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Effectiveness of Emotional Intelligence Training in Perceived Stress and Problem-Solving Skills in Students

Yasaman Alipour[1], Ali Naseri[2*]

1. MSc, Clinical Psychology, Department of Psychology, Shiraz Branch, Islamic Azad University, Shiraz, Fars, Iran
2. Ph. D, Assistant Professor, Department of Psychology, Firoozabad Branch, Islamic Azad University, Firoozabad,Fars, Iran

*** *Corresponding author:*** Ali Naseri, Ph. D, Assistant Professor, Department of Psychology, Firoozabad Branch,Islamic Azad University, Firoozabad, Fars, Iran. E-mail: dr.alinaseri@iau.ac.ir

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Abstract

Background: Based on the research, intervention programs in educational institutions that target emotional competence, such as life skills training programs emphasizing emotional skills, have been successful in the promotion of social adaptation.

Objectives: The present study aimed to assess the effects of emotional intelligence training on students' perceived stress levels and problem-solving skills.

Methods: This quasi-experimental study was conducted based on a pretest-posttest control group design with a two-month follow-up period design. A total of 70 participants were selected via the available sampling technique and randomly assigned to two groups (n=35 in each group). During the pre-test and post-test phases, all participants completed the Perceived Stress Scale by Cohen et al. and the Problem-Solving Questionnaire by Hepner and Patterson. The experimental group received training according to the Bar-On emotional intelligence protocol in eight 90-minute sessions, while both groups were observed throughout the study. The data collected was analyzed using SPSS software.

Results: The results of covariance analysis demonstrated that the intervention was successful in the enchantment of personal-solving confidence and personal control (P<0.05); however, there was no significant improvement in the avoidance style component (P<0.05). The effect size measurement (partial eta square) indicated that the intervention had a more marked impact on personal control than personal-solving confidence (r=0.472).

Conclusion: As evidenced by the obtained results, emotional intelligence training can lower perceived stress levels and enhance problem-solving skills by aiding the recognition and management of emotions.

Keywords: Emotional intelligence, Perceived stress, Problem-solving skill, Students

1. Background

Problem-solving is sophisticated cognitive skills that involve attention, perception, memory, and other processes working together to achieve a goal (1). Problem-solving is a logical and purposeful activity, representing a prime example of critical thinking that involves applying previously acquired knowledge, skills, and concepts in unfamiliar situations, leading to new learning (2). Participation in the mental activity of problem-solving allows people to find practical solutions to daily difficulties. While not every problem may be resolved, problem-solving skills depend on the method and tactics used in dealing with challenges, leading to successful and flexible solutions

(3). Effective problem-solving and decision-making necessitate reducing stress and achieving mental relaxation, highlighting the importance of skills, such as coping with perceived stress (4).

Perceived stress is the evaluation and experience of life events as uncontrollable, unpredictable, and threatening by individuals (5). Yang and Wu (2023) describe perceived stress as a person's subjective feeling towards the cognitive assessment of stressful events, which can manifest in various ways and impact mental health. Since stress interpretation is subjective, people may react differently to similar stressful situations based on factors, such as perceived stress level, nature, duration, and intensity (6). Lazarus (1993) defines two types of stress-coping mechanisms: problem-solving and desensitizing. Therefore, individuals need problem-solving and emotion regulation skills, requiring high emotional stability. As emotion regulation is a key component of emotional intelligence, its role in people's quality of life is crucial (7).

The initial definition of emotional intelligence was introduced by Salovey and Mayer in 1990, and a strong conceptualization and modeling were used to support it. As per this definition, emotional intelligence refers to the capability of monitoring one's own and others' emotions, recognizing and distinguishing them, and constructively utilizing emotional information, which serves as a guide for both thinking and behavior (8). According to a study by Yang and Duan (2023), individuals with high emotional intelligence can comprehend their own and others' emotions, utilize emotional information to direct their thoughts and actions, and differentiate and manage various emotions and feelings (9). Emotional intelligence training is identified as one of the most effective programs that can enhance the ability to guide others and reinforce effective coping mechanisms to foresee individual success and instill them in individuals through emotional perception, emotional facilitation, emotional understanding, and emotion management (10).

