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The Role of Adverse Childhood Experience on Adult Perceived Stress

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Abstract

There are some inconsistencies in previous studies regarding the relation between adverse childhood experiences and perceived stress. On the other hand, some studies have found that adverse childhood experiences affect the body's stress-related brain regions, such as the amygdala and prefrontal cortex. This research aims to re-examine the role of adverse childhood experiences (ACEs) in later perceived stress during the young adult phase. In total, 270 collegians (18–25 years old) in Yogyakarta completed the ACE-IQ and PSS-10 questionnaires. Data were analyzed using simple linear regression. The result indicates that adverse childhood experiences play a significant role in perceived stress in young adulthood ($\beta = 20.5\%$, $p < .001$). Moreover, these predictions are significant to both males and females. Despite these findings, the severity and profundity of the effect of ACEs were not quantitatively assessed. This highlights the need for subsequent research that provides more rigorous, detailed measurements of these variables. This research suggests early intervention for individuals with adverse childhood experiences to strengthen the protective factors against stress in adulthood.

Stress is a common human experience, often encountered every day. According to S. Cohen et al. (2016), stress can be understood in three ways: epidemiological tradition (objective levels of stress based on an individual's life events), psychological stress (perceived/appraisal of the stressors), and biological stress (physiological perturbations of reactions to provide adaptive behavioral action or coping). While these components are interrelated, they must be understood individually, as they can have distinct intervention foci (Baker et al., 2020).

One dimension of stress is perceived stress (PS), which, psychologically, refers to perception, felt, or derived from the assessment of the stressor itself (Baker et al., 2020). Unlike other stressors, PS relates to an individual's feelings, sensitivity, and assessment of the pressure they are facing at a given moment, rather than to the stressor's severity itself. For example, when a lecturer assigns an assignment in class, students may perceive the task differently (perceived stress) even though the assignment is the same (actual stress). Higher PS indicates that the individual perceives the burden as more severe.

PS is not related solely to the stimuli themselves. As Wang and Wang (2019) stated, PS is also determined by the brain's ability to regulate the various factors involved. The ability to perceive stress effectively is closely related to the prefrontal cortex's and amygdala's ability to induce feelings of helplessness (controllability) and to an individual's level of self-efficacy in managing stress (Busler et al., 2022; Schneider et al., 2020; Veer et al., 2015). The activation of the amygdala, hypothalamus, and prefrontal cortex is also linked to the ability to maintain a calm/regulated state, enabling individuals to effectively manage stressors (Buijs & Van Eden, 2000). Therefore, perceptions of helplessness and self-efficacy are crucial for emotional processing and stress regulation, which is key to engaging in successful stress management strategies (Bastianon et al., 2020).

High levels of perceived stress have been shown to be associated with various long-term negative impacts on individuals. For example, prolonged exposure to perceived stress can disrupt physical (biological) systems, such as the immune, neural, and endocrine systems, increasing the risk of chronic disease and premature death (Boullier & Blair, 2018). Dohrenwend (2000) suggested that high levels of perceived stress are associated

with psychopathological disorders such as depression and PTSD. Beyond psychological issues, high levels of perceived stress are associated with behavioral problems such as alcohol and drug use (Dohrenwend, 2000; Garami et al., 2019). This demonstrates the importance of PS management in avoiding the negative impact of long-term PS exposure.

High levels of perceived stress are influenced by both environmental and biological factors. Environmental factors that can influence perceived stress include career, socioeconomic status, and social status (Divaris et al., 2014). All of these factors are related to the actual pressures encountered. There are also factors related to individual personality and coping strategies, such as neuroticism, irritability, and optimism (Roohafza et al., 2016). From a biological perspective, for example, it relates to the function of brain regions such as the amygdala and prefrontal cortex in handling and regulating stress (Buijs & Van Eden, 2000; McEwen et al., 2016). According to Pessoa and Adolphs (2010), the amygdala plays a central role in evaluating threatening information, fear conditioning, emotional processing, and memory. Therefore, disorders in this part of the brain heighten individuals' sensitivity to threatening stimuli.

