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Effectiveness of Attributional Re-training on Academic Emotions and Problem-solving in Pharmacy and Nursing Students at Zanjan University of Medical Sciences, Zanjan, Iran

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Abstract

Background & Objective: This study aimed to evaluate the effect of an attributional re-training (AR) program on the academic emotions and problem-solving in pharmacy and nursing students in Zanjan University of Medical Sciences, Zanjan, Iran.

Materials and Methods: This was a trial study with a pretest-posttest design and a control group. The statistical population included all pharmacy and nursing students in the first semester of 2018-2019. In total, 72 subjects were selected by random sampling and divided into two test and control groups of 36. The participants in the test group attended seven AR sessions, and data were collected using the academic emotions and problem-solving questionnaires before the intervention, and one month after the program. Data analysis was performed in SPSS version 23 using descriptive statistics and analysis of covariance.

Results: Analysis of covariance showed that the AR program had a significant effect on the problem-solving process ($P<0.05$) while having no significant impact on academic emotions.

Conclusion: According to the results of the study, AR programs can be used as a suitable intervention to help the problem-solving process in students.

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Introduction

During their education, students experience a range of positive and negative emotions in their educational challenges in the academic environment, such as enjoyment, hope, anxiety, shame, and stress (1-3). Most experimental studies consider feelings such as hope, enjoyment, and anxiety as necessary foundations of academic emotions (4, 5), which are usually defined as feelings related to learning conditions, outcomes, and achievements (6). With this definition, academic emotions are defined as feelings of success and failure at school or university, which are the result of education or studying (2, 7). Activation of positive emotions (e.g., hope and enjoyment) can positively influence the learning process through increasing motivation, regulating emotions, and selecting learning strategies (8-10). In contrast, negative academic emotions (e.g., anxiety and hopelessness) might affect the learning process through behavioral mechanisms such as inhibiting activity by increasing anxiety and stress and tendency to avoid successful situations (1, 11, 12). Several studies have emphasized the association between academic emotions and variables of academic performance (13, 14), academic achievement (1, 15, 16), cognitive (asking yourself questions) and metacognitive (monitoring, assessment) processes of selecting learning strategies (17), which can play a pivotal role in the facilitation of inhibition of the learning process (18-21).

Problem-solving can be defined as a process to help an individual to increase the possibility of effective coping in a range of situations; in fact, problem-solving teaches individuals how to use a set of practical cognitive skills to deal with problematic interpersonal situations. Problem-solving can be a tool for dealing with many situational problems and solving them (22). In general, problem-solving refers to a cognitive and behavioral process that provides a range of alternative and potential answers to cope with problematic situations and increases the possibility of selecting the best and most efficient alternative responses. This issue is the reason why learning based on problem-solving is better than other types of learning and is more capable of moving to new situations (23). Research shows that knowledge retention is longer in students who learn via problem-solving approaches, compared to other methods. Di Leo, Muis, Singh realized that positive

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academic emotions facilitate the problem-solving process in learners (24). Also, researchers have concluded that negative emotions reduce the possibility of analytical solutions in the problem-solving process. In contrast, positive emotions facilitate problem-solving without considering a specific solution strategy. In their research, Martinson and Farnham emphasized the relationship between internal and manageable documents and facilitation of the problem-solving process (25, 28, 29). In the current review of the results of various studies, it is shown that the presence in the academic environment presents different learners with different levels of academic excitement and complex problems and assignments (30, 32). However, despite the ever-increasing importance of emotions for learning and success in a problem-solving process, there is a paucity of research in this area (33).

