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# Research Paper: The Relationship between Cognitive Emotion Regulation and Executive Functions

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## Abstract

This research was conducted with the aim of investigating the relationship between cognitive emotion regulation and executive functions. The research method is descriptive-correlation type. 150 students of Islamic Azad University Science and Research Branch were selected by convenience sampling method and completed research tools including Cognitive Emotion Regulation Questionnaire (CERQ) and Barkley Deficits in Executive Functioning Scale (BDEFS). Data analysis was done with Pearson correlation coefficient and SPSS-22 software. The findings showed that there is a positive and significant relationship between the strategies of emotion regulation of acceptance, positive refocusing, planning, positive reappraisal, and putting into perspective with executive functions, but this relationship were inverse for self-blame, other-blame, catastrophizing and rumination (P< 0.01). According to the findings, it is concluded that constructive strategies of cognitive emotion regulation can be effective in strengthening executive functions, and incorrect strategies of cognitive emotion cause problems in executive functions.

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## 1. Introduction

Today, in various fields of psychology, we are witnessing the attention paid to executive functions and the defects that arise in them due to diseases or how to strengthen them. Executive functions refer to the abilities that people rely on to implement their plans and achieve their goals (Friedman & Robbins, 2022). So far, different researchers have listed different actions and capabilities as executive functions, but there is a general consensus that abilities such as organization, planning, problem solving and decision making, self-control, self-regulation, receiving feedback, working memory, and self-motivation are among executive functions (Diamond, 2013; Karbach & Kray, 2016). Several behavioral exercises have been introduced to strengthen executive functions (Diamond & Ling, 2016) and researchers have investigated the issue of which areas are the neuro-brain basis of executive functions and how some psychological disorders such as learning disorders, cognitive impairment, behavioral disorders such as ADHD with defects in executive functions are related. Today, it has been well shown that the frontal areas of the brain are one of the areas that play the main role in executive functions (Otero & Barker, 2013; Stuss, 2011) and that neural distortion in this area can be associated with executive function defects. Therefore, in many mental disorders in which weakness in executive functions is observed (such as OCD, ADHD, LD), abnormality can be seen in these brain areas, and drug therapies and psychotherapies lead to the improvement of the functioning of these areas.

One of the fields that are considered as executive functions is the field of emotion regulation (Sahin et al., 2023). Emotion regulation refers to the ability of people to regulate the intensity and duration of their emotions (Petrova & Gross, 2023). People with emotional dysregulation (for example, people with borderline personality disorder) experience emotions with more or less intensity and duration than normal people (Goldbach et al., 2023).

One of the ways that can be used to regulate emotions is to pay attention to thoughts and ways of thinking. These ways of emotional regulation based on thoughts are called cognitive emotion regulation. Some of these strategies of cognitive emotion regulation such as rumination, self-blame, other-blame and catastrophizing are destructive and negative, and others such as planning, acceptance and positive refocusing are positive strategies and are healthy (Garnefski et al., 2002).

University students are one of the groups in society that strengthening their executive functions can have beneficial effects in their future education and career. If students can use healthy cognitive strategies of emotion regulation to better manage their emotions, they can show better performance and achieve better results. Therefore, in order to achieve a more comprehensive understanding in this field, the present research has investigated the relationship between the cognitive regulation of emotion and executive functions among students.

## 2. Methods

### 2.1. Statistical Population, Sample, and Sampling Method

The research method is descriptive-correlation type. The research population was the students of Islamic Azad University Science and Research Branch in the 2021-2022 academic year. 150 students of Islamic Azad University Science and Research Branch were selected by convenience sampling method and completed research tools including Cognitive Emotion Regulation Questionnaire (CERQ) and Barkley Deficits in Executive Functioning Scale (BDEFS). The questionnaires were prepared online using the Porsline system and distributed to student groups through the WhatsApp application. Some of the questionnaires were not returned and some were incompletely filled, which were excluded from the analysis process. Data analysis was done with Pearson correlation coefficient and SPSS-22 software.