From childhood to adolescence, the brain undergoes rapid development. This includes the amygdala and prefrontal cortex, which continue to develop into early adulthood (Tottenham, 2020). Environmental factors, such as domestic violence, abuse, neglect, marital dysfunction, bullying, and community issues, are among the adverse childhood experiences (ACEs) that can also impact the cognitive and biological development of individuals who experience them. Including those related to the regulation of perceived stress.

Previous studies have found a link between trauma and negative childhood experiences and changes in cognitive abilities and memory (Kalia & Knauft, 2020; Majer et al., 2010). Trauma and exposure to maltreatment during childhood also adversely affect problem-solving capacities and reflexive functioning in stressful situations (Demirbaş, 2018; Heleniak et al., 2016; Kalia & Knauft, 2020). Furthermore, exposure to violence, negative experiences, and childhood trauma impacts the development of brain regions such as the amygdala, hippocampus, cingulate gyrus, insula, and prefrontal cortex (Mueller et al., 2010; Teicher & Samson, 2016; van Harmelen et al., 2013; Veer et al., 2015; Weissman et al., 2020). Disruptions in the development of these brain regions can manifest as behavioral and psychological disorders (Dubovický, 2010). Childhood trauma even alters the structure (methylation) of DNA associated with stress responses (Peng et al., 2018).

Closer examination reveals that most of the affected areas are related to the body's ability to deal with stress and problem-solving, which are also related to psychological distress. For example, dysregulation in the amygdala impairs an individual's assessment of threats (including stressors). Appraising stressors as more threatening (hyperreactive) can increase feelings of helplessness, which is the key to psychological distress (i.e., stress is perceived as more severe). Therefore, it is possible that the ability to perceive stress is also affected by adverse childhood experiences. This finding is particularly evident in regions directly involved in the regulation of psychological distress, namely, the amygdala and prefrontal cortex (Buijs & Van Eden, 2000). However, several brain regions begin to mature as individuals enter early adulthood, and a strong ability to regulate psychological distress is an essential protective factor against stress and its long-term negative effects (Zahniser & Conley, 2018).

Previous research has shown that perceived stress acts as a connecting mechanism between adverse childhood experiences and various psychopathological and behavioral outcomes in adulthood. For example, Garami et al. (2019) found that childhood trauma has a significant effect on parenting behaviors and opioid addiction, mediated by perceived stress levels. Exposure to physical and psychological abuse during childhood also mediates stress perceptions and emotion-focused coping with future health problems (Hager & Rund, 2012).

Several studies have directly examined the link between childhood experiences and PTSD. For example, research by (Hyman et al., 2007) showed a significant association between childhood violence and higher perceived stress and higher use of stress-avoidance coping. Other studies have found that individuals with lower childhood violence experience also report lower perceived stress, and vice versa (Cook et al., 2012; Heinze et al., 2017). Hence, despite these findings, some studies have obtained conflicting results.

Notwithstanding evidence that ACEs play a role in PS, findings regarding the relationship between ACEs and PS remain inconsistent, including differences by gender. For example, Baker et al. (2020) and Weltz et al. (2016) found no relationship between childhood violence and perceived stress or individual reactivity to stress. Furthermore, Hong et al. (2018) found a significant association between childhood violence exposure and perceived stress only in girls and not in boys. Therefore, research related to the role of ACEs in PS must be reexamined.

Perceived stress is a component of stress that is rarely studied compared to other components, such as daily stress (Baker et al., 2020). According to Baker et al. (2020), research on each component of stress is necessary because interventions to regulate and mitigate its effects may differ. In addition to deepening empirical studies, research on ACEs in the Indonesian context remains limited, so further work is needed in young adult populations.

In the literature on the biological effects of adverse childhood experiences and changes in stress-related mechanisms, researchers hypothesize that exposure to adverse childhood experiences contributes to high levels of perceived stress in early adulthood. This study is expected to provide a starting point for further research on exposure to adverse childhood experiences in Indonesia.

Methods

Participants

The participants of this study were 270 active students (212 females and 58 males) in Yogyakarta. They were young adults aged 18-25. Participants were recruited through online research forms and posters, and all were entitled to receive compensation of Rp 10,000 in digital money. The distribution of participants was dominated by students from Gadjah Mada University (74.1%) (n: 200), while the remaining 25.9% were distributed among 15 other universities in Yogyakarta.

