

The Relationship Between the Effects of Adverse Childhood Experiences with Emotion Regulation and Cognitive Flexibility in Teenage Students

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Received July 10,2019; Revised August 4,2019; Accepted September 10,2019

Abstract

Background: Adolescence is a developmental period when the adverse childhood experiences have a significant impact due to the changes in the brain structure and functioning during this period. This is mainly related to cognitive and emotional functioning. Childhood treatment, relationships, and health are the key factors involved in predicting later life emotional and cognitive growth and function.

Objectives: This research aimed to investigate the relationship between adverse childhood experiences with emotion regulation and cognitive flexibility in teenage students. The research method was descriptive correlational.

Methods: The population of the study included all enrolled teenage students in English language institutes of Ardabil city in 2019; 135 individuals were selected as the sample of the study. The research tools were Adverse Childhood Experiences Questionnaire, Cognitive Flexibility Questionnaire, and Emotional Regulation Scale.

Results: The results showed that there was a significant negative correlation between adverse childhood experiences with emotion regulation ($r=-0.409$), ($P=0.001$) and cognitive flexibility($r=-0.435$), ($P=0.001$). The results of the regression analysis showed that 29.5% of emotion regulation was explained by adverse childhood experiences. Also, 50.6% of cognitive flexibility was explained by adverse childhood experiences.

Conclusion: There was found a negative and significant correlation between adverse childhood experiences with emotion regulation and cognitive flexibility in teenage students. From this finding, it can be concluded that the early development period and family member treatment, relationships, and health are the key factors in predicting later life emotional and cognitive growth and function.

Keywords: Childhood Experiences, Emotion, Flexibility, Adolescence

How to Cite: Shahab M, Taklavi S. The Relationship Between the Effects of Adverse Childhood Experiences with Emotion Regulation and Cognitive Flexibility in Teenage Students. Int. J. School. Health. 2019;6(4):41-47.

1. Introduction

Emotional growth in adolescence involves a real and coherent sense in relation to others, including learning how to deal with stress and emotional management (1). One of the main aspects of emotional growth is emotion regulation (2). Emotion regulation is one of the psychological variables that has been considered by many researchers (3); it involves the process of changing the current or desired emotion (4). Emotion regulation ability includes the ability to adjust one's emotional experiences to achieve an optimal emotional state and adaptive outcomes (5). Teens always encounter a range of emotional problems that require different strategies for emotional regulation (6) and compared with adults when exposed to trauma, they show a wide range of symptoms that increases their risk of emotional and behavioral problems (7). Executive functions also play a wide role in the activities of young people (8). In general, executive function is an umbrella term that encompasses a wide range of cognitive processes and related behaviors. Cognitive flexibility is one of the key

components of executive functions (9). Cognitive flexibility is the ability to adapt the thinking and behavior of the individual to respond to changes in the environmental condition (10). Cognitive flexibility is defined as the ability to change one's thoughts and actions in response to demands arising from situations and problems (11). The adolescent brain undergoes changes in a variety of functional and structural areas known to be the regulators of emotion and executive function processes (12). Due to these changes in brain structure and functioning during the developmental period, the effects of earlier maltreatment have a great impact (7). The incidence of childhood adverse experiences is high and cognitive flexibility is significantly influenced by adverse childhood experiences (13). Adverse childhood experiences can also be described as poor emotion regulation triggers (14). They are negative experiences that a child might face in the first 18 years of life. Adverse childhood experiences have been classified as abuse (physical, sexual, and emotional abuse), household dysfunction (violence, mental illness, parental divorce, and availability of criminal household member),

and neglect (either physical or sexual neglect or both) (15). There is an evidence of a link between childhood adverse experiences with poor emotional development and reduced emotional awareness (16). Thurston and colleagues found that there was a significant relationship between childhood adversity and emotion regulation (17). Other studies have also shown that the strict attitude of the parents is exclusively related to their children's cognitive flexibility (18). Pechtel and colleagues showed that there was a relationship between childhood adverse experiences with cognitive emotional regulation and cognitive function (19). Guinosso and colleagues showed that adverse childhood experiences were all hypothesized to influence children's general cognitive ability and executive function (20). It is estimated that 6 out of 10 children in the United States have experienced adverse childhood experiences (15). The rate of childhood adversity is high and this has serious consequences. Fewer studies have examined the effects of adverse childhood experiences on cognitive flexibility and emotional regulation ability. No research has been carried out in Iran.