Therefore, in line with studies such as Tai Pan Vali, developing educational/interventional programs aimed at providing students with the necessary psychological immunity to meet the increasing demands of academic life seems a necessity. One of the most useful interventional programs in this area is the attributional retraining (AR) program (34), which is based on cognition used to eliminate motivational problems. Moreover, the program emphasizes the encouragement of students to attribute their failures to internal and controllable instability factors (e.g., lack of effort, weaknesses in learning strategies, and inadequate study). According to Weiner's theory-based retraining, attributing failure to uncontrollable factors is an obstacle to the achievement motivation and academic performance. Besides, Seligman has developed programs to change the explanatory style of individuals from pessimism to optimism through AR. These programs are based on Beck and Ellis's cognitive therapy patterns. In fact, AR is teaching how to discover and challenge pessimistic attributions and replace them with optimistic attributions (35).

The proposed conceptual approach of Abramson, Seligman, and Teasdale (36) about optimism with an emphasis on the concept of AR approaches constitutes the underlying theoretical logic of AR programs. According to the viewpoint of Abramson et al. (36), Seligman, Reivich, Jaycox, and Gilham (37) presented the first rounds of AR to change the uncompromised attribution method of children in University of Pennsylvania, concluding that AR effectively used depression. Publication of this article was associated with many other studies on AR in Iran with structures such as problem-solving (38), achievement emotions (39), and other structures related to educational psychology. Also, the concept of attribution pattern indicates one's preference for the causes of events similar to a learning skill. A review of experimental evidence shows that the use of individual attribution patterns by learners is associated with a wide range of motivational, emotional, and physical dysfunctions (40). Ultimately, the variables of academic emotions and problem-solving were selected in the present study as a motivational element to emphasize the conflicting conceptual circles of excitement and motivation.

The growing trend of negative emotional experiences and motivational impairment in learners following facing irritating academic situations has led to researchers' emphasis on the effectiveness of AR on low academic performance, avoiding failure, academic burnout, optimism and skepticism regarding achievement motivation, emotion regulation strategies and academic resilience, problem solving and academic emotions and engagement (41-48). As such, considering the need to equip learners' coping skills with dealing with increasing educational challenges through motivational interventions (e.g., AR) is an inevitable necessity in research, similar to a health agent. With this background in mind, this study aimed to evaluate the effectiveness of AR on academic emotions and problem-solving of students and help raise their awareness of their personal abilities, identify and use external supportive resources, expand their interpersonal relationship skills, improve their problem-solving ability, and most important of all, modify their academic emotions.

Materials and Methods

This trial study was conducted with a pretest-posttest design and a control group. The statistical population included all pharmacy and nursing students in the first semester of 2018-2019 (N=667). Notably, the subjects were selected from two fields of study due to an insufficient number of students in each discipline (because it was not possible to select students from one field of study based on inclusion and exclusion criteria such as not being a freshman, gender and age homogeneity, and no serious psychological problems). In total, 372 individuals were selected by simple random sampling by referring to the university at a specific time and selecting 76 students (38 in the test group and 38 in the control group) from those who met the inclusion criteria. In this study, the inclusion criteria were informed consent, lack of any disease, and the age range of 20-35 years. On the other hand, the exclusion criteria were lack of attending educational sessions, disrupted training, lack of completing the questionnaires, and attending other educational sessions simultaneously. Besides, one subject from each of the groups was eliminated during the training process due to many absences or unwillingness to cooperate with the

research, respectively. In order to establish a balance in the number of samples in two groups, we randomly eliminated two other subjects, and the final sample size was estimated at 72 (36 participants per group). Given the high number of questions and increased accuracy and tolerance of responders, a 15-minute rest with a brief reception was considered between the pretest and posttest stages since catering to the respondents and giving them a few minutes to rest would decrease their fatigue and carelessness in responding to the second questionnaire.

Data collection tools included the academic emotions questionnaire-revised (AEQ-R), validity, and reliability of which was confirmed by Abdollahpour et al. (49). The questionnaire measures eight different types of academic emotions in three situations of academic achievement, study, and exam. Furthermore, the questionnaire encompasses three subscales of class-related, learning-related, and test-related emotions. The questionnaire's items are scored based on a five-point Likert scale from disagreeing entirely (score=1) to agree (score=5) completely. Moreover, the scale related to class, learning, and test emotions included 43 items and seven subscales of enjoyment (five items), arrogance (five items), anger (four items), anxiety (six items), shame (eight items), despair (four items), and exhaustion (11 items).