Procedure

This study used a quantitative survey method with convenience sampling. Data collection took place during the COVID-19 pandemic (October–November 2021), so the entire process was conducted online. To minimize risk, participants were instructed to stop at any time if they felt uncomfortable, taught diaphragmatic breathing relaxation techniques from Miltenberger (2016), and provided with information about nearby psychological services.

Information about the research (posters) was distributed through social media and student groups (Instagram, Line, Twitter, and WhatsApp). Participants who agreed to participate filled out a Google Form. Given the pandemic situation, this method was chosen because online surveys allow for the collection of large amounts of data in a short time. Furthermore, this method is concise, allowing respondents to complete the online questionnaire using their own devices. The research results are published anonymously to maintain data confidentiality.

With regard to the procedure, participants first read the research information sheet and provide informed consent. Next, participants provided demographic data, including name/initials/pseudonym, gender, age, faculty of origin, university of origin, and mobile phone number for reward purposes (optional). The third part involved completing the ACE-IQ scale and then the Perceived Stress Scale (PSS-10). Finally, participants were given a debriefing to help them relax and process any emotions that might have arisen upon completion of the questionnaire. After the debrief, participants also received information about nearby psychological services. This included information about psychological services at the nearest community health center (Puskesmas), available at https://bit.ly/daftarlayananpsikologi; GMC Psychologists for UGM students; and UKP Psychologists at the Faculty of Psychology UGM. The information was included in the closing section after the debrief. Data collection was carried out after clearance was obtained from the ethics committee of the Faculty of Psychology, Gadjah Mada University (Ethical Clearance Number: 6103/UN1/FPSi.1.3/SD/PT.01.04/2021).

Research Instrument

The study used the WHO's ACE-IQ scale and the PSS-10 developed by S. Cohen et al. (1994). Both have been adapted into Indonesian, and the researchers have granted permission for their use.

1. Adverse Childhood Experience (ACE-IQ) The ACE scale was developed based on the WHO model of negative experiences in children (Kazeem, 2015). The ACE-IQ consists of 29 items that measure types of violence or negative experiences experienced in childhood across 13 categories. These categories are neglect (emotional and physical), abuse (sexual, emotional, physical), household dysfunction (family members who: use alcohol/drugs, have mental disorders, have been incarcerated, are divorced/deceased, and have experienced violence), bullying, community violence, and collective violence (Almuneef et al., 2014). The scale used is the ACE-IQ, adapted into Indonesian by Rahapsari et al. (2021). This scale has concurrent validity with the ACEQ scale ($r = .807$, $p < .01$). It also has strong internal reliability, namely, $\alpha = .74$ (Rahapsari et al., 2021). Based on reliability testing of this study sample, a Cronbach's reliability coefficient of $\alpha = .77$ was obtained. An example of an item in this scale is "Have your parents, guardians, or other family members threatened, intentionally neglected, or thrown you out of the house?"
   The ACE scoring system is based on the WHO frequency scoring system, as used by Rahapsari et al. (2021). Scoring is performed by first assigning a score of 1 or 0 based on the minimum score for each item and on the given reference. Then, if at least 1 item in the category received a score of 1, the category itself receives a score of 1. Therefore, the ACE-IQ score ranges from 0 to 13. The scoring itself is usually written as 1, 2, 3, 4, and >4.
2. Perceived Stress Scale (PSS-10) The PSS scale consists of 10 items and has been translated into Indonesian by Paramitha (2012), who also conducted validity and reliability tests. The items are evaluated using a Likert scale from 0–4 that measures the degree to which participants assess aspects of stress in their lives over the past month in the form of helplessness and self-efficacy. The PSS-10 scale has a Cronbach's α reliability score of .87 (Paramitha, 2012). Based on reliability testing of this research sample, Cronbach's α was 0.883. An example of an item in this scale is "During the past month, how often did you feel upset because something happened that you did not expect?"
   The PSS scale scoring refers to the global interpretation system of S. Cohen et al. (1994). Scores are obtained by summing the Likert scale responses for each item. Four items on this scale are considered unfavorable: numbers 4, 5, 7, and 8. Thus, the assigned scores must be adjusted (0 = 4, 1 = 3, 2 = 2, 3 = 1, 4 = 0). Scores on this scale range from 0 to 40.