2. Objectives

This study aimed to investigate the relationship between adverse childhood experiences with emotion regulation and cognitive flexibility.

3. Methods

This study was descriptive and correlational. The population of the study consisted of all adolescent students enrolled in English language education of Ardabil, district 2, in spring semester 2019. The population was 220 individuals and among them, 135 were selected as the sample of the research by simple random sampling according to Morgan table. The samples were selected randomly by correspondence with the managers of the English language institutes and explaining the aim of the study by simply accessing the students' names. The students were first informed about the confidentiality of the information and then completed the questionnaires. After completing the questionnaires, the data was entered into the SPSS software version 23 and analyzed using descriptive and inferential statistics. The Pearson test and regression were used to test the research hypotheses and questions.

3.1. Adverse Childhood Experiences Questionnaire (ACEQ): This questionnaire was designed by the US Center for Disease Control and Prevention and the Kaiser Foundation (21). It consists of 10 questions, each measuring one dimension of a child's adverse experiences. The ten

dimensions include the following: Emotional abuse, Physical abuse, Sexual abuse, Emotional neglect, Physical neglect, Household violence, Parental imprisonment, Parental mental illness and Parental divorce. The answer to the questions can be yes or no; an affirmative response is a sign of that experience occurring in the first 18 years of life. The total score ranges from 0 to 10. A higher score indicates more adverse experiences for the individual. One of the questions as an example is, "During the first five years of life, did any of your family members have depression or mental illness or a suicidal tendency?" The Adverse Childhood Experiences Questionnaire is a reliable and valid tool for measuring childhood difficulties and problems; it has been used in a wide range of studies (22, 23). This questionnaire is a valid and cost-effective tool for screening individuals through the retrospective evaluation of their childhood adverse experiences, and it has satisfactory internal consistency (24). This questionnaire has optimal overlap with the Persian child abuse questionnaire (25). In this study, reliability via Cronbach's alpha method was reported to be appropriate (0.907).

3.2. Cognitive Flexibility Questionnaire (CIF): This questionnaire was developed by Dennis and Vendera (26). It is a 20-question self-reporting tool, and it is used to measure the kind of cognitive flexibility needed to successfully challenge one's ability to replace dysfunctional thoughts with more efficient ones. The scoring method is based on a 7-point Likert scale of 1 to 7. It tries to measure the three aspects of cognitive flexibility, namely 1) the desire to understand difficult situations as controllable situations, 2) the ability to create several alternative justifications for human life events and behavior, and 3) the ability to create several alternative solutions for difficult situations. The questionnaire is for clinical and non-clinical patients and also for assessing one's progress in developing flexible thinking in cognitive behavioral therapy for mental illness (26). Dennis and Vander showed that the questionnaire has a simultaneous factor structure and a good convergent validity (26). The researchers showed that the two factors of perception related to the different options and perceptions of behavior justification had one meaning and the control factor was considered to be the second subscale. The concurrent validity of this questionnaire is equal to the validity of the Beck Questionnaire (BDI-II) -0.39. Martin and Anderson tested the reliability via Cronbach's alpha for the whole scale, including the control ability related to the perception of different options, which was 0.91, 0.91 and 0.84 (27). It was obtained by retrieval method, which is resulted in 0.81, 0.75, and 0.77, respectively. The coefficient of validity of the whole -scale retest was reported as being 0.71 by Shareh and colleagues in Iran (28). The subscales

reported on the controllability perceptions, perceptions of different options and behavior justification perceptions were 0.87, 0.89, and 0.55, respectively. Cognitive Flexibility Questionnaire has good operational, convergent, and concurrent validity in Iran. In the Persian version, unlike the original scale, which yielded only two factors, the cognitive flexibility questionnaire has three factors, namely the controllability perception, the perception of different options, and the behavior justification perception. The convergent validity of the Resiliency questionnaire was 0.67 and the concurrent valid of the Beck Questionnaire was -0.50 (28).

