Research Paper

Predicting the Cognitive Regulation of Emotion Based on Problem Solving Skills and Metacognitive Skills

Faezeh Shahdadnezhad[1]*, Sadeg Farahmand Amin[2]

1 Master's in General Psychology, Faculty of Humanities, Islamic Azad University, Ardabil Branch, Ardabil, Iran.
Corresponding author: khirkhirkhir260@gmail.com
2 Department of Psychology, Ardabil Branch, Islamic Azad University, Ardabil, Iran

Abstract
The study of the cognitive regulation of emotion and the factors affecting it in today's society requires special attention for students. The purpose of this research was to predict the cognitive regulation of emotion based on problem solving skills and metacognitive beliefs of students. The study was of a descriptive-correlation type of prediction type and the statistical sample was a random cluster method and using the Kargesi Morgan table, there were 310 female students of secondary schools in Ardabil city. Based on the objectives, three cognitive emotion regulation questionnaires of Garnevsky et al. (2001), metacognition questionnaire of O'Neill and Abedi (1996) and problem solving skill questionnaire of Cassidy and Long (1996) were used to collect data. Pearson's correlation test and multiple linear regression were used to analyze the data. The results of correlation analysis showed that there is a significant positive correlation between metacognitive beliefs and cognitive emotion regulation (r=0.64) at the level of 0.01.Also, there is a significant positive correlation between problem solving skills and cognitive emotion regulation (r = 0.56) at the 0.01 level. Also, the result of regression analysis showed that the cognitive regulation of emotion can be predicted based on problem solving skills (beta coefficient 0.156) and metacognitive skills (beta coefficient 0.142) (F=37.119, P<0.001). From these results, it can be concluded that by institutionalizing the meaningful teaching-learning process and also, conditions away from anxiety, the cognitive regulation of students' emotions can be improved.

Introduction

One of the important goals of education is to provide suitable fields for the all-round growth of students and to train healthy, efficient and responsible people to play a role in individual and social life. Since students, as the basic pillar of the country's education system, have a special role and position in achieving the goals of the education system, it is very important to pay attention to this group of society (Ngui & Lay, 2020). With all the organizational and educational planning, all students can reach the necessary goals and prosperity, and a few of them can flourish their talents and become successful in this field. One of the most important and effective factors in students' academic performance is their psychological factors. Cognitive regulation of emotion is one of the psychological characteristics that greatly affects the educational process of students (Gorjinpour & Barzegar, 2022).

Cognitive regulation of emotion represents the range of processes through which people can change the nature, fluctuation, and duration of emotions (Gross, 2015) and consists of: all external and internal processes of a person responsible for monitoring, evaluating and modifying reactions Emotional, especially its intense and fleeting states, are aimed at achieving goals (Thompson, 1991). The study of human behavior shows that each person regulates emotional responses (Zarotti, Povah, & Simpson, 2020). In this context (Gross, 1998) believes that the difference between the tendency to emotional response and the behavior that ultimately comes from us,

indicates that we constantly adjust our emotional responses. This adjustment may be automatic or voluntary. be done consciously or unconsciously. The concept of cognitive regulation of emotion is a very broad concept and includes countless regulatory processes (Chen et al., 2020). In addition to conscious and unconscious cognitive processes, it may also include a wide range of physical, social and behavioral processes. who is faced with stressful or threatening events, manages or regulates his emotions and has control over them and does not drown in his emotions (Garnefski, Teerds, Kraaij, Legerstee, & van Den Kommer, 2004). Students' performance has a lot to do with their emotion regulation skills. Emotion regulation plays a role in the individual's learning process and emphasizes the autonomy and responsibility of students to advance their own learning (Gorjinpour & Barzegar, 2022).