In another study by Pekran et al. (48), the internal consistency coefficients of subscales of enjoyment, arrogance, anger, anxiety, shame, despair, and exhaustion in the subscale related to class emotions at 0.85, 0.79, 0.82, 0.86, 0.89, 0.90, and 0.93, respectively, in the subscale related to learning emotions at 0.78, 0.77, 0.75, 0.86, 0.84, 0.86, 0.90, and 0.92, respectively, and in the subscale related to test emotions at 0.78, 0.80, 0.86, 0.77, 0.86, 0.92, 0.87, and 0.92. In research by Abdollahpour (49), the internal consistency coefficient of the mentioned subscales was estimated at an acceptable range for three areas of class, learning, and test-related emotions.

Problem-solving Inventory (PSI)

To assess respondents' perception of problem-solving behaviors, we applied a 35-item questionnaire by Heppner and Petersen (50), designed to measure people's reactions to daily issues and scored based on a six-point Likert scale (from agreeing to disagree completely). The questionnaire encompasses three separate subscales of problem-solving confidence (PSC) (11 items), attitude avoidance style (AAS) (16 items), and personal control (PC) (five items). Khosravi et al. translated the questionnaire, and its validity and reliability were confirmed as well (51). In the present study, the reliability of the two tools was confirmed at the Cronbach's alpha of 0.766 and 0.825 for academic emotions scale and problem-solving questionnaire, respectively. In 1982, Heppner and Petersen regulated and tested the problem-solving questionnaire on several samples and reported its internal consistency to be high with alpha amounts of 0.72-0.85 in the subscales of the tool and 0.90 for the overall scale. Furthermore, Jalili et al. (52) estimated the Cronbach's alpha of 0.78 for the problem-solving questionnaire and 0.55-0.82 for its subscales. Moreover, they assessed the validity of the questionnaire by correlating each item with the total score. Pearson's correlation coefficients were estimated in the range of 0.62-0.79, which was significant at the level of 0.001.

Table 1: Reliability of the research instrument

Title of variables	Number of questions	Cronbach's alpha	
Class Emotions	13	%74	Acceptable
Learning Emotions	20	%87	Acceptable
Quiz Emotions	10	%81	Acceptable
Belief to Solve Problems	11	%76	Acceptable
Attitude-Avoidance Style	16	%80	Acceptable
Personal Control	5	%79	Acceptable

The academic emotions and problem-solving AR program were conducted for the test group in the form of seven 90-minute sessions (two sessions per week) while the subjects in the control group remained on the waiting list for training. Notably, the AR program used in the present study was designed by Seligman attribution theory (53). The pretest was implemented for both groups after selecting students and dividing them into control and test groups. Following that, the AR program was held for the participants in the test group for seven weeks (two-hour sessions). At the end of the sessions, a posttest was conducted in the eighth week. In order to adhere to ethical considerations, the training program content was provided to the subjects in the

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control group in the form of four intensive training sessions after collecting data at the follow-up group.

The training sessions are summarized below, and the list of contents of the AR program were based on purpose and activity (Seligman, 1995).

