

# ***The Relationship Between Early Life Adversity and Emotion Regulation in Different Dimensions: Sleep Quality as a Mediator***

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**Abstract:** Early Life Adversity (ELA) with negative effects on individuals' emotional and physical health is related to individuals' emotion regulation abilities. Exposure to ELA can lead to changes in people's stress response system, affecting people's behavioral and cognitive ability to respond to negative life events later in their lives. The purpose of this study is to investigate the relationship between early life adversity and emotion regulation under the consideration of sleep quality to identify the extent of influences that different factors exert on emotion regulation strategies. An effective sample size of 424 participants was recruited for this study with an average low score on ELA. Results showed that early life adversity was related to an increase in the utilization of ineffective emotion regulation strategies in response to negative life events. More specifically, evidence pointed out that threats under the subcategories of ELA exerted a bigger influence than deprivation on individuals' emotion regulation strategies. However, the mediation caused by sleep quality between the relationship of threat, deprivation, and emotion regulation needs to be noted. In this study, sleep quality mediated the relationship between deprivation and ineffective emotion regulation as well as the relationship between threat and effective emotion regulation. The differences in the influence level of different subcategories of ELA (threat and deprivation) on emotion regulation were represented as well. This study can encourage future studies to focus on the relationship between ELA and sleep quality, and the mediation of different factors in the relationship between ELA and emotion regulation.

**Keywords:** early life adversity, sleep quality, emotion regulation, childhood deprivation, childhood threat

## **1. Introduction**

Early Life Adversity (ELA) is a range of adverse experiences, including but not limited to parental separation, and physical abuse, that individuals go through in their early life [1].

Previous research showed that exposure to ELA is often associated with emotion regulation. Emotion regulation is defined as an attempt to influence our or others' emotions. Cognitive appraisal, which is known as changing one's thoughts towards certain situations to affect the emotional response, is commonly adapted [2]. People reported experiences of down-regulating negative emotions, mainly by decreasing different aspects of negative emotions and up-regulating positive emotions due to the

human nature that people usually desire to have positive emotions. Moreover, people attempt to manage their emotions by adjusting the duration of emotions, and the quality of emotional responses. Situation selection, situation modification, attentional deployment, cognitive change, and response modulation are all examples of emotion regulation strategies [3].

Emotion regulation strategies can be affected by exposure to early life adversity since ELA can impair glucocorticoids' negative-feedback control of the hypothalamic-pituitary-adrenal axis, cause alterations in glutamate neurotransmission, and a decrease in hippocampal neurogenesis [4]. The Hypothalamic-Pituitary-Adrenal Axis (HPA) is associated with the stress system, indicating that reduced HPA can lead to dysfunction of the stress system [5].

Moreover, children who were physically abused showed smaller hippocampal volumes and smaller amygdala. Those were related to the expression of behavioral problems and interferences with children's emotional processing and regulation later in their lifetime [6]. Furthermore, early life adversity leads to an increase in the likelihood of anhedonia, defined as a decreased capacity to feel pleasure which further provokes many emotional disorders. This could change the interactions of reward networks in the amygdala [7]. Research in the past illustrated that understanding our emotions can result in better regulation of emotions n of emotions [8]. Therefore, anhedonia as a result of early life adversity can negatively affect individuals' emotion regulation.

However, different subcategories of ELA tend to exert different influences on emotion regulation.

Deprivation and threat as subcategories of ELA were demonstrated to have different effects on emotion regulation. Threats can make children experience difficulties adapting to emotional conflict and differences in the coupling of the amygdala and pregenual anterior cingulate cortex when responding to different negative events. Threats were also found to lead to an inhibition of responses in individuals toward emotional stimuli. In comparison, deprivation was related to deficits in individuals' cognitive control instead of automatic emotion regulation [9]. In addition, a threat was found to be related to expressive flexibility, while deprivation was not [10].

Nonetheless, many unexpected factors affect the relationship between ELA and emotion regulation. For instance, sleep quality was often found to be associated with emotion regulation. Lower sleep quality was related to lower cognitive reappraisal, indicating a negative effect on emotion regulation [11].