One of the variables that can help regulate emotion is problem solving skills. Problem solving is one of the most useful problem-oriented approaches that helps a person effectively solve his problem with a logical approach and sequential thinking and eliminate the stress caused by it. Solving problems as a basic skill in social fields is essential for a person. This skill is an intellectual, logical and systematic process that helps a person to search for different solutions when facing problems and choose the best way and implement it. Dervard (Gellis & Bruce, 2010). Problem solving styles refers to a cognitive-behavioral process that provides a range of alternative and

potential responses to deal with problematic situations and the possibility of choosing the best and most effective responses. increases People who have a positive sense of themselves in problem solving are more successful in problem solving skills (Ozgur, Temel, & Yilmaz, 2012). If students learn problem-solving skills, it enables them to defend themselves and their interest against emotional situations and enables them to act adaptively in relation to other people, society, culture, and their environment. Learning problem-solving skills increases the sense of control over various school events and creates positive feelings in students towards themselves and the prediction of their performance. This skill helps people to think correctly and make correct decisions in difficult life situations. This skill improves social relations with peers and increases compatibility in society and family. People who can recognize a problem, accept it, reflect on its solutions, are less likely to suffer from frustration caused by unresolved needs and interpersonal conflicts.

Also, another issue that can be raised in connection with the cognitive regulation of emotion is metacognitive beliefs. Educational systems can increase the guidance of students in different ways. One of the most important ways is to stick to the way of thinking instead of learning to think. According to most experts, educational methods based on the principles and method of metacognition can help educational systems in realizing this mission (Modrek, Kuhn, Conway, & Arvidsson, 2019). Metacognition refers to a person's knowledge about all the mentioned cognitive processes and how to use them to achieve learning goals. In other words, metacognition is knowledge or a person's awareness of his own cognitive system or knowledge about knowing. Metacognitive knowledge helps us to consider our progress when learning and knowing things (Erozkan, 2014).

(Jalilnasrabadsofla, Kadivar, & Sarami, 2020) examined goal orientation and metacognition with emotion management and showed that the variables of mastery orientation and metacognition were respectively suitable predictors for the criterion variable of emotion management.

Considering that the identification of the influencing factors on the progress and performance of students creates a suitable approach in the direction of planning, development and evolution of educational programs so that the best possible results can be obtained both for the desired educational development and for knowledge. students, it is necessary to pay attention to the individual, social and educational factors affecting the living and academic conditions of students so that more comprehensive programs can be set up and implemented to advance educational goals in schools. In this regard, one of the important issues that can have a significant impact on all aspects of students' lives is cognitive regulation of emotion and identification of effective factors. The research background shows that the factors affecting the cognitive regulation of emotion in students have been less investigated.

Several researches have been conducted in line with the current research. (Daregiraei, Saberi, & Tavakoli, 2010) showed that mindfulness had a direct effect on attention control, emotion regulation, cognitive flexibility and academic progress, and attention control, emotion regulation and cognitive flexibility had a direct effect on academic progress. Also, the mediating role of attention control, emotion regulation and cognitive flexibility in the relationship between mindfulness and students' academic progress was confirmed. Therefore, it can be concluded that attention control, emotional regulation, cognitive flexibility and mindfulness are particularly important for the academic progress of students. In a research, (Dehghani & Hekmatiyan Fard, 2020) showed that there is a significant relationship between academic optimism, metacognitive beliefs and cognitive regulation of emotion. (Lee & Jang, 2021) showed that social-cognitive mindfulness has a positive effect on reappraisal and a negative effect on suppression. Furthermore, social-cognitive mindfulness positively predicts positive achievement emotions but negatively predicts negative emotions. Reappraisal had a positive effect on positive emotions, whereas suppression had a positive effect on negative emotions. Furthermore, reappraisal mediated the relationship between mindfulness and positive emotions, and suppression mediated the relationship between mindfulness and negative emotions.

(Erozkan, 2014) showed in a research that there is a significant relationship between self-efficacy, metacognitive beliefs and

emotion regulation. The research of (Parmentier et al., 2019) investigated the mediation of four emotion regulation mechanisms: worry, rumination, reappraisal and suppression, the effects of mindfulness on depression and anxiety directly and indirectly on depression and anxiety. The results showed that mindfulness is directly and indirectly related to lower levels of depression and anxiety. Suppression, reappraisal, worry, and rumination all act as important mediators of the relationship between mindfulness and depression. Similar results were obtained for the relationship between mindfulness and anxiety, except that suppression was not a mediator. The data also showed that the estimated number of hours of mindfulness meditation practice did not directly affect depression or anxiety, but indirectly reduced these by increasing mindfulness. Worry and rumination proved to be the strongest mediating variables. Overall, the results confirm that emotion regulation plays an important mediating role between mindfulness and depressive and anxiety symptoms in the general population, and suggest that meditation focusing on reducing worry and rumination may be particularly beneficial in reducing the risk of developing clinical depression. In this regard, the current research has considered two variables of problem solving skills and metacognitive beliefs as two variables related to the cognitive regulation of emotion, and the purpose of this research is to determine the relationship between problem solving skills and metacognitive beliefs with the cognitive regulation of emotion in secondary school female students in Ardabil city.