### 2.2. Instrument

Cognitive Emotion Regulation Questionnaire (CERQ): This questionnaire was created by Garnefski & Kraaij (2006). It has 18 items and is scored from never (1) to always (5). including 9 components of self-blame (items 1 and 6), acceptance (items 3 and 4), rumination (items 2 and 5), positive refocusing (items 1 and 7), planning (items 9 and 10), positive reappraisal (items 11 and 16), putting into perspective (items 13 and 14), catastrophizing (items 15 and 12) and other-blame (items 17 and 18).In the research of Garnefski & Kraaij (2006), the 9-factor structure of the scale was confirmed and the internal consistency of the subscales was reported between 0.75 and 0.86. Jafarpour et al. (2016) applied this questionnaire in Iran. The data analysis using Cronbach's alpha method showed that the questions of this questionnaire have good internal stability (a=0.85). A confirmatory factor showed that the questions of this questionnaire were loaded on 9 factors like the original version, and the fit indices indicated the fit of the measurement model with the theoretical model.

Barkley Deficits in Executive Functioning Scale (BDEFS): This scale has 89 items designed by Barclay (2011) which has five subscales including Self-Management to Time (e.g., “have trouble doing what I tell myself to do”; Cronbach’s α = .96), Self-Organization/Problem Solving (e.g., “have trouble doing things in their proper order or sequence”; α =.96), Self-Restraint (e.g., “likely to do things without considering the consequences for doing them”; α =.93), Self-Motivation (e.g., “I do not have the willpower or determination that others seem to have”; α =.93), and Self-Regulation of Emotion (e.g., “overreact emotionally”; α =.93). The scoring of the scale is such that the option never or rarely gets a score of 1 and the option most of the time gets a score of 4. High scores on any subscales can be a sign of impairment in that area of executive functioning in daily activities. Its 5-factor structure has been confirmed in the research of Barkley (2011). Zarenezhad (2018) investigated the validity and reliability of this scale in Iran. The results of the confirmatory factor analysis showed that all 89 items have

a suitable factor load and none of the questions were deleted and all five subscales were confirmed. The reliability of the subscales was also calculated by Cronbach's alpha method and their values and their rate was between 0.72 and 0.90

## 3. Results

123 students were female and 27 were male. The mean and standard deviation of the students' age were 23.14 and 3.46. 81% of students (124 students) were in bachelor's degree and the rest were in master's degree. 89 people were in psychology, 23 in counseling, 18 in language translation, 8 in law, 7 in history, and 5 in Persian literature. The mean and standard deviation of the cognitive emotion regulation and executive functions are presented in Table 1.

Table 1

*The mean and standard deviation of cognitive emotion regulation and executive functions*

| | Variables | Mean | Standard deviation |
|---|---|---|---|
| Cognitive emotion regulation | Self-blame | 13.79 | 2.13 |
| | Acceptance | 4.27 | 1.47 |
| | Rumination | 6.95 | 1.38 |
| | Positive refocusing | 2.81 | 0.81 |
| | Planning | 5.08 | 1.55 |
| | Positive reappraisal | 3.72 | 1.68 |
| | Putting into perspective | 2.96 | 0.92 |
| | Catastrophizing | 6.17 | 2.11 |
| | Other-blame | 7.10 | 2.32 |
| Executive functions | Self-management to time | 18.45 | 5.84 |
| | Self-organization/problem solving | 14.26 | 4.31 |
| | Self-restraint | 21.66 | 5.02 |
| | Self-motivation | 27.19 | 5.75 |
| | Self-regulation of emotion | 24.82 | 6.33 |

The Kolmogorov-Smirnov test was not significant to check the data distribution (cognitive emotion regulation: F = 0.19, P = 0.81; executive functions: F = 0.23, P = 0.74), which indicates that the data have a normal distribution. The correlation matrix of the relationship between cognitive emotion regulation and executive functions is presented in Table 2.