Given that students face new expectations and roles when they enter higher education, experiencing significant changes in various aspects of their lives, often leading to stress and decreased efficiency, it is crucial for them to develop coping skills to manage stress effectively (11). Furthermore, strong problem-solving skills are essential for success in various fields, allowing people to make better decisions when faced with challenges. Considering that stress can impact students' physical and mental health, emotional intelligence training is necessary to build resilience and improve stress management (12). Problem-solving skills are not only crucial for academic success but also for handling everyday issues. In today's tech-savvy and competitive job market, students need to be able to solve problems quickly and effectively. These skills enable students to tackle personal problems, generate creative solutions, and address new challenges. Emotional intelligence is beneficial for students in managing education and life challenges, making it easier for them to overcome obstacles. The points mentioned emphasize the significance and immediacy of this study (13).

Prior studies conducted both domestically and internationally have established the effectiveness of emotional intelligence training in reducing perceived stress and enhancing problem-solving skills. In a study entitled "Investigating the relationship between emotional intelligence and metacognition with problem-solving skills in first-year secondary school students in Shiraz," Sheikhani and Shojaei Fard (2023) confirmed the significant predictive role of emotional intelligence in problem-solving skills, specifically in the areas of confidence and personal control (14). Another study by Bakhshi and Sedigh Arfaei (2021) revealed a notable decrease in stress levels among the experimental group post-intervention. Overall, the findings suggested that emotional intelligence training effectively

reduced perceived stress among students (15).

In the same context, Merida Lopez et al. (2022) conducted a study examining the impact of emotional intelligence on perceived stress among Spanish teachers. "This research investigated how different aspects of emotional intelligence affect subjective happiness and perceived stress in a large group of Spanish teachers. The results pointed out that the abilities to assess, use, and control emotions were strong indicators of both mental well-being and stress levels." Overall, all aspects of emotional intelligence were positively connected to mental happiness, while perceived stress was correlated with lower grades (16). In their study entitled "Emotional intelligence and problem-solving skills in people who attempted suicide," Korkmaz et al. (2020) found that individuals with

low emotional intelligence face more challenges in problem-solving than healthy individuals (17).

2. Objectives

Nonetheless, as emotional intelligence levels increase, so do problem-solving skills and the capacity to overcome challenges. The primary aim of this study was to investigate the impact of emotional intelligence training on perceived stress and problem-solving skills among students at Islamic Azad University, Shiraz branch. It is hypothesized in this research that emotional intelligence training can affect students' perceived stress levels and their problem-solving skills."

3. Methods

This quasi-experimental study was conducted based on a pretest-posttest control group design with a two-month follow-up period. Participants were all master's degree students from Islamic Azad University, Shiraz branch. A total of 72 individuals were initially selected using available sampling methods, with 36 cases randomly assigned to an experimental group and 36 subjects to a control group. Due to sample dropouts (Figure 1), the final sample size consisted of 70 individuals, with 35 in each group (18). The research adhered to ethical principles by obtaining approval from the university ethics committee, ensuring participant confidentiality, maintaining their safety, and not imposing financial burdens. The inclusion criteria required participants to not be on psychiatric medication, visit a counselor or psychologist, or engage in emotional intelligence training during the study period. On the other hand, the exclusion criteria entailed unwillingness to continue participation, sudden illness, or experiencing significant stress that could impact the study results.

After being given the code of ethics by Islamic Azad University and completing a pre-test in both the experimental and control groups, participants in the experimental group underwent eight 90-minute training sessions in emotional intelligence skills. Following the Bar-On emotional intelligence training protocol (19), a post-test on perceived stress and problem-solving skills was conducted on both the experimental and control groups at the end of training. Two months later, the collected data were analyzed using SPSS software (version 28), and the researcher discussed the research hypothesis and drew conclusions based on the results. The detailed content of Bar-On emotional intelligence training sessions is provided in Table 1.