18

Materials and Methods

This descriptive research is a type of correlational study. The study population of this research is all female students of the first secondary school in Ardabil city in the academic year 1402-1403, including 45 active schools in the city. Ardabil is 1660 people. Among the research population, a sample size of 310 people was selected by random cluster sampling method and based on Morgan's table.

After obtaining the necessary permits from the Department of Education, the researcher divided the city of Ardabil into five parts, North, South, East, West, and Center, using random cluster sampling. The part randomly selected two schools and after visiting the school among the students who were willing to cooperate, questionnaires of problem solving skills, metacognitive beliefs and The cognitive regulation of emotion was distributed among these students and collected after answering.In order to meet the ethical considerations of the research, students who were willing to cooperate entered the research and were assured that the results would remain confidential.

The tool for collecting information was a questionnaire, the specifications of which are presented below:

Cognitive emotion regulation questionnaire

This questionnaire was designed by (Garnefski et al., 2004) and has two long (36 items) and short (18 items) forms. In this research, a 36-item form was used. This questionnaire measures the cognitive emotion regulation strategies in response to threatening and stressful life events on a 5-point Likert scale from one (never) to five (always) based on 9 subscales. The total score of each of the subscales is obtained by adding the scores of the items. A higher score indicates a person's greater use of that cognitive strategy in facing stressful events.The sum of the scores of self-blame, blame of others, rumination, and catastrophizing subscales gives the total score of the uncompromising strategies of cognitive regulation of emotion, and the sum of the scores of the subscales of acceptance, refocusing on planning , positive refocusing, positive reappraisal and low significance also indicate the total score of the compromised strategies of cognitive regulation of emotion. The psychometric properties of the emotion-cognitive order questionnaire have been confirmed in foreign studies, and the total Cronbach's alpha coefficient is 0.93 for compromised strategies and 0.87 for compromised strategies. In Iran (Hoseini Beheshtian & Mirzazadeh, 2016) reported Cronbach's alpha coefficient of 0.79. Its content validity was evaluated by expert judgment, which was confirmed.

Questionnaire of problem solving styles

In this research (Cassidy & Long, 1996) Problem Solving Styles Questionnaire will be used to measure problem solving styles. Questionnaire of problem solving styles has

24 questions which was designed and made by Cassidy and Long in 1996 and has 6 subscales (helplessness, inhibition, creativity, trust, tendency and avoidance) and each subscale has 4 items. The range of scores is scored between 0 and 4, and items 5, 6, and 7 are scored inversely. A higher score indicates more willingness of Osmondi to this style of problem solving. The reliability and validity of the questionnaire has been confirmed by its designers, Cassidy and Long (1996). Also, its validity and reliability in (Mohammadi, Kaykha, Sadeghi, Kazemi, & Raeisoon, 2015) were estimated as 0.77, 0.79, 0.83, 0.81, 0.89, and 0.75 respectively for the aforementioned components.

Questionnaire of metacognitive beliefs

In this research, (O'Neil Jr & Abedi, 1996) Metacognition Questionnaire was used to measure metacognitive beliefs. This questionnaire is designed in 20 items and has 4 components, the components are metacognitive awareness (5 items), cognitive strategy (5 items), planning (5 items), self-review (5 items). The scores of each component are based on the spectrum. Five-value Likert scale is estimated and finally, the total score of the components calculates the total score of the metacognitive beliefs variable and the total score of the metacognitive skill from the total of the components and in the range A number between 20 and 100 points is obtained. A score of 20-35 is considered as weak metacognitive states, a score of 36-50 is considered as moderate metacognitive beliefs, a score of 51-65 is considered as good metacognitive states, and a score of 66-80 is considered as excellent metacognitive beliefs.

In order to analyze the data, descriptive statistics methods (prevalence, frequency percentage, mean and standard deviation) as well as skewness and kurtosis to check the normality of data distribution in the subjects and at the level of inferential statistics from Pearson's correlation coefficient and multiple regression with the help of SPSS23 statistical software is used.