Number of Meetings	Targets	Activities
First Session	Introducing members to each other and the educator and outlining the educational program (psychological training)	Implementation of pre-test, review of the theoretical foundations of the retraining program
Second Session	Teaching the relationship pattern between emotional reactions in coping with adverse events based on individual beliefs (Based on Ellis's Proposed Model to apprise people about the Influence of Thoughts on Behavior), expressing different types of irrelevant thoughts and cognitive distortions, and challenging thought, to help awareness about irrational thought and negative thought	Presenting several scenarios, including an unpleasant event, the consequences of dealing with these events, and the underlying beliefs of these outcomes
Third Session	Evaluation of people's strategy model in the encounter of unpleasant events	Defining the concept of records - continue facing pessimism - Explaining vents based on Ellis pattern
Fourth Session	Conflicting and confronting attitudes and beliefs perceive a tragedy	Based on Ellis's model, two factors of conflict and energizing were tested using different scenarios. Participants contribute to four principles: 1. Gathering evidence 2. Introducing alternative interpretations 3. Avoiding catastrophic thinking 4. Having a plan to learn the technique of dealing with negative thoughts.
Fifth meeting	Identifying parson's behavioral styles	Training productive communication with the help of the DISC model (is a personality view for identifying and decoding the behaviors of individuals and predicting the behaviors that are commonly observed) interact effectively and successfully in a variety of situations)
Sixth Session	Five Steps to Problem Solving Skills Training	To achieve a successful and efficient solution through five steps: 1. To hesitate and Thinking 2. Viewpoints of others 3. Set goals 4. Choose ways to act after defining the positive and negative 5. Effectiveness test, and Nonobligatory solution
Seventh Session	Teaching social skills in assertiveness and negotiation	The following steps emphasized in the training of assertiveness skills: 1. Describing actual events 2. Expressing emotions 3. Demanding specific and brief change 4. Survey the efficacy of change on how one feels. The following points emphasized the negotiation: 1. Identifying a rational and unattainable demand 2. Making reasonable requests 3. Paying attention to the wishes of the other 4. Trying to reach an agreement 5. negotiation to reach an agreement

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Results

Normal distribution of the data was assessed after extracting the data related to two intervention and control groups via pretest in two stages before and after training, where the results of Kolmogorov-Smirnov test (a test to assess the normal distribution of the data) and Levene's test (to assess the equality of variances) confirmed the normal distribution of the data. Table 2 illustrates the results of comparing the intervention and control groups in terms of the distribution of three variables of gender, age, and field of study. As observed, no significant difference was observed between the groups regarding the mentioned variables.

Table 2: Frequency distribution of the studied samples in intervention and control groups according to demographic characteristics (Zanjan University of Medical Sciences 2019)

	Retraining group		Control group		P-value
Sex	**Number**	**Percentage**	**Number**	**Percentage**	
Male	11	33.3	12	37.5	0.876
Femae	22	66.7	20	62.5	
Total	33	100	32	100	
Age (years)	Mean	Standard deviation	Mean	Standard deviation	
	21.96	1.53	22.37	1.33	0.065
Minimum age	19		19		
Maximum age	26		24		
Field of study	Number	Percentage	Number	Percentage	
Pharmacology	21	63.6	22	68.8	0.931
Nursing	12	36.4	10	31. 2	
Total	33	100	32	100	

After data collection in the stage before the implementation of the educational intervention, the data related to the variables of "academic emotions and its constructs" and "problem-solving and its constructs" were analyzed using the paired t-test. According to the results, no significant difference was observed between the constructs of the two variables and their total scores. Also, there was no significant difference between the intervention and control groups by a retest. Table 3 shows the results of the independent t-test regarding the variable of academic emotions in the intervention and control groups before and after the intervention. As perceived, no significant difference was observed between the academic emotions' constructs and the mean total score of academic emotion before the intervention. However, there was a significant increase in the scores of boredom, shame, and hopelessness constructs after the intervention. In other words, the educational intervention improved the scores of the mentioned constructs. However, no significant difference was observed in the other constructs despite an increase in their mean score. In the intervention group, there was a significant difference in the total mean score of academic emotions before and after the intervention. On the other hand, the results of the independent t-test showed no significant change in the mean score of the constructs and the total mean score of academic emotions in the control group.