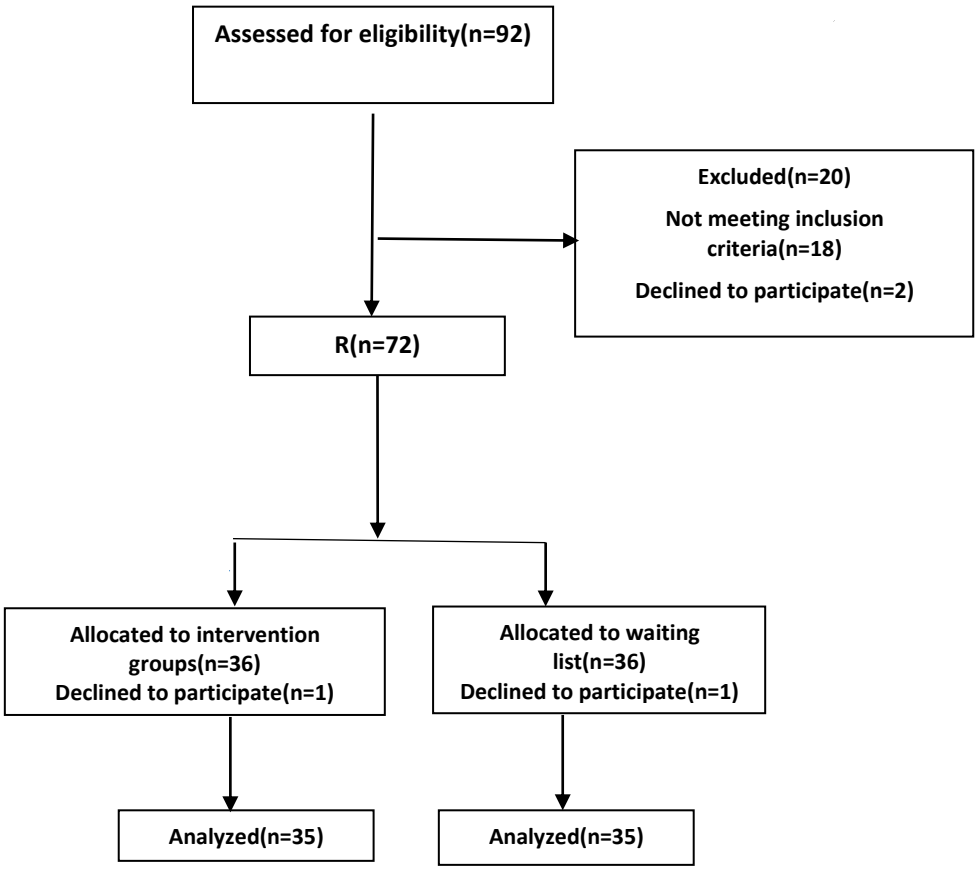

Figure 1. Flow diagram of participation in the study

Table 1. Summary of Training Program Based on the Bar-on Model

Session	Educational contents of the session
First	Group formation, Member introduction, planning, and explaining the rules and expectations of the group
Second	The place of intelligence in life, emotional self-awareness, recognition and expression of facial emotions, evaluation and rating of emotional state
Third	Active listening skills (effective listening), assertiveness
Fourth	Emotional autonomy, the cycle of consciousness, the discovery of emotions
Fifth	Self-expression, facing social fear, all kinds of emotions
Sixth	Courageous behaviors, empathy
Seventh	The importance and types of communication in life, emotion management
Eighth	Barriers to effective communication, consequences of lack of communication skills, summarizing and implementing the final program, and preparation for continuing activities in life.

Research tools

Cohen et al.'s perceived stress questionnaire (1983): Cohen et al. developed a questionnaire in 1983 to evaluate perceived stress using 14 items rated on a five-point Likert scale ranging from never to very much, with values from 0-4 for each item (20). Scores are totaled, with possible results ranging from 0-56 (never 0, low 1, medium 2, high 3, very high 4). Scores of 0-18, 18-36, and >36 indicate low, moderate, and high perceived stress, respectively. The internal consistency reliability of this questionnaire, as reported by Cohen, Kamark, and Mermelstein in 1983, ranged from 0.84-0.86 using Cronbach's alpha. The criterion validity of this questionnaire, also validated by Cohen, Kamark, and Mermelstein in 1983, ranged from 0.52-0.76. Saadat et al. (2014) also found reliability above 0.70 using Cronbach's alpha. In the current study, the reliability of this questionnaire was 0.89 (21).