## 2. Goal & Hypothesis

The purpose of this study is to

- Identify the correlation between ELA and emotion regulation
- Differentiate the influences of different subcategories included in the ELA on emotion regulation
- Determine the role of sleep in the relationship between ELA and emotion regulation

### 2.1. Hypotheses

*Hypothesis 1:* Higher ELA score is related to worse emotion regulation.

*Hypothesis 2:* Sleep quality mediates the relationship between ELA and emotion regulation.

*Hypothesis 3:* There is a stronger association between emotion regulation and deprivation compared to threats and emotion regulation.

### **3. Methods**

#### **3.1. Participants**

Participation requests, mainly in the form of a Qualtrics link, were sent through different social media applications including WhatsApp, Facebook, Instagram, and WeChat. Participants who were under 18, have been diagnosed with mental disorders, or using psychotic medication at the time were excluded for final data collection. This study initially included 849 participants, though only 316 females and 108 males with a total of 424 participants were counted in the end. The decrease in participant size was due to 244 participants failing to finish the survey, 149 participants not passing the catch trial when they were told to choose a specific answer, 27 participants being under 18 years old, and 5 participants with a diagnosis of mental health issues and use of psychological medicines.

#### **3.2. Procedure**

Random participants were required to finish a survey on Google Qualtrics, a survey platform. The questionnaire included information about participants' age, gender, highest finished level of education, diagnosis regarding mental health, and current use of medication. After completing questions regarding demographic information, participants were led to finish the Children Trauma Questionnaire Questionnaire, the Cognitive Emotion Regulation Questionnaire, and the Pittsburgh Sleep Quality Index [12-14].

#### **3.3. Measurements**

##### **3.3.1. Maltreatment Experience**

Early life adversity was measured by Children Trauma Questionnaire in this study [12]. This questionnaire was comprised of 28 different items used to measure six subscales - emotional abuse, physical abuse, sexual abuse, emotional neglect, physical neglect, and minimization/denial- of an individual's maltreatment experiences in childhood. Note that the subscale of minimization/denial including three items was excluded from the study due to its lack of true representation of one's maltreated experience. The minimization/denial consists of 3 items that aim at screening underreporting of childhood maltreatment cases, and it has been excluded from this study because it does not measure an individual's real maltreated experience. A five-point Likert scale with a range from 1 (never true) to 5 (very often true) was utilized for all the questions in this questionnaire, designed for individuals to choose the best matching answer. Therefore, the range of scores was 25 to 125 for a total of 25 questions in this questionnaire. In particular, deprivation was measured with 10 questions, indicating that individuals could score ranging from 10 to 50. Threats were measured with 15 questions, and individuals could receive a sum score ranging from 15 to 75. Additionally, this questionnaire has been shown to maintain high internal consistency (Cronbach's  $\alpha=.95$ ).

##### **3.3.2. Emotion Regulation Strategies**

Emotion regulation was measured by the Cognitive Emotion Regulation Questionnaire [13]. 36 items were included in the questionnaire to measure people's capacity to utilize emotion regulation strategies cognitively after experiencing stressful or threatening events in their lives. Individuals' thoughts instead of their actual behavior in responding to the events were primarily measured by this questionnaire. 9 categories of cognitive emotion regulation methods each with 4 items - self-blame, acceptance, rumination, positive refocusing, refocusing on planning, positive reappraisal, putting into perspective, catastrophizing, and blaming others - were included in this questionnaire. A five-point scale was also utilized in this questionnaire with options from 1 (rarely) to 5 (almost always) in

response to how likely participants would use each strategy in response to a negative life event. The sum score for each category ranged from 4 to 20 with responses to 4 items. Therefore, the sum score for all categories ranged from 36 to 180 with responses to 36 items. The internal consistency and reliability were shown to be appropriate with a Cronbach's alpha above .70 [13].

### 3.3.3. Sleep Quality

The Pittsburgh Sleep Quality index including 19 items was used to measure the sleep quality for clinical populations in this study [14]. 7 aspects of sleep quality - subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction over a month - were measured. A four-point scale was utilized in this study ranging from 0 (no difficulty) to 3 (severe difficulties). The sum score ranged from 0 to 21 for each aspect and the sum score ranged from 0 to 57 for all elements. The validity and reliability of this questionnaire were shown to be appropriate with a Cronbach's alpha from 0.64 to 0.82 [15].