Table 3:Average scores of academic emotion in intervention and control groups before and after educational intervention (Zanjan University of Medical Sciences - 2019)

Study groups / Study variables		Retraining (33) Mean	Retraining (33) Standard deviation	Control (32) Mean	Control (32) Standard deviation	Independent T-test
Enjoyment	Before Intervention	16.97	3.66	16.68	4.17	0.773
	After Intervention	17.24	3.92	16.62	4.11	0.538
Anxiety	Before Intervention	13.66	2.30	12.59	3.01	0.111
	After Intervention	14.42	3.01	13.03	2.75	0.074
Exhaustion	Before Intervention	32.09	6.48	32.31	8.23	0.904
	After Intervention	37.39	5.53	31.56	6.59	0.001
Shame	Before Intervention	21.18	4.80	21.84	4.69	0.557
	After Intervention	27.54	5.97	22.84	4.94	0.001
Despair	Before Intervention	9.96	1.72	9.71	2.21	0.965
	After Intervention	12.42	3.18	10.43	2.35	0.006
Arrogance	Before Intervention	17.96	2.84	17.56	2.66	0.554
	After Intervention	17.97	2.86	17.34	2.62	0.362
Hope	Before Intervention	10.63	2.19	10.61	1.59	0.721
	After Intervention	11.45	2.41	11.31	1.98	0.431
Anger	Before Intervention	11.87	2.49	11.93	1.99	0.917
	After Intervention	12.48	2.75	12.09	2.03	0.518
The total score of academic emotion	Before Intervention	123.48	11.56	122.65	11.00	0.768
	After Intervention	139.48	17.13	123.93	11.12	0.001

Table 4 shows the results of the independent t-test for the variable of problem-solving in the two intervention and control groups before and after the intervention. According to the results, there is no significant difference between intervention and control groups regarding constructs (except PSC) and the total mean score of problem-solving before the intervention. However, a significant increase was observed in the mean total score of problem-solving and constructs of "AAS" and "PSC" in the intervention group after the intervention. Meanwhile, the mean score of the constructs and the total mean score of problem-solving (except PSC, with only a slight increase) decreased in the control group, which showed no significant difference. In other words, the AR program significantly increased the mean score of problem-solving in the participants.

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Table 4: Average scores on problem-solving questionnaire in intervention and control groups before and after educational intervention (Zanjan University of Medical Sciences 2019)

Studied groups / Problem solving variable		Retraining group		Control group		Independent T-test (P-value)
		Mean	Standard deviation	Mean	Standard deviation	
Attitude-Avoidance Style	Before intervention	52.93	5.30	52.40	4.28	0.658
	After intervention	56.30	4.63	49.09	6.33	0.001
Personal control	Before intervention	14.33	2,40	15.87	6.16	0.186
	After intervention	15.45	2.73	14.71	3.10	0.307
Confidence in solving issues	Before intervention	41.90	4.83	38.62	4.75	0.008
	After intervention	46.09	6.74	39.50	4.21	0.001
Total Average Problem Solving Score	Before intervention	119.36	9.29	116.96	8.13	0.274
	After intervention	128.30	11.22	112.65	10.48	0.001

Table 5 demonstrates the qualitative grouping of scores of the academic emotions questionnaire in two AR and control groups before and after the intervention. As observed, no significant difference was observed between the grouping of the two intervention and control groups before the implementation of the educational intervention and more than 90% of the subjects were in the moderate group in both groups. However, 42% of the subjects in the AR group were classified as good after the intervention, whereas no change was observed in the control group. In addition, the Chi-square results indicated an increase in the score of the intervention group after the educational intervention, compared to the control group, which was statistically significant.

Table 5: Comparison of Qualitative Scores on Academic Emotionality Scale in Retraining and Control Groups after Educational Intervention (Zanjan University of Medical Sciences - 2019)

Study groups		Poor 43-71	Medium 72-143	Good 143-215	Fisher Precision P value
Before Intervention	Retraining	0	32	14	0.746
		%0.0	%97.0	%3.0	
	Control	0	30	2	
		%0.0	%93.8	%6.3	
After Intervention	Retraining	0	19	14	0.001
		%0.0	%57.6	%42.4	
	Control	0	30	2	
		%0.0	93.8	%6.3	

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Discussion

The present study aimed to evaluate the effectiveness of an AR program on academic emotions and problem-solving ability in a group of pharmacy and nursing students. According to the results, the AR program did not affect the academic emotions of the participants while improving students' problem-solving performance. While our findings were indicative of the significant effect of the intervention on improvement of scores of boredom, shame, and hopelessness constructs, the AR program was not recognized as an effective intervention in a decrease of negative academic emotions and increase of positive academic emotions, which is inconsistent with the results obtained by Ramezani et al. (54) and Gashtasbi et al. (39).