Heppner and Peterson problem-solving questionnaire: In 1982, Hepner and Patterson designed this 35-item questionnaire to evaluate problem-solving skills (22). The questionnaire

utilizes a 6-point Likert scale and factor analysis to identify three distinct subscales. These include the personal-solving confidence (items 5-10-11*-12-19-23-24-34-33 35-27*), the approach-avoidance style (items 1*-2*-4*-6-7-8-13*-15*-16-17*-18-20-21*-30 28*-31), and personal control (items 3*-14*-25*-26*-32*). Additional questions (9-22-29) are also included, with those marked with an asterisk being reversely scored. The scoring ranges from a minimum of 32 to a maximum of 192. The confirmatory factor analysis results indicated that the three-factor structure of this scale fits well with the data, as evidenced by various fit indices (χ/df= 2.56؛ GFI= 0.97, NFI= 0.96, NNFI= 0.97, CFI= 0.97). To assess divergent validity, an independent t-test revealed that non-procrastinators had problem-solving skills significantly higher by 16 points compared to procrastinators (P<0.05). The reliability of the problem-solving components and the overall scale (self-confidence in problem-solving: 0.80, tendency-avoidance problem: 0.78, personal control: 0.70, and problem-solving skills: 0.91) was deemed satisfactory when assessed using Cronbach's alpha methods(23). In the current research, the reliability of problem-solving components ranged from 0.76-0.79. The validity of the components (personal-solving confidence 85%, approach-avoidance style 84%, and personal control 72%) demonstrates good internal consistency.

Statistical Analysis

Fisher's test was employed to compare gender and marital status in the two groups. The results illustrated no significant differences between the two groups when it came to the demographic traits of gender and marital status. The results of Fisher's test, with a significance level exceeding 0.05, suggested that the two groups were equivalent in terms gender and marital status. The homogeneity of age among the groups was evaluated using an independent T-test. The results demonstrated that the mean age scores in the experimental and control groups were 27.58 and 28.19, respectively. There was no significant variance in the mean age of the two groups. As per the independent T-test, the groups were homogeneous in age.

4. Results

As presented in Table 2, moderate perceived stress levels in the experimental group decreased during the post-test phase, with a slight decrease being observed in the control group. Nevertheless, during the follow-up period for both groups, there was a slight increase in perceived stress that was not statistically significant. In addition, the experimental group showed an increase in average personal-solving confidence, approach-avoidance style, and personal control during the post-test phase, while the control group experienced a slight increase in these areas. However, both groups demonstrated a minor decrease in these variables throughout the follow-up period

Table 2. Mean and standard deviation of perceived stress and problem-solving skill by group

Variable	Time	Experimental Group		Control Group	
		M	SD	M	SD
Perceived Stress	Pre-test	24.38	7.32	27.86	6.56
	Post-test	19.74	6.63	27.37	6.54
	Follow up	19.83	6.66	27.90	6.66
Personal-solving confidence	Pre-test	48.44	6.46	47.34	5.81
	Post-test	03.12	7.21	47.51	5.68
	Follow up	03.07	7.20	47.42	5.66
Approach-avoidance style	Pre-test	65.15	0.32	61.97	6.17
	Post-test	66.24	4.94	62.43	6.00
	Follow up	66.22	4.93	62.27	5.98
Personal Control	Pre-test	20.53	3.70	18.37	5.03
	Post-test	24.21	4.85	18.31	5.00
	Follow up	24.11	4.82	18.26	4.98

Normal tests

The current study assessed the hypothesis of outlier data absence using a box plot and found no outlier data in the observations. Normal distribution was confirmed through skewness, kurtosis, and the Shapiro-Wilk test. The skewness values for all variables fell within the ±2 range, indicating no significant deviation from normal distribution. The elongation values for all variables ranged from +2 to -2, further supporting normal distribution. The Shapiro-Wilk test results suggested that the assumption of normal distribution for the variables was supported (P<0.001), suggesting that parametric tests, such as analysis of covariance, could be employed.

As illustrated in Table 3, the p-values for all scenarios are above 0.05, implying that the interaction effect between the group and pre-test variables is not supported. Therefore, the regression slopes are consistent across all cases, confirming the hypothesis.