### 3.4. Statistical Analysis

Statistical tests were conducted with R studio, predictive analytics software to identify the relationships between different factors and emotion regulation. A multiple regression analysis was introduced to discover the relationship between ELA and emotion regulation. The independent variables included the sum scores of CTQ (minimization/denial subscale excluded), the sum scores of deprivation dimension of CTQ (emotional neglect and physical neglect), and the sum scores of threat dimension of CTQ (emotional abuse, physical abuse, sexual abuse). The dependent variable was the sum score of CERQ. Moreover, mediation analysis was included to determine the influence of sleep quality on the relationship between emotion regulation and ELA. In this case, the sum scores of PSQI were set as the mediator variable, the sum scores of CTQ were set as the independent variable, and the sum scores of CERQ were set as the dependent variable.

## 4. Results

### 4.1. Demographic Characteristics

Demographic traits of this study were demonstrated through table 1, which indicated that no significant differences appeared in any measured variables between females and males.

Table 1: Demographic characteristics of the participants.

| Sample characteristic | n   | %    | Age      |           | CTQ      |           | Effective emotion regulation |           | Ineffective emotion regulation |           | PSQI     |           |
|-----------------------|-----|------|----------|-----------|----------|-----------|------------------------------|-----------|--------------------------------|-----------|----------|-----------|
|                       |     |      | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i>                     | <i>SD</i> | <i>M</i>                       | <i>SD</i> | <i>M</i> | <i>SD</i> |
| Gender                |     |      |          |           |          |           |                              |           |                                |           |          |           |
| Female                | 316 | 74.5 | 20.54    | 4.46      | 33.06    | 8.94      | 19.59                        | 2.37      | 11.07                          | 2.01      | 4.80     | 2.95      |
| Male                  | 108 | 25.5 | 20.22    | 2.90      | 33.19    | 8.87      | 19.28                        | 2.61      | 10.97                          | 1.81      | 4.71     | 3.24      |

Note: N=424

### 4.2. Relationship Between ELA Sum Score and Emotion Regulation

In this study, linear regression was utilized to determine the relationship between the ELA sum score and emotion regulation. Data showed that a statistically significant relationship existed between ELA

and the frequency of use of ineffective emotion regulation [ $F(1, 422) = 40.38, p < 0.001$ ]. Figure 1 shows that there was a positive relationship between the two variables. As the ELA sum score increased, there was an increase in the amount of ineffective emotion regulation as well [ $\beta = 0.065, t(423) = 6.354, R^2 = 0.0873$ ]. About 8.73% of the observed variation in ineffective emotion regulation could be explained by the ELA sum score in this model.

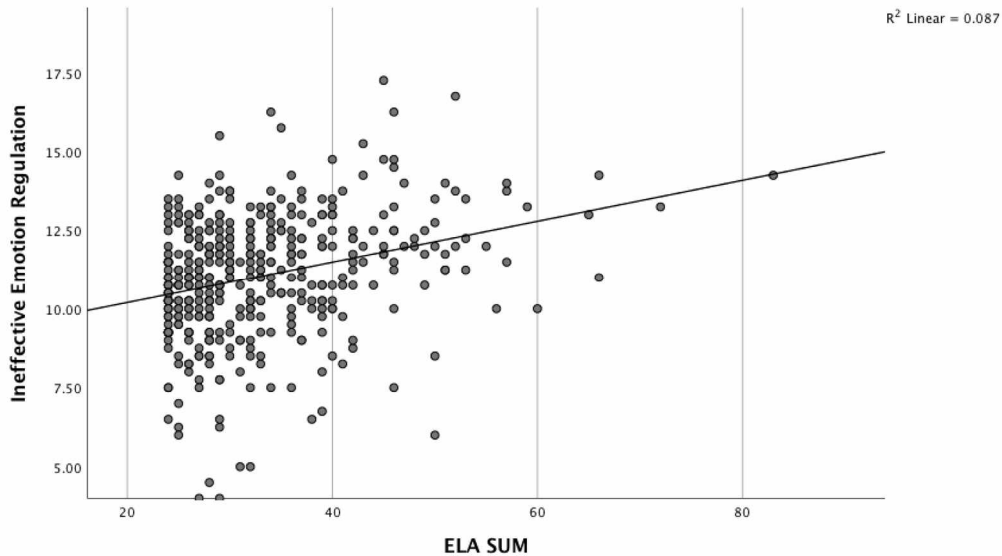


Figure 1: The relationship between ELA sum score and ineffective emotional regulation.