This lack of effectiveness of AR on academic emotions might be due to the type of tools used in the research and interaction or mediation of other variables such as personality or demographic characteristics. Another cause of this inconsistency is assessing academic emotions in a specific area (i.e., education dimension). However, the content of the educational package of AR is not just related to academic experiences and might cause the distribution of thematic areas. Therefore, it might be better to allocate AR to academic situations in educational packages accurately. According to the results of the present study, AR can affect the problem-solving process of students, which is in line with the results obtained by Ashouri et al. (38), Shokri (45), and Parker (46). Consistent with our findings, Matthews (55) showed the effect of AR on functional goals. Consistent with various studies, it seems that trying to equip students' coping skills by providing them with psychological immunity to obstacles, challenges and demands, and the problems of their academic life can lead to positive results (56, 57). In other words, based on Ellis approach, replacing disempowering interpretations with empowering interpretations, which results in the dominance of causal adaptive attributions over causal non-adaptive attributions, can improve and modify the students' emotional-motivational status and eliminate lack of motivation to solve problems.

Haynes et al. (58, 59) confirmed that AR-based treatments increase the impulse to control problems, which leads to discovery and strengthening of the individual abilities of people. Tae et al. emphasized that the AR interventional programs affected the Taiwanese nurses' perception of competency, which developed interpersonal skills. According to the results, nurses will be more successful in controlling their emotions by explaining the reasons for others' attributions more rationally (34). Weiner's theory suggests that successful causal attributions can affect individuals' motivation and future behaviors. Therefore, people would attempt to control the environment and consider their life challenges as opportunities when they realize the importance of attributions in life. Moreover, people would be more able to recognize and use external support sources and develop their interpersonal relationship skills (42). However, Butch and Dickhauser believe that lack of knowledge of the role of attribution styles leads to the passive presence of students in the learning process and students will have more exceptional ability to solve the problem if they learn how to change irrational attributions from external, stable and uncontrollable attributions to internal, unstable and controllable attributions (60). While a costly method for behavior change, AR seems to be an effective method for changing faulty attribution patterns and might prevent accepting defeat in life and academic challenges, urging individuals to be more dynamic until solving the problem (56).

Some of the significant drawbacks of the present study included the number of samples, implementation location, and limiting the research implementation area to Zanjan University of Medical Sciences. Therefore, it is recommended that future studies be conducted on larger sample sizes, students in various fields of study, other disciplines, and different cities. Besides, due to the lack of proper time and the lack of access to full facilities for conducting research and the unlikelihood of subsequent follow-up after several months, it is suggested that these issues be considered in other studies. Furthermore, it is recommended that our findings be used by educators and instructors in educational designing to improve academic performance and problem-solving function in students. However, given the effectiveness of university in positive and negative emotions and emotional adjustment of students, holding especial AR courses for students seems beneficial to improve their mental health and problem-solving ability.

Conclusion

Our findings confirmed that while AR programs had no significant effect on the academic emotions, this type of training improved students' problem-solving function. Even though AR requires time and cost to change a behavior, it seems that it can be an efficient method for changing faulty attribution patterns. Also, it can prevent accepting defeat in life and academic challenges and help individuals solve their problems. In addition to emphasizing the effectiveness of AR as a proper interventional method in problem-solving abilities of students and regard to its excellence in the primary prevention aspect, this method can be used by educational administrators.

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