Table 3. Test of the interaction effect of the intervention and pre-test variables to determine the homogeneity of the slope of the regression line

Type of interaction	F-value	P-value
Pre-test interaction of perceived stress and group	2.54	0.087
Pre-test interaction of personal-solving confidence and group	2.23	0.115
Pre-test interaction of approach-avoidance style and group	1.60	0.209
Pre-test interaction of personal control and group	0.884	0.437

Levin's test results pinpointed that the significance level for all variables exceeded 0.05, confirming the assumption of homogeneity of variance among groups (Table 4).

The study confirmed that emotional intelligence training intervention effectively reduced perceived stress, with a statistically significant result (P<0.05). Emotional intelligence training accounted for 44.9% of variance changes in perceived stress (Table 5).

The intervention group had a mean perceived stress score of 21.28, significantly lower by 4.59 points compared to the control group. There was no overlap in the mean stress levels between the two groups, indicating that emotional intelligence training effectively reduced perceived stress. The effectiveness of the intervention on various components of problem-solving skills (personal-solving confidence, approach-avoidance style, and personal control) was examined using multivariate covariance analysis. The assumption of homogeneity of variance-covariance matrices was tested using the Mbox test, yielding a value of 10.87 and a significance level of 0.111. The assumption of homogeneity was confirmed based on the criterion of 0.001 (P<0.001). In addition, the significance level of Wilks's lambda test and other multivariate tests was below 0.05, indicating a significant difference in the problem-solving skill components between the two groups. There was a group difference (P<0.05) in at least one variable (Table 6).

Based on the findings presented in Table7, it was evident that the intervention was successful in improving personal-solving confidence and personal control (P<0.05), although there was no significant improvement in the avoidance style component (P<0.05). The effect size measurement (partial eta square) signified that the intervention had a more substantial impact on personal control than personal-solving confidence, with a coefficient of 0.472. Overall, the results demonstrated the effectiveness of emotional intelligence training in enhancing two aspects of

problem-solving skills - personal-solving confidence and personal control.

Table 4. Homogeneity of variance test among the groups (Levin's test)

Variables	F-value	Significance level
Perceived stress	0.685	0.411
Personal-solving confidence	0.290	0.592
Approach-avoidance style	1.79	0.186
Personal control	4.59	0.061

Table 5. ANCOVA results to test the effectiveness of emotional intelligence training intervention on perceived stress

Source of change	SS	DF	MS	F-statistic	P-value	Effect Size
Group	340.79	1	340.79	53.78	<0.001	0.449
Pre-test	2488.59	1	2488.59	392.74	<0.001	0.856
Error	418.20	67	6.34			

Table 6. Comparison of adjusted mean of perceived stress in groups using the Bonferroni test

Variable	Group	Adjusted mean	SE	Lower limit	Upper limit	MD	P-value
Perceived stress	Experimental	21.28	0.439	20.41	22.16	4.59	<0.001
	Control	25.87	0.439	25.01	26.73		

Table 7. Multivariate covariance analysis test to measure the effectiveness of the intervention on the components of problem-solving skill

Dependent Variable	Adjusted mean		MD	SS	DF	F-value	P-value	Effect size (eta squared)
	Emotional intelligence training	Control						
Personal-solving confidence	52.67	47.95	4.72	349.51	1	32.83	<0.001	0.339
Approach-avoidance style	64.86	63.76	1.10	18.99	1	2.85	0.096	0.043
Personal control	23.07	19.42	3.65	209.14	1	57.29	<0.001	0.472

5. Discussion

The current study aimed to assess the impact of emotional intelligence training on students' perceived stress levels and problem-solving skills. The findings pointed out that emotional intelligence training had a notable impact on decreasing levels of perceived stress, resulting in a 44.9% shift in variance, including self-assurance in solving personal issues and self-regulation. Nonetheless, it did not have a significant effect on the way individuals approach or avoid problems. Emotional intelligence training was linked to a 47.2% change in variance regarding problem-solving skills. These findings align with previous research by Bakhshi and Sedigh Arfaei (15), Bahrami Jalal et al. (23), and Rajan et al. (2022) on the effectiveness of emotional intelligence training in the mitigation of perceived stress (24).