#### 4.3. Relationship Between Deprivation, Threat, and Emotion Regulation

Moreover, linear regression was used to measure the relationship between deprivation, threat, and emotion regulation to determine any potential difference in their level of influence on emotion regulation strategies. Calculations demonstrated that the relationship between deprivation and the frequency of ineffective emotion regulation was statistically significant [ $F(1,422) = 14.52, p < 0.001$ ]. Figure 2 indicated that deprivation was positively related to ineffective emotion regulation. An increase in exposure to deprivation corresponded with an increase in ineffective emotion regulation strategies [ $\beta = 0.068, t(423) = 3.81, R^2 = 0.0333$ ]. Deprivation was accountable for around 3.33% of the observed variation in ineffective emotion regulation.

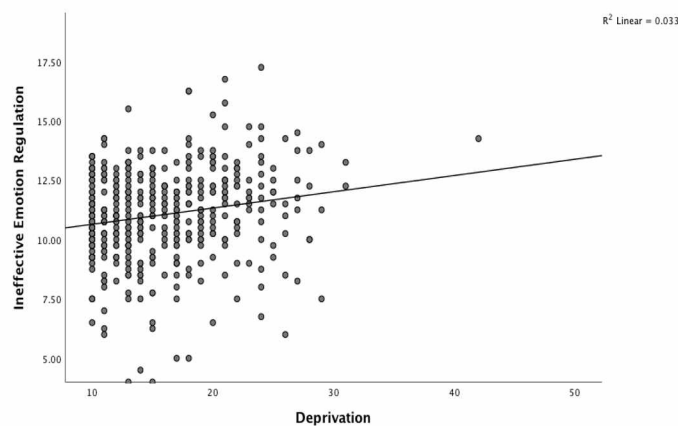


Figure 2: The relationship between deprivation and ineffective emotion regulation.

Furthermore, the relationship between threat and emotion regulation was calculated with a linear regression model. Threats were proven to have a statistically significant relationship with both frequencies of ineffective emotion regulation and effective emotion regulation. Figure 3 illustrated that there was a positive relationship between threat and frequency of ineffective emotion regulation [ $F(1,422) = 58.5, p < 0.001$ ]. An increase in threat experienced in childhood was associated with an increase in ineffective emotion regulation in the future life stage [ $\beta = 0.142, t(423) = 7.468, R^2 = 0.122$ ]. Compared to deprivation which could be used to explain about 3.33% of the observed variation in ineffective emotion regulation, exposure to threat in childhood had a bigger influence since it was accountable for about 12.2% of the observed variation. However, figure 4 showed that the increase in exposure to threats was also associated with an increase in the use of effective emotion regulation [ $\beta = 0.0651, t(423) = 2.677, p < 0.001$ ]. Threats were accountable for about 1.67% of the observed variation in effective emotion regulation [ $F(1,422) = 7.165, R^2 = 0.0167$ ].

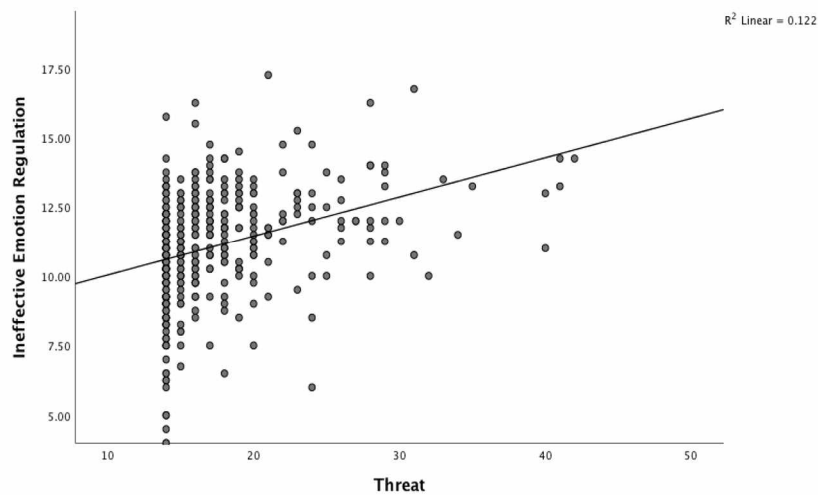


Figure 3: The relationship between threat and ineffective emotion regulation.