3.3. Emotion Regulation Scale: This scale was made by Gross and John (29). This scale consists of 10 items, which involve two reassessment subscales (6 items) and subdue (4 items). The answers are focused on a Likert scale (7 degrees) ranging from totally disagree 1 to totally agree 7. Cronbach’s alpha coefficient for the re-evaluation was 0.79 and for the subscale was 0.73. The retest reliability after three months, for the whole scale, was 0.68 (29). The intrinsic homogeneity coefficient of this scale was obtained by the Milan State university staff and Catholic students for the reassessment on a scale of 0.48 to 0.68 and for subsidence of 0.42 to 0.63. The correlation coefficients of reappraisal with a positive effect scale was 0.24, a negative effect of -0.14 was also reported. The Persian version of the Gross and John questionnaire has been standardized by Hasani (30). In this study, the validity of the scale is based on the internal consistency method (Cronbach’s alpha domain was from 0.60 to 0.81). The validity of the questionnaire has been reported through principal component analysis using the varimax rotation correlation between two subscales

($r=0.13$) and the desirable criterion validity.

Written informed consent was obtained from the participants. All the students have participated in the research with the consent of themselves and their teachers, as well as with the managers of the language education institution.

Results

According to the findings, 54.82 percent of the students were female and 45.18 percent were male. The mean and standard deviation of the age of the female students were 14.25 and 1.05 and the boys were 14.36 and 1.14. The highest frequency was in the third grade of the second high school and the lowest was in second grade of the first high school. The mean score of the students’ academic achievement was 19.02.

As can be seen in Table 1, the average of childhood adverse experiences, emotional regulation, controllable perception, perception of different options, perception of justified behavior, and cognitive flexibility were 1.16, 35.57, 35.79, 46.13, 10.47, 82.09, respectively. The results of the Kolmogorov-Smirnov test for the distribution of scores of the variables indicated the normal distribution of the variables (for adverse childhood experiences: $P=0.63$, $Z=1$, for emotion regulation: $P=0.63$, $Z=0$, for cognitive flexibility: $P=0.196$, $Z=1$).

As can be seen in Table 2, there was a significant relationship between adverse childhood experiences with emotion regulation ($r=-0.409$), ($P=0.001$) and cognitive flexibility ($r=-0.435$), ($P=0.001$). Before performing

Table 1: Mean and standard deviation of research variables

Variables		Mean±SD
Adverse childhood experiences	Emotional abuse	0.72±0.36
	Physical abuse	0.86±0.47
	Sexual abuse	0.18±0.09
	Emotional neglect	0.80±0.43
	Physical neglect	0.83±0.45
	Household violence	0.84±0.45
	Addiction of parents	0.88±0.48
	Prison of parents	0.63±0.31
	Divorce of parents	0.59±0.27
	Adverse childhood experiences	1.14±0.49
	Emotion regulation	Re-evaluation
Subdue		18.56±5.63
Emotion regulation		35.57±8.12
Cognitive flexibility	Controllable perception	35.79±6.23
	Perception of different options	46.13±7.64
	Perception of justifies behavior	10.47±2.35
	Cognitive flexibility	82.09±12.47

Table 2: Correlation coefficient between adverse childhood experiences with emotional regulation and cognitive flexibility