The present research hypothesis can be explained by referring to Mayer and Salovey's emotional intelligence model, which suggests that emotions serve as sources of information that assist in social interactions. This framework consists of four components: perception, appraisal, and expression of emotion; incorporating and utilizing emotions to improve emotional facilitation of thinking; understanding and analyzing emotions; and reflective regulation of emotions to promote emotional and intellectual growth. The information processing theory on stress emphasizes the interpretation of stressful stimuli as stressors, involving cognitive assessment and selective attention (25). Individuals decide which stressors to focus on, entering sensory and short-term memory and eventually long-term memory, shaping their response. Conversely, overlooking specific stressors, neglecting them, and failing to pay attention to them can significantly contribute to the onset or worsening of stress (26).

The assessment of the two aforementioned theories suggests that acquiring skills and techniques to enhance

emotional intelligence can lead to improved focus on events, better comprehension and assessment of events and emotions, and effective management of them. This, in turn, enhances individuals' mental well-being by enabling them to cognitively evaluate stressful events, forming the groundwork for decreasing perceived stress (27).

The outcomes of this study, which focused on the impact of emotional intelligence training on problem-solving skills, are consistent with the findings of previous research conducted by Shahbazi et al.(28), Shamsi (29), Alifia and Olupoi (30), and Korkmaz et al.(17). According to cognitive theorists, learning entails the assimilation and reconstruction of cognitive frameworks through which information and data are processed and stored in memory. Learning is a process that occurs within an individual and may not always be apparent in their actions. Nevertheless, it becomes a part of their abilities and skills that can be applied to resolve problems when necessary (31). Emotions often play a role in distorting cognition and behavior, leading to changes in behavior that affect the learning process and perpetuate problematic behaviors. When emotions are managed effectively through emotional intelligence, there is a better balance between emotions and cognition (32).

The primary limitation of the current study was the inability to control all factors that could affect the results and the restriction of the study to students at Islamic Azad University, Shiraz branch. Therefore, great caution should be exercised when generalizing the findings to different demographic groups. It is recommended that the effects of emotional intelligence training on students' perceived stress and problem-solving skills be investigated while also considering factors such as financial situation, family history, and marital status. Furthermore, due to the significance of emotional intelligence in personal and social life, psychologists and experts should offer more extensive training in this area to the general public. In addition, university administrators should seek the expertise of psychologists and counselors to enhance students' emotional intelligence in a targeted and specialized manner, as students may require such skills for their upcoming transition from college to professional careers.

6. Conclusion

As evidenced by the results of this study, participation in emotional intelligence training had a noteworthy impact on decreasing perceived stress levels in terms of changes in variance. By improving emotional intelligence skills, individuals can gain a better understanding of events, manage their emotions, and make more efficient decisions in addressing problems. Teaching techniques that boost emotional intelligence can improve the connection between mental processes, leading to better learning outcomes and problem-solving skills.

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Conflicts of interest: The authors have no conflicts of interest to report in this study.

Availability of data and materials: The information used in the research can be obtained by contacting the author before or after the publication.

Consent for publication: The Publisher is sent a signed Consent to Publish by the Authors in order to give permission to publish the Work.

Ethics approval and consent to participate: The current study received ethical approval from the Institutional Review Board of the

Islamic Azad University, Shiraz branch, with the reference number IR.IAU.KAU.REC.1402.041. The present study was conducted in terms of the principles of the revised Declaration of Helsinki, which is a statement of ethical principles that directs physicians and other participants in medical research involving human subjects.

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Author contributions: Y.A.: Contributed to the conception of the work, revising the draft, approving the final version of the manuscript, and agreeing on all aspects of the work; A.N.: Contributed to the data analysis and interpretation, critical revision, and approval of the final version of the manuscript; Y.A.: Contributed to acquiring data, drafting the manuscript, and approving the final version; A.N.: Contributed to the conception and design of the study, critical revision, and approval of the manuscript's final version; Y.A.: Contributed to the conception and design of the study, data interpretation, drafting of the manuscript and critical revision, and approval of final version.

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