Finding

In this section, the results of descriptive and inferential statistics of the research are presented, which first described the variables and then tested the hypothesis of the research.

Table 1. Variable descriptive indices of metacognitive beliefs in participants

Variable	Mean	Standard Deviation
Metacognitive awareness	13/45	3/29
Cognitive strategy	21/78	4/77

Physical neglect planning	16/31	5/84
Self-review	19/53	6/77
Metacognitive beliefs	68/04	18/15

Based on the results of the variable description of metacognitive beliefs, it was found that the highest average amount related to the cognitive strategy component was (21.78), then self-review was (19.53), physical neglect planning was (16.31), and the lowest average amount was related to the metacognitive awareness component. The rate was (13.45).

Table 2. Descriptive variables of the cognitive regulation of emotion in the participants

Variable	Mean	Standard Deviation
Blame yourself	15/87	2/79
Blame others	10/20	2/81
rumination	10/23	2/09
Catastrophe	16/96	2/50
Cognitive regulation of emotion	38/37	4/03

Based on the results of the description of the variable of cognitive regulation of emotion, it was found that the highest average amount related to the catastrophizing component was (16.96), then self-blame was (15.87), rumination was (10.23), and the lowest average amount was related to the component of blaming others 20 It was (10.20).

Table 3. Descriptive indicators of the problem solving skill variable in the participants

Variable	Mean	Standard Deviation
helplessness	12/18	3/29
mastermind	17/78	3/77
creativity	11/31	3/84
trust	18/53	3/77
tendency	10/55	3/67
avoid	9/43	3/15

Problem solving skills	80/28	9/19

Based on the results of describing the variable of problem solving skill, it was found that the highest average amount related to the trust component was 18.53, then inhibition was 17.78, helplessness was 12.18, creativity was 11.31, tendency was 10.55 and The lowest average value related to the avoidance component was 9.43.

Since correlation methods have been used in this research to test hypotheses, the presuppositions of using this method should be examined and confirmed. Kolmogorov-Smirnov (KS) test was used to check the normality of the data. The results of which are reported in Table (4)

Table (4). The results of Kolmograph-Smirnov test to determine the normal distribution of research data

Variable	Cognitive Regulation Of Emotion	Problem Solving Skills	Metacognitive Beliefs
Z	0/48	0/56	0/50
Sig	0/21	0/083	0/06
N	310	310	310

The Kolmogorov-Smirnov test was tested with an error level of 5%. In this situation, it can be said that if the significance level in this test is more than 5%, the data can be assumed to be normal. Otherwise, it cannot be said that the data distribution is normal. According to the above table and significance level values, the assumption of normality of research variables was confirmed.

Table 5. Summary of the predictive model of cognitive emotion regulation based on problem solving skills and metacognitive skills

Model	Multiple Correlation Coefficient	Oefficient Of Determination	Djusted Coefficient Of Determination	Find The Standard Error	Durbin-Watson
3	0/271a	0/073	0/048	14/89	2/17

  22

Table 5 shows the summary of the predictive model of cognitive emotion regulation scores based on problem solving skills and metacognitive skills to determine the independence of the residuals. As can be seen, the Durbin-Watson statistic value is 2.17. It can be said that the residuals are independent if the obtained number is greater than 1.15 and smaller than 2.5. Therefore, it can be said here that the independence of the remainders has been respected.
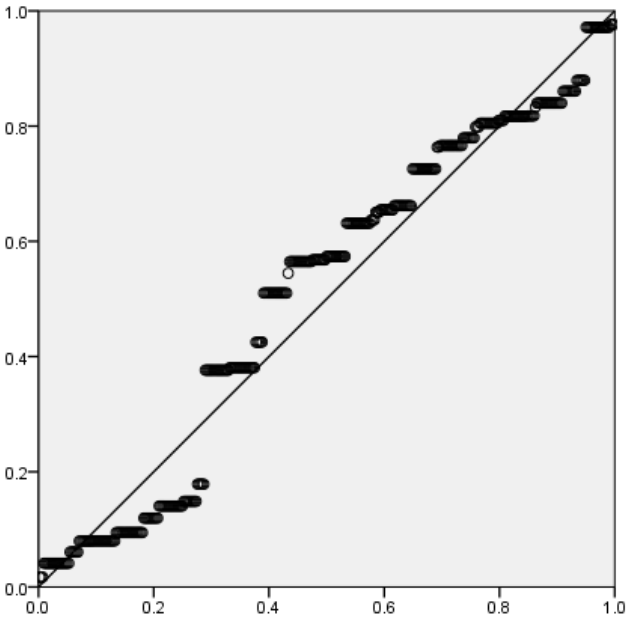