Variable	Re-evaluation	Subdue	Emotion regulation	Control perception	Option perception	Justification perception	Flexibility
Emotional abuse	-0.284**	-0.287**	-0.512**	-0.324**	-0.309**	-0.311**	-0.418**
Physical abuse	-0.175**	-0.198**	-0.216**	-0.105*	-0.054	-0.202**	-0.213**
Sexual abuse	-0.352**	-0.307**	-0.479**	-0.406**	-0.232**	-0.326**	-0.429**
Emotional neglect	-0.180**	-0.197**	-0.308**	-0.082	-0.037	-0.260**	-0.268**
Physical neglect	-0.155*	-0.108*	-0.125*	-0.053	-0.039	-0.103*	-0.153*
Household violence	-0.231**	-0.250**	-0.366**	-0.210**	-0.218**	-0.226**	-0.280**
Parental drug use	-0.189**	-0.191**	-0.194**	-0.037	-0.082	-0.135*	-0.171*
Parental imprisonment	-0.074	-0.103*	-0.217**	-0.045	-0.123*	-0.137*	-0.198**
Parental divorce	-0.229**	-0.270**	-0.365**	-0.219**	-0.227**	-0.240**	-0.313**
Adverse childhood experiences	-0.230**	-0.285**	-0.409**	-0.318**	-0.310**	-0.357**	-0.435**

*Significant at the error level of 0.05; **Significant at the error level of 0.01

Table 3: The results of multiple regression analysis to determine the role of childhood adverse experiences in predicting emotional regulation

Predictive variables	Unstandardized Coefficients		Standardized Coefficients	T	P
	Se	B	Beta		
Constant	20.60	2.117	-	10.590	0.001
Emotional abuse	-0.513	0.049	-0.423	-8.017	0.001
Physical abuse	-0.215	0.021	-0.221	-3.570	0.006
Sexual abuse	-0.530	0.052	-0.437	-8.406	0.001
Emotional neglect	-0.244	0.023	-0.240	-3.795	0.005
Physical neglect	-0.090	0.011	-0.064	-1.013	0.058
Household violence	-0.251	0.025	-0.243	-3.806	0.005
Parental drug use	-0.204	0.021	-0.117	-2.935	0.036
Parental imprisonment	-0.336	0.029	-0.265	-4.174	0.004
Parental divorce	-0.380	0.033	-0.317	-5.855	0.003
Adverse childhood experiences	-0.295	0.039	-0.401	-7.203	0.001

Table 4: The results of multiple regression analysis to determine the role of childhood adverse experiences in predicting cognitive flexibility

Predicting variables	Unstandardized Coefficients		Standardized Coefficients	T	P
	Se	B	Beta		
Constant	24.37	2.362	-	11.852	0.001
Emotional abuse	-0.501	0.057	-0.415	-8.930	0.001
Physical abuse	-0.210	0.025	-0.216	-3.127	0.007
Sexual abuse	-0.477	0.052	-0.409	-8.318	0.001
Emotional neglect	-0.219	0.027	-0.220	-3.540	0.006
Physical neglect	-0.087	0.012	-0.076	-1.076	0.053
Household violence	-0.215	0.026	-0.225	-3.670	0.006
Parental drug use	-0.197	0.019	-0.103	-2.803	0.043
Parental imprisonment	-0.213	0.025	-0.218	-3.069	0.008
Parental divorce	0.295	0.031	-0.302	-5.630	0.004
Adverse childhood experiences	-0.506	0.058	-0.423	-9.124	0.001

univariate regression test, the presuppositions of this test included Variance inflation factor (emotion regulation: 1.45 and cognitive flexibility: 1.55) and Tolerance index (emotion regulation: 0.91 and cognitive flexibility: 0.83).

As can be seen in Table 3, the observed F value is

significant ($P < 0.01$) and 29/5 percent of emotion regulation is explained by childhood adversity. Based on the results, B coefficient indicated that emotional abuse: ($B = -0.423$), ($P = 0.001$), sexual abuse: ($B = -0.437$), ($P = 0.001$), parental divorce: ($B = -0.317$), ($P = 0.004$), and adverse childhood experiences: ($B = -0.401$), ($P = 0.001$), respectively, were the most powerful predictors of emotion regulation.