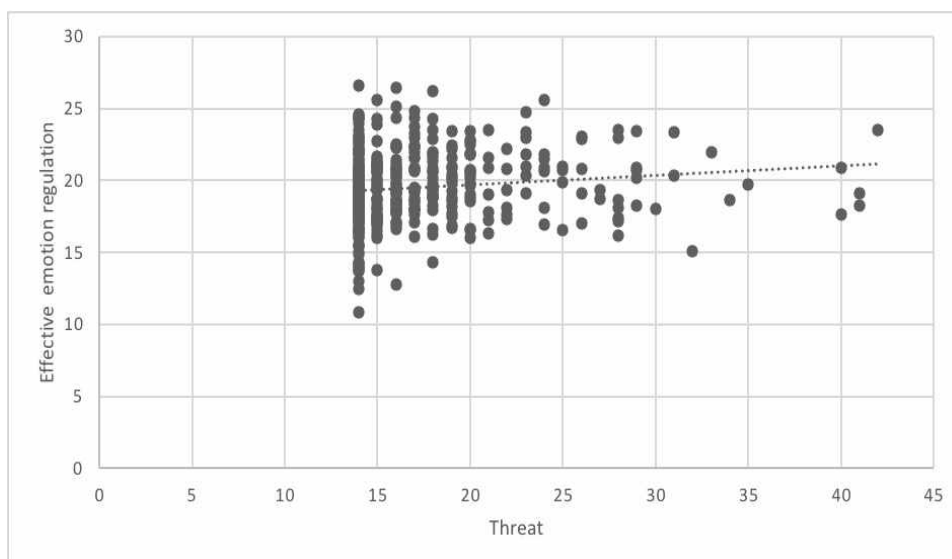


Figure 4: The relationship between threat and effective emotion regulation.

#### 4.4. The Effect of Mediator Sleep Quality in the Relationship Between Deprivation and Ineffective Emotion Regulation

A mediation model was utilized to analyze the effect of sleep quality on the relationship between deprivation and ineffective emotion regulation. The results showed that there was a significant relationship between deprivation and sleep quality ( $\beta = 0.189$ ,  $p < 0.001$ ), demonstrated by path 1 in Figure 5. An increase in exposure to deprivation corresponded with worse sleep quality. Furthermore, a significant relationship existed between ineffective emotion regulation and sleep quality ( $\beta = 0.203$ ,  $p < 0.001$ ), shown by path 2 in Figure 5. A worse sleep quality was related to a higher frequency of use of ineffective emotion regulation strategies. Lastly, a significant relationship was also discovered between deprivation and ineffective emotion regulation ( $\beta = 0.0685$ ,  $p < 0.001$ ), represented by path 3 in Figure 5. An increase in exposure to deprivation was associated with an increase in ineffective emotion regulation. After excluding the impact of sleep quality, the relationship between deprivation and ineffective emotion regulation was found to be mediated completely by sleep quality ( $\beta = 0.301$ ,  $p = 0.0981$ ), illustrated by path 4 in Figure 5.

*Path 1:* the relationship between deprivation and sleep quality. *Path 2:* the relationship between sleep quality and ineffective emotion regulation. *Path 3:* the relationship between deprivation and ineffective emotion regulation. *Path 4:* the relationship between deprivation and ineffective emotion regulation excluding the effect of sleep quality

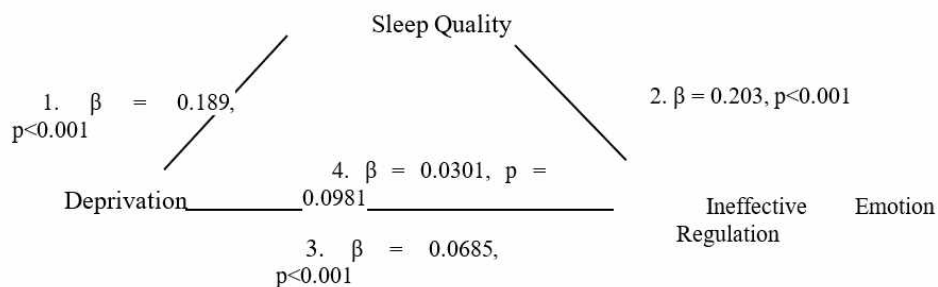


Figure 5: The effect of sleep quality on the relationship between deprivation and ineffective emotion regulation.