Analysis

Data analysis employed simple linear regression analysis. The analysis was conducted using IBM SPSS Statistics 21.

Prerequisite tests were conducted before the regression hypothesis test. The prerequisites were that the residual distribution be normal, the data be linear, and there be no heteroscedasticity. As additional data, the male and female populations were analyzed for significance. This was done to ensure that the observed significance was not due to the greater number of female respondents, given that Hong et al. (2018) found significance only among women, and the respondents in this study were predominantly female, with a 1:4 male-to-female ratio.

Results

Descriptive Analysis

A total of 283 participants completed the questionnaire, but 13 did not meet the criteria for Yogyakarta students. Thus, 270 participants were subjected to further analysis. Overall, the average ACE score was 3.29, and the average PSS score was 22.93 (Table 1).

Pre-Requisite and Hypothesis Tests

Assumption Test

Normality values and linearity significance values were above 0.05. In addition, the heteroscedasticity test graph showed no relationship or correlation between the predicted variables and the residuals across all tests, indicating that the assumption of homoscedasticity was met. Linear Regression Analysis. Based on the results of the prerequisite tests, the research data met all required assumptions, allowing regression analysis to proceed. The model above shows that the magnitude of ACE's contribution to perceived stress is significant in all data, in the total population (R^2 = .205; p<.001; Table 2), male population (R^2 = 0.294; p<0.001; Table 2), and female population (R^2 = .172; p<.001; Table 2).

The results of the simple linear regression analysis show that exposure to adverse childhood experiences significantly influences perceived stress, with a constant value $\beta_0 = 18.509$, $SE = .162$, $t = 8.310$, and a regression coefficient $\beta_1 = 1.347$ ($p < .001$), yielding the regression model $Y = 18.509 + 1.347$x.

Discussion

The results of this study indicate that exposure to adverse childhood experiences (ACEs) contributes to perceived stress in early adulthood ($p < .001$), supporting the hypothesis. This contribution is positive: As exposure to ACEs increases, so does perceived stress in early adulthood.

The results of this study support the research of Hyman et al. (2007), which stated that exposure to negative childhood experiences is associated with perceived stress in cocaine-dependent adults. The results of this study indicate that, in the context of different participants, namely, university students (academics) in Indonesia, the conclusion that a link exists between adverse childhood experiences and perceived stress remains consistent. Additionally, the results of this study support the longitudinal study of Heinze et al. (2017), which found a relationship between exposure to violence experienced in adolescence (before age 18) and levels of perceived stress in early adulthood. This study also measured other contexts of ACEs, namely, neglect, bullying, family dysfunction, and adverse experiences at the community level. On the other hand, this study does not align with the research by Baker et al. (2020), which concluded that negative childhood experiences were not associated with levels of perceived stress or stress reactivity in early adulthood. The results of this study also differ from the research of Hong et al. (2018), which found significance only in women. The results of this study indicate that negative experiences in childhood are significant in early adulthood for both men and women.

The effect of ACEs on childhood stress is likely due to the body's mechanisms for coping with stress. Several studies have suggested that early exposure to adversity can lead to increased sensitivity to stress and heighten the risk of negative physical and mental health outcomes (Barboza Solís et al., 2015; McLaughlin et al., 2010). Perhaps ACEs act as primary stressors that serve as a foundation, then interact with secondary stressors in the form of further stress throughout subsequent development (Scorza et al., 2022). Additionally, Kalia and Knauft (2020) found that ACEs are associated with a lower sense of control. This low sense of control may be related to the development of feelings of helplessness and self-efficacy, which are the keys to perceived stress.

This study found that adverse childhood experiences predicted 20.5% of perceived stress levels in young adulthood. This contribution is categorized as having a moderate effect, according to J. Cohen (2013) interpretation. However, Ferguson (2009) added that, practically speaking, in the social sciences (especially psychology), large effect sizes are rare for variables, and even small to moderate effect sizes are significant. Furthermore, PS is a contextual and situational construct because it depends on an individual's current assessment of available demands and resources. Therefore, the effects of ACEs occurring during earlier developmental periods are distal (long-term), and it is natural that they are not statistically dominant.

In addition to ACEs, other variables are likely associated with high levels of perceived stress, such as personality and perceived social support (Kaurin et al., 2021