As can be seen in Table 4, the F value is significant ($P < 0.01$) and 50/6 percent of cognitive flexibility is explained by childhood adversity. Based on the results of B coefficient indicate that emotional abuse ($B = -0.415$), ($P = 0.001$), sexual abuse ($B = -0.409$), ($P = 0.001$), parental divorce ($B = -0.302$), ($P = 0.004$), and adverse childhood experiences ($B = -0.423$), ($P = 0.001$) were the most powerful predictors of cognitive flexibility.

Discussion

The purpose of this research was to investigate the relationship between adverse childhood experiences with emotion regulation and cognitive flexibility in teenage students. The results of the study showed that there was a significant negative correlation between adverse childhood experiences with emotion regulation and cognitive flexibility in the adolescents. This finding is in line with several studies (13, 14, 17, 20, 31-34). In a study investigating the relationship between childhood trauma and cognitive developmental problems and emotion regulation showed that disasters affect emotion regulation (32). Another research study that investigated the role of childhood abuse on emotion dysregulation showed that emotional abuse was most strongly related to emotion dysregulation (34). It can be said that the dysfunction of emotion regulation may occur as a result of psychological experiences, but it is also a sign of the neurobiological effects of adverse childhood experiences. These effects involve molecular changes occurred in the stress hormone response systems, which, in turn, affect myelination, neuronal morphology, neurogenesis, and synaptogenesis in the different brain regions (7). Research in healthy controls has emphasized the role of the Dorsolateral Prefrontal cortex and Cingulate Cortex concerning emotion regulation. Successful downregulation is associated with decreased Amygdala activation, thus emotional dysregulation in adolescence might be associated with functional and structural abnormalities in the frontocingulate and fronto limbic pathways (19). Psychologically, affection and attention are the essential needs, so when children exposed to a variety of physical and emotional abuse, neglect and violence, they endure conflicts between their needs and what they actually experience; it can be a cause of emotion dysregulation in adolescence. In a study investigated the impact of stressful early life events on children's cognitive flexibility, they found that adolescents who exposed to stressful life events had less cognitive flexibility than their peers who did not have such experiences (31). In another research that investigated the effect of adverse childhood experiences on the executive function of Chinese students, the results showed that there was a significant relationship between adverse childhood experiences

with cognitive flexibility (13). To explain this finding, it can be said that high or chronic levels of stress may disturb brain development and affect mental health (35). Brain regions with extended postnatal development are particularly vulnerable to the long-term effects of stress. Magnetic resonance imaging (MRI) studies of children diagnosed with Post Traumatic Stress Disorder, resulting from maltreatment show differences in comparison with their non-maltreated peers (31). The frontal lobes play a significant role in executive function, and it is susceptible to the adverse effects of stress in childhood. Therefore, because of this, cognitive flexibility is one of the essential aspects of executive function. Adverse childhood experiences can disturb cognitive flexibility and other cognitive activity in the adolescence.

Conclusions

There is a significant relationship between adverse childhood experiences with emotion regulation and cognitive flexibility. Among childhood adverse experiences, sexual abuse, emotional abuse, and parental divorce had highest negative correlation with emotion regulation and cognitive flexibility.

In this study, we had limited population. The students entered in this study participated in English language learning classes, so they may not represent the whole student community. Because some of the questionnaires in this study were retrospective, the participants may have been mistaken when recalling information about the early years of their life.

It is recommended that more extensive samples be used in future research. Given the importance of the early years of life and critical role of the family in the mental growth and health of children, policies that reduce poverty and enhance parental education should be on the agenda, in addition, efforts should be made to promote safe, sustainable, and nurturing environments. Promising early interventions need to become part of the advertising campaigns to achieve better outcomes for adolescents.

Acknowledgments

The researchers would like to thank the managers, teachers, and students of the English language education institution for their contribution.

Authors' Contribution: Maryam Shahab wrote the manuscript, designed, and carried out the statistical analyses. Somayye Taklavi supervised data collection and procedures and proofread the manuscript.

Ethical Approval: This study was approved by Azad University of Ardabil.

Funding/Support: The study received no grant from any institution/company/university.

Conflict of Interest: None declared.

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