Figure 1: Normal probability diagram (p-p) of the standardized residual of the regression based on the cognitive emotion regulation scores

Figure 1 shows the normal probability plot (p-p) of the standardized regression residual based on the cognitive emotion regulation scores. As can be seen, the deviation of the observed cumulative probability points and the cumulative probability of the case from the line is low. In other words, the scores are drawn around a straight line from the lower left corner of the graph to the upper right corner. So it can be concluded that the assumption of linearity of the remaining scores has been met.

As a result, to test hypotheses and analyze data, the researcher is allowed to use parametric statistics and related methods.

The first research hypothesis: There is a relationship between metacognitive beliefs and cognitive regulation of emotion

In order to analyze the data related to this hypothesis, Pearson's correlation coefficient test was used, the results of which are presented in Table 6

Table 6. Pearson correlation coefficients between metacognitive beliefs and cognitive emotion regulation

Variable	1	2	3	4	5	6
Metacognitive awareness	1					
Cognitive strategy	0/66*	1				
Physical neglect planning	0/80**	0/66**	1			
self review	0/70**	0/80**	0/67**	1		
Metacognitive beliefs	0/75**	0/52**	0/78**	0/55**	1	
Cognitive regulation of emotion	0/72**	0/82**	0/63**	0/80**	0/64**	1

Based on the results of Table 6, there is a positive and significant correlation between metacognitive beliefs and cognitive regulation of emotion (r=0.64). Also, between the dimensions of metacognitive beliefs and cognitive regulation of emotion, including; metacognitive awareness and cognitive regulation of emotion (r=0.72), cognitive strategy and cognitive regulation of emotion (r=0.82) and physical neglect planning and cognitive regulation of emotion (r=0.63), self-review and cognitive regulation of emotion (r=0.80) there is a significant positive correlation at the level of 0.01. As a result, it can be said that the hypothesis of the present research based on the relationship between metacognitive skills and cognitive regulation of emotion was confirmed.

The second research hypothesis: There is a relationship between problem solving skills and cognitive regulation of emotion.

In order to analyze the data related to this hypothesis, the Pearson correlation coefficient test was used, the results of which are presented in Table 7.

Table 7. Pearson correlation coefficients between problem solving skills and cognitive emotion regulation

Variable	1	2	3	4	5	6	7	8
helplessness	1							
mastermind	0/66*	1						
creativity	0/30**	0/66*	1					

trust	0/48	0/44	0/51	1				
tendency	0/35	0/32	0/36	0/31	1			
avoid	0/28	0/36	0/32	0/34	0/41	1		
Problem solving skills	0/26-	0/32	0/36	0/37	0/39	0/41	1	
helplessness	-0/35**	0/40**	0/37**	0/36	0/45	-0/39	0/56	1

Based on the results of Table 7, there is a negative and significant correlation between helplessness and cognitive regulation of emotion (r = -0.35). Also, inhibition and cognitive regulation of emotion (r=0.40), other creativity and cognitive regulation of emotion (r=-0.37) and trust and cognitive regulation of emotion (r=0.36), tendency and cognitive regulation of emotion (45/ r=0), avoidance and cognitive regulation of emotion (r=0.39), is significant at the level of 0.01. As a result, it can be said that the second hypothesis of the current research, which is the relationship between problem solving skills and cognitive regulation of emotions, is confirmed.

The third research hypothesis: the cognitive regulation of emotion can be predicted based on problem solving skills and metacognitive skills.

In order to analyze the data related to this hypothesis, the multiple regression test was used, the results of which are presented in Table 8.