Table 2
*The correlation matrix of the relationship between cognitive emotion regulation and executive functions*

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Self-blame | 1 | | | | | | | | | | | | |
| Acceptance | -0.42** | 1 | | | | | | | | | | | |
| Rumination | 0.28** | -0.26** | 1 | | | | | | | | | | |
| Positive refocusing | -0.33** | 0.33** | -0.23** | 1 | | | | | | | | | |
| Planning | -0.41** | 0.30** | -0.31** | 0.38** | 1 | | | | | | | | |
| Positive reappraisal | -0.25** | 0.21** | -0.27** | 0.42** | 0.53** | 1 | | | | | | | |
| Putting into perspective | -0.30** | 0.28** | -0.23** | 0.33** | 0.37** | 0.44** | 1 | | | | | | |
| Catastrophizing | -0.44** | -0.26** | 0.38** | -0.36** | -0.34** | -0.48** | -0.48** | 1 | | | | | |
| Other-blame | 0.47** | -0.24** | 0.31** | -0.32** | -0.31** | -0.36** | -0.50** | -0.27** | 1 | | | | |
| Self-management to time | -0.23** | 0.23** | -0.43** | 0.22** | 0.21** | 0.27** | 0.41** | -0.21** | -0.22** | 1 | | | |
| Self-organization/problem solving | -0.26** | 0.25** | -0.41** | 0.35** | 0.19** | 0.20** | 0.29** | -0.24** | -0.24** | 0.53** | 1 | | |
| Self-restraint | -0.35** | 0.24** | -0.30** | 0.28** | 0.26** | 0.26** | 0.37** | -0.33** | -0.19** | 0.51** | 0.50** | 1 | |
| Self-motivation | -0.20** | 0.31** | -0.44** | 0.26** | 0.35** | 0.38** | 0.28** | -0.19** | -0.21** | 0.47** | 0.48** | 0.44** | 1 |
| Self-regulation of emotion | -0.24** | 0.46** | -0.39** | 0.33** | 0.27** | 0.25** | 0.30** | -0.34** | -0.23** | 0.55** | 0.53** | 0.51** | 0.44** |

As can be seen in Table 2, there is a positive and significant relationship between the methods of emotion regulation of acceptance, positive refocusing, planning, positive reappraisal, and putting into perspective with executive functions, but this relationship were inverse for self-blame, other-blame, catastrophizing and rumination ($P < 0.01$).

## 4. Discussion

This research was conducted with the aim of investigating the relationship between cognitive emotion regulation and executive functions. The findings showed that healthy forms of cognitive emotion regulation such as acceptance, positive refocusing, planning, positive reappraisal, and putting into perspective had a positive relationship with executive functions, but unhealthy forms of cognitive emotion regulation such as self-blame, other-blame, catastrophizing and rumination have a negative relationship with executive functions.

Although there was no research that examined the relationship between the cognitive emotion regulation and executive functions, but the previous researches are somewhat consistent with the findings obtained in this study (Gyurak et al., 2012; Mohammed et al., 2022; Sperduti et al., 2017). For example, Gyurak et al. (2012) showed in a research on neurodegenerative patients that better verbal fluency -as one of the executive functions- was related to better emotional regulation. Mohammad et al. (2022) also showed that a higher level of

executive functions is partially related to the effective use of emotion regulation strategies.

In the explanation of these findings, it can be said that healthy strategies in the cognitive regulation of emotions help so that a person, instead of being more involved and drowning in negative emotions, has a newer perspective on the situation that has occurred and can, with the help of these cognitive strategies, control his emotions. On the other hand, unhealthy cognitive strategies in emotion regulation, such as rumination or self-blaming or others-blaming, not only do not help to solve the problem, but also fuel the problems and make the situation more difficult than before. In this way, when people use healthy cognitive emotion regulation strategies, they will be able to perform better in executive functions such as memory, concentration, organization, emotion regulation, and self-management. On the other hand, unhealthy cognitive strategies in emotion regulation will weaken them by interfering in the process of executive functions.

This research also had some limitations. Sampling method was convenience and the study group was students. The tools used were self-report questionnaires and was discussed only the correlation between the variables. It is suggested that future studies investigate the role of cognitive emotion regulation strategies on functions in specific groups of patients. Also, teaching students healthy strategies to regulate emotions can help them to perform better in their academic, career and family fields.

## 5. Conclusion

The findings of the research showed that executive functions are related to cognitive emotion regulation strategies. Therefore, more attention should be paid to the role of cognitive regulation of emotion on emotional functions.

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## Conflicts of Interest

No conflict of interest has been reported.

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