#### 4.5. The Effect of Mediator Sleep Quality in the Relationship Between Threat and Emotion Regulation

Two mediation models were utilized to determine the effect of sleep on the relationships between threat and emotion regulation. First, a significant relationship was discovered between threat and sleep quality ( $\beta = 0.225$ ,  $p < 0.001$ ) shown as path 1 in figure 6. An increase in exposure to threats was related to worse sleep quality. Furthermore, figure 6 showed that sleep quality had a significant relationship with ineffective emotion regulation ( $\beta = 0.160$ ,  $p < 0.00$ ) as path 2. Worse sleep quality was related to an increase in ineffective emotion regulation. Moreover, figure 5 showed that a significant positive relationship existed between threat and ineffective emotion regulation ( $\beta = 0.142$ ,  $p < 0.001$ ) as path 3. However, results showed that a significant positive relationship still existed between threat and ineffective emotion regulation excluding the impact of sleep quality ( $\beta = 0.106$ ,  $p < 0.001$ ) shown as path 4.

*Path 1:* the relationship between threat and sleep quality. *Path 2:* the relationship between sleep quality and ineffective emotion regulation. *Path 3:* the relationship between threat and ineffective emotion regulation. *Path 4:* the relationship between threat and ineffective emotion regulation excluding the effect of sleep quality

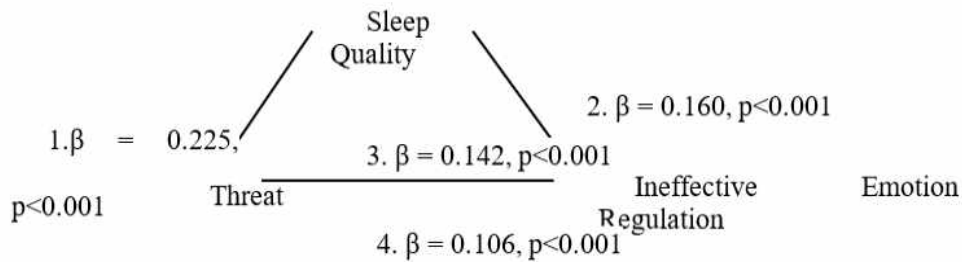


Figure 6: The effect of sleep quality on the relationship between threat and ineffective emotion regulation.

Second, figure 7 demonstrated the existence of a significant relationship between threat and sleep quality shown as path 1 ( $\beta = 0.225, p < 0.001$ ). An increase in exposure to threats was related to worse sleep quality. Moreover, worse sleep quality was related to more effective emotion regulation shown as path 2 ( $\beta = 0.0992, p = 0.0170$ ). In addition, an increase in exposure to threats was related to more effective emotion regulation demonstrated as path 3 ( $\beta = 0.651, p = 0.00772$ ). Excluding the effect of sleep quality, the relationship became insignificant as shown in path 4 in figure 7 ( $\beta = 0.428, p = 0.0994$ ).

*Path 1:* the relationship between threat and sleep quality. *Path 2:* the relationship between sleep quality and effective emotion regulation. *Path 3:* the relationship between threat and effective emotion regulation. *Path 4:* the relationship between threat and effective emotion regulation excluding the impact of sleep quality.

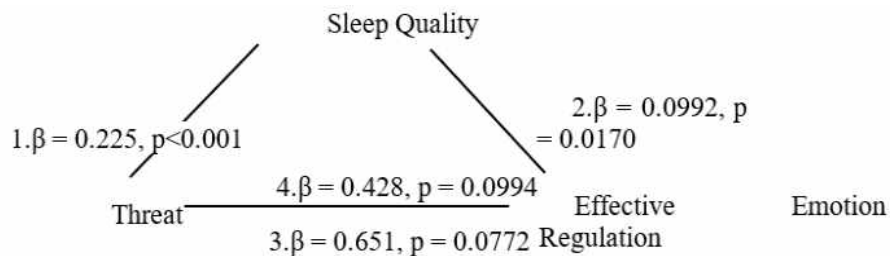


Figure 7: The effect of sleep quality on the relationship between threat and effective emotion regulation.