Table 8. Variance analysis test to check the significance of the regression model predicting the cognitive regulation of emotion based on problem solving skills and metacognitive skills

Source of Variation	Sum Of The Squares	df	MEAN OF THE F-SQUARES	F	Sig
Regression	1367/444	3	455/815	37/119	0/001
remaining	4555/793	307	11/79		
total	5923/237	310			

Table 8 shows the variance analysis test to check the significance of the regression model predicting the cognitive regulation of emotion based on problem solving skills and metacognitive skills. As can be seen, the observed F is equal to (37.119), which is statistically significant (P<0.001). So it can be concluded that the cognitive regulation of

emotion can be predicted based on problem solving skills and metacognitive skills.

Table 9. Regression coefficients for predicting scores of cognitive emotion regulation based on problem solving skills and metacognitive skills

Model	Unstandardized coefficients		Standardized Coefficients	T	Sig
	B	Standard Error	Beta		
Fixed value	40/69	15/22	-	2/67	0/009
Problem solving skills	0/150	0/122	0/156	1/22	0/016
Metacognitive skills	0/202	0/124	0/142	1/09	0/034

Table 9 shows the regression coefficients for predicting the scores of cognitive emotion regulation based on problem solving skills and metacognitive skills. Considering that the scale of predictor variables is not different, the results of unstandardized coefficients are used. As can be seen, the observed t for problem solving skill (1b) is equal to 1.22, which is statistically significant (P=0.016). Also, the observed t for metacognition skills (2b) is equal to 1.09, which is statistically significant (P = 0.34).

Discussion & Conclusions

The first hypothesis: The findings from the data analysis of the first hypothesis showed that there is a significant positive correlation between metacognitive beliefs and cognitive regulation of emotion (r = 0.64) at the level of 0.01.

The result of this hypothesis is in agreement with the findings of (Daregiraei et al., 2010; Dehghani & Hekmatiyan Fard, 2020; Erozkan, 2014; Jalilnasrabadsofla et al., 2020; Lee & Jang, 2021; Parmentier et al., 2019).

In the explanation of the research findings, it can be stated that people use different strategies to regulate emotions, some of which can be adaptive, or non-adaptive and ineffective. Cognitive regulation of emotions helps students to regulate their emotions and feelings and not be overcome by the intensity of emotions (Poorakbaran, Mohammadi GhareGhozlou, & Mosavi, 2018). The processes of emotion regulation change with changes and transformations in adolescence, and transformational changes in emotion regulation are associated with changes in its

background factors. For example, with the increase of life experiences and intellectual growth, the relative values and benefits of emotion regulation change with age, and if the cognitive development of students has better results than the inhibition of emotion, then the students are developmentally developed. they use healthy emotion regulation strategies (such as marketing) and use less unhealthy emotion regulation strategies (emotional inhibition) (Gross & John, 2003). An important issue that seems to be effective in regulating students' emotions is metacognitive beliefs. Metacognitive beliefs are very important for understanding how cognition works and how we produce conscious experiences about ourselves and the world around us.Metacognition determines what we pay attention to. It also shapes our evaluations and affects the types of strategies we use to regulate our thoughts and feelings. One of the ways of psychological empowerment of students to increase their emotion regulation is to strengthen metacognitive factors that make them more efficient. In the same direction and classification of the current research, there is a significant relationship between metacognitive beliefs and cognitive regulation of emotion.

The second hypothesis: The findings of the data analysis of the second hypothesis showed that there is a significant positive correlation between the problem solving skill and the cognitive regulation of emotion (r=0.56) at the level of 0.01.

The result of this hypothesis is in agreement with the findings of (Daregiraei et al., 2010; Dehghani & Hekmatiyan Fard, 2020; Erozkan, 2014; Jalilnasrabadsofla et al., 2020; Lee & Jang, 2021; Parmentier et al., 2019).

In the explanation of the research findings, it can be stated that the problem solving method is one of the learning methods that is used both in everyday life and in discovering complex scientific problems. In education, it is possible to put learners in the position of problem solving, instead of forcing students to memorize the material, they can be exposed to problem solving. in such a way that he sees himself in the real scene and facing the problem and solves the problem (Majidi, Salajegheh, & Taheri, 2021). Learning through problem solving is a kind of active and deep learning and prepares a person to deal with real life experiences and emotion regulation because emotion regulation can lead to maintaining and strengthening emotional arousal as well as calming students. Most theorists believe that in cultures where inhibition regulates emotion, emotion regulation skills lead to suppression of emotional arousal; But even in cultures that induce this, emotion management strategies often lead to maintaining and strengthening emotional arousal; Such as when students feel sorry for themselves, or when adults ruminate on feelings of guilt, anger, or shame in response to social injustice. For this purpose and according to the findings of the current research, there is a significant relationship between problem solving skills and cognitive emotion regulation.

