviation

Table 3: The mean changes in problem-solving skill scores before the intervention and immediately and 2 months after it

Group	Mean±SD			z	P
	Before the intervention	Immediately after the intervention	2 months after the intervention		
Intervention group	71.35±11.95	77.75±8.31	78.75±8.00	20.41 df=2	0.001
Control group	72.21±7.84	71.78±7.29	71.25±7.20	5.74 df=2	0.100

SD=Standard deviation

category and two (10%) participants stayed in very high emotional intelligence category. In the control group, the highest percentage of participants, 9 (1.39%), stayed in moderate emotional intelligence category.

Discussion

The results of the present study showed low levels of problem-solving skills among nursing students. Similar findings were also reported by Moattari and Abedi in Iran[1] and Altun in Turkey.[6]

In confirmation to this issue, the results of Lau showed that problem-solving skills' training is a critical factor for nursing graduates and Macao has had no problem-solving training in its educational curriculum; an effective problem-solving training should be implemented as part of the curriculum. With so many changes in health care today, nurses must be good social problem solvers in order to deliver holistic care.[24]

In fact, the intervention group, who had acquired social problem-solving skills, was able to recognize, accept, and solve the existing problems by concentrating on their strengths and weaknesses. Previous research has confirmed the effects of problem-solving skills on self-awareness,[24-26] stress management, self-esteem, conflict management,[27] satisfaction, realism, honesty,[6] and self-realization.[1] Higher self-awareness decreases the level of stress and the chance for depression in individuals with sufficient problem-solving skills.[28] In other words, problem-solving skills are expected to improve emotional intelligence.

Palanci and Okutan found that five-factor personality of principals was predicted by interpersonal reactivity and emotional intelligence. Problem-solving skills of principals are affected by situational factors.[29,30] EQ is related to principals' feelings, self-awareness, keeping their determinations concerning their thought, acts and willingness high which can be upgraded with problem-solving training.[31] These results are consistent with the results of the study.

Shewchuk *et al*. concluded that problem-solving in the form of small group discussions resulted in the best possible solutions and promoted critical thinking in the participants.[32] They believed that such an approach improved various skills including observation, comparison, organization of information, determination and management of variables, developing and testing hypotheses, analysis, deduction, evaluation, and ultimately judgment.

McCallin and Bamford obtained similar results and showed that teamwork increases the most abilities in

people, especially emotional intelligence, and increases job satisfaction in nurses.[33] We also adopted methods such as group discussions, question and answer sessions, and small group activities to teach problem-solving skills based on the comprehensive protocol provided by D'zurilla and Goldfried.

The implemented techniques in the present research required the students to use their previous educational, professional, and personal experiences to deal with real problematic situations. Thus, by focusing on social problem-solving, the applied method was able to improve emotional intelligence (a phenomenon with social consequences). The first stage of the mentioned protocol determines the general approach toward the problem and emphasizes the ability to control emotions and reactions in response to different problems and incidents. In the next stage, the learners, who have already accepted the problem as a reality in life, replace impulsive decisions with firm decisions based on logical thinking and optimism about the future. They will also be capable of constant revision of the steps taken in order to identify their weaknesses and strengths and to embrace other solutions if necessary.

The results of Ahghar show that learning rate of self-regulation in students with training in problem-solving skills is significantly more than students without these trainings. Therefore, problem-solving skill training is effective in self-regulation learning of students and has good stability over time.[34]

Several studies have indicated that problem-solving skill training positively affected various subscales of emotional intelligence, for example, emotional self-awareness, self-actualization, optimism, flexibility, assertiveness, and independence.[24-27]

Shahba and Allahvirdiyani reported that teaching problem-solving skills and emotional intelligence can both play a significant role in reducing students' aggression. This result shows that training problem-solving and emotional intelligence skills can be successful in controlling the emotional reactions of individuals and can reduce adverse reactions to problems.[35]

Similarly, our findings suggested the problem-solving skill training program to cause significant improvements in the mentioned subscales of emotional intelligence. However, the changes were not significant in case of other subscales of emotional intelligence such as social responsibility, sympathy, interpersonal relationships, and stress tolerance. Apparently, overall enhancement of emotional intelligence will require training programs which target all its subscales.

Since this research was conducted on a small size of population, the results cannot be generalized to all senior nursing students; therefore to generalize the results, further studies on large samples of students are warranted to confirm the results in students of other fields.

Our findings can also be used to present nursing policymakers, executives, teachers, and students with new approaches to enhance both problem-solving skills and emotional intelligence in a more desirable manner. In fact, curriculum planners' and teachers' careful attention to promoting problem-solving skills and emotional intelligence of medical and nursing students can provide the community with doctors and nurses who are capable of proper decision-making, judging, and problem-solving under the most difficult circumstances and ultimately boost the quality of patient care, patient satisfaction, and public health.

The probability of transferring the content between the students of the intervention and control group is one of the research constraints. Therefore, in order to control this issue, interventional students were asked not to talk with the control group regarding the interventions performed during the research and to reduce this probability, the teaching method used was such that the students were trained in small groups and did not receive a book or handout or pamphlet for the students out of class. However, the research results indicate the ineffectiveness of this interaction in effective transfer of learning. Further elaboration on weaknesses of the study is inevitable.

Limitations to the study
Although the research has reached its aims, there were some unavoidable limitations. This research was conducted only on a small size of population who were attending the seventh semester of their undergraduate studies at Hazrat Fatemeh School of Nursing and Midwifery. Therefore to generalize the results for large groups, the study should have involved more participants at different levels.

Conclusion

Considering the results of the study and the significant impact of problem-solving skills' training on enhancing students' emotional intelligence and the well-known role of emotional intelligence in improving the quality of health services, it is recommended that a designed and continuing educational program about problem-solving and emotional intelligence skills should be added to nurses' higher educational programs that effects on other nurses' abilities and quality of services. It is worth noting, after many studies and the lack of a

problem-solving and emotional intelligence training program in the nursing curriculum in Iran, the training of these two skills will be held as a workshop for all students in subsequent courses. A knowledgeable and demanding society needs nurses today to have the ability to participate, solve problems, and make decisions related to profession, communication, and mutual understanding. Accordingly, educators should also try to strengthen problem-solving skills, emotional intelligence skills, and student decision-making in different ways. The results of this study indicate the success of this desire.

Conflicts of interest
There are no conflicts of interest.

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