## 5. Discussions

Much prior research demonstrated the multiple effects of ELA on individuals, including more vulnerability to mental illness, and impairment of brain areas associated with emotion regulation. This study concentrates on interpreting the relationship between ELA and emotion regulation in several dimensions. More specially, we aim to look at the relationship between deprivation, threat, and both ineffective and effective emotion regulation strategies. Our first hypothesis was met with data showing that higher ELA was related to worse emotion regulation which aligns with previous studies. A possible explanation for this finding was the dysfunction of the stress system. Individuals who were exposed to early life adversity including stress and abuse experienced impairment in the stress system, which led to worse emotion regulation strategies [5]. Chronic stress could also impair activities in the prefrontal cortex and lead to decreased cognitive flexibility in adulthood as well [16]. Another explanation could be the appearance of major disruptions in emotional and behavioral



regulations as a result of exposure to ELA [17]. The second hypothesis was met as well. Threats had a larger effect on emotion regulation than deprivation. One possible explanation was that threats were related to the more frequent use of disengagement strategies, which would further impact the development of psychopathologies in the future [18]. Another explanation could be that threats were related to the inhibition of responses toward emotional stimuli [9]. Individuals with inhibition of responses could subsequently experience ineffective emotion regulation strategies. Furthermore, threats were associated with expressive flexibility [10]. Individuals who were inflexible in expressing their emotions might have difficulty regulating their emotions compared to others. Lastly, the third hypothesis was partially met. Sleep quality in this study mediated the relationship between deprivation and ineffective emotion regulation, and threat and effective emotion regulation. One possible explanation for this outcome was the relationship between sleep quality and emotion regulation. Sleep quality was important in terms of people's ability to effectively regulate emotions. Poor sleep quality can lead to more negative emotions experienced, which can negatively affect individuals' abilities to regulate emotions [19]. One potential explanation for the initially identified relationship between threat and effective emotion regulation might be due to the nature of the sample obtained for this study. With a range from 25 to 125, participants on average scored around 30 on their CTQ questionnaires. The participants were relatively healthy and therefore could be accountable for this relationship.

## 6. Limitations

Though the relatively large sample size was one strength of this study, many weaknesses of this study should also be noted when conducting future research. To start with, the sample size mainly featured individuals from China, which led to a limitation of representation of different cultures. The result of the study could be hard to use to generalize to populations with different cultural backgrounds since different cultures possess different ideal and focal emotions. Those preferences for certain emotions can unconsciously alter people's emotion regulation strategies in daily life. Moreover, participants might be affected by social norms, which could cause them to change their true responses to match responses that are favored by society towards questions in the survey. Therefore, they might answer those questions differently to receive a better score. Furthermore, people might also experience memory bias, which can make them alter their memories to match their current beliefs or attitudes. Hence, those who have effective emotion regulation strategies now might reconstruct their memories to present a more positive childhood. Similarly, those who have ineffective emotion regulation strategies can now reconstruct their memories to present a more negative childhood. In addition, the individuals on average scored low on ELA, which might imply that a strong relationship between ELA and emotion regulation can be hard to find. Lastly, 74.5% of the participants were females in this study with only 25.5% of participants being males, and this gender difference could potentially affect individuals' emotion regulation strategies though no significant effect of gender difference was shown in the study.

## 7. Conclusion

In conclusion, this study offered insights into the relationship between ELA and emotion regulation by proving that exposure to ELA was negatively related to emotion regulation strategies. Additionally, threat exerted a bigger influence on emotion regulation than deprivation though sleep quality seemed to be able to affect the relationships on some level. Future research can involve more longitudinal studies to examine the effect of sleep quality on emotion regulation more thoroughly. Research should take notes of participants' surroundings, including their parents to determine potential mediation factors. Consequently, studies can concentrate on how adjusting mediation factors can regulate

emotion regulation. Moreover, research can focus on a broader scope of populations representing different cultures to produce outcomes that are capable of being generalized.

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