The third hypothesis: The findings from the data analysis of the third hypothesis

showed that the cognitive regulation of emotion can be predicted based on problem solving skills and metacognitive skills (F=37.119, P<0.001).

The result of this hypothesis is in agreement with the findings of (Daregiraei et al., 2010; Dehghani & Hekmatiyan Fard, 2020; Erozkan, 2014; Jalilnasrabadsofla et al., 2020; Lee & Jang, 2021; Parmentier et al., 2019).

The result of this hypothesis is in agreement with the findings of (Daregiraei et al., 2010) is consistent. In the explanation of the research, it can be stated that metacognitive beliefs are important factors that affect the way students respond to negative thoughts, beliefs, signs and symptoms. Beliefs are the hidden force behind harmful thinking styles that lead to long-term emotional distress. Positive metacognitive beliefs are related to the benefits and usefulness of engaging in cognitive activities that constitute cognitive-attentional symptoms. For example, "Being excited about the future helps me avoid risk. Negative metacognitive beliefs are beliefs related to the uncontrollability, meaning, importance, and dangerousness of metacognitive thoughts and experiences (Wells, Walton, Lovell, & Proctor, 2015). It seems that an important issue that is important in students' metacognitive skills is problem solving skills. The main goal of the problem-solving method is to determine the most effective alternative, which can be followed by other personal control operations to act in a way that is comprehensive. It is chosen to be aroused and to continue it. Therefore,

problem solving becomes an initial vital stage in the more general process of self-control, which is often described with terms such as independence, competence and self-reliance (Seyf, 2013). In this regard, it can be concluded that the cognitive regulation of emotion can be predicted based on problem solving skills and metacognitive skills.

Although the present study provided evidence that the cognitive regulation of emotion based on metacognitive beliefs and problem-solving skills of secondary school students was determined, there were several limitations, which include that the present study was only based on quantitative research methods. The statistical population of the present study included only the students of girls' secondary schools in Ardabil city. The present study was conducted cross-sectionally. In this study, possible variables affecting the results of the study, such as students' intelligence and history of mental disorders, were not controlled. Some variables related to the mother and the family, such as the mother's mental illnesses, the presence or absence of the mother in the teenager's life, and the economic conditions of the family were not controlled, which is suggested in order to improve the way of conducting research in future studies, considering that it seems that only Quantitative research method was used in this research, it is better to use mixed or qualitative methods in future research. Also, in this research, the community of secondary girls' schools in Ardabil was addressed, this research can be done in a comparative manner with other students in different educational

levels and different cities. Also, it is suggested that education organize regular workshops to familiarize students with metacognitive beliefs and problem solving skills in order to increase the cognitive regulation of students' emotions.

References

Cassidy, T., & Long, C. (1996). Problem-solving style, stress and psychological illness: Development of a multifactorial measure. *British Journal of clinical psychology, 35*(2), 265-277.

Chen, W., Zhang, G., Tian, X., Luo, J., Gao, R., & Yang, T. (2020). Test of the emotion regulation questionnaire in the middle school students. *Chin. Ment. Health J, 34*, 56-61.

Daregiraei, P., Saberi, R., & Tavakoli, V. M. (2010). Investigating the Mediating Role of Attention Control, Emotion Regulation and Cognitive Flexibility in the Relationship between Mindfulness and Academic Achievement of Students.

Dehghani, Y., & Hekmatiyan Fard, S. (2020). Investigation role of educational optimism, metacognitive beliefs and cognitive emotion regulation in prediction of self-handicapping in students with special learning disabilities. *Psychology of Exceptional Individuals, 10*(37), 135-159.

Erozkan, A. (2014). Analysis of Social Problem Solving and Social Self-efficacy in Prospective Teachers. *Educational Sciences: Theory and Practice, 14*(2), 447-455.

Garnefski, N., Teerds, J., Kraaij, V., Legerstee, J., & van Den Kommer, T. (2004). Cognitive emotion regulation strategies and depressive symptoms: Differences between males and females. *Personality and individual differences, 36*(2), 267-276.

Gellis, Z. D., & Bruce, M. L. (2010). Problem-solving therapy for subthreshold depression in home healthcare patients with cardiovascular disease. *The American Journal of Geriatric Psychiatry, 18*(6), 464-474.

Gorjinpour, F., & Barzegar, M. (2022). The effectiveness of self-efficacy training on emotional cognitive adjustment and student's stress in secondary school students. *Quarterly Journal of Women and Society, 13*(49), 105-118.

Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of general psychology, 2*(3), 271-299.

Gross, J. J. (2015). Handbook of emotion regulation. In.

Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: implications for affect, relationships, and well-being. *Journal of personality and social psychology, 85*(2), 348.

Hoseini Beheshtian, S. M., & Mirzazadeh, r. (2016). Effectiveness of resilience training on emotion regulation strategies and life satisfaction among women-headed households. *Journal of Cultural Community Studies, 7*(3).

Jalilnasrabadsofla, K., Kadivar, P., & Sarami, G. (2020). The role of self-efficacy mediation in the relationship between attachment styles and documentary styles with student's progression. *Educational Psychology, 16*(57), 97-118.

Lee, M., & Jang, K.-S. (2021). Nursing students' meditative and sociocognitive mindfulness, achievement emotions, and academic outcomes: Mediating effects of emotions. *Nurse Educator, 46*(3), E39-E44.

Majidi, A. H., Salajegheh, S., & Taheri, M. (2021). The Relationship between Mindfulness, Problem Solving Styles and Self-Efficacy with Academic Achievement in 10th-grade male students. *Journal of School Counseling, 1*(1), 1-17.

Modrek, A. S., Kuhn, D., Conway, A., & Arvidsson, T. S. (2019). Cognitive regulation, not behavior regulation, predicts learning. *Learning and Instruction, 60*, 237-244.

Mohammadi, Y., Kaykha, A., Sadeghi, A., Kazemi, S., & Raeisoon, M. (2015). Relationship of metacognition learning strategy and locus of control with academic achievement of students. *Education Strategies in Medical Sciences, 8*(5), 323-328.

Ngui, G. K., & Lay, Y. F. (2020). The Effect of Emotional Intelligence, Self-Efficacy, Subjective Well-Being and Resilience on Student Teachers' Perceived Practicum Stress: A Malaysian Case Study. *European Journal of Educational Research, 9*(1), 277-291.

O'Neil Jr, H. F., & Abedi, J. (1996). Reliability and validity of a state metacognitive inventory: Potential for alternative assessment. *The journal of educational research, 89*(4), 234-245.

Ozgur, S. D., Temel, S., & Yilmaz, A. (2012). The effect of learning styles of preservice chemistry teachers on their perceptions of problem solving skills and problem solving achievements. *Procedia-social and behavioral sciences, 46*, 1450-1454.

Parmentier, F. B., García-Toro, M., García-Campayo, J., Yañez, A. M., Andrés, P., & Gili, M. (2019). Mindfulness and symptoms of depression and anxiety in the general population: The mediating roles of worry, rumination, reappraisal and suppression. *Frontiers in psychology, 10*, 506.

Poorakbaran, E., Mohammadi GhareGhozlou, R., & Mosavi, S. M. R. (2018). Evaluate the effectiveness of therapy on cognitive emotion regulation spirituality in women with breast cancer. *Medical Journal of Mashhad University of Medical Sciences, 61*(4), 1122-1136.

Seyf, A. (2013). Modern educational psychology, publishing Duran. *Tehran*.

Thompson, R. A. (1991). Emotional regulation and emotional development. *Educational psychology review, 3*(4), 269-307.

Wells, A., Walton, D., Lovell, K., & Proctor, D. (2015). Metacognitive therapy versus prolonged exposure in adults with chronic post-traumatic stress disorder: A parallel randomized controlled trial. *Cognitive therapy and research, 39*(1), 70-80.

Zarotti, N., Povah, C., & Simpson, J. (2020). Mindfulness mediates the relationship between cognitive reappraisal and resilience in higher education students. *Personality and individual differences, 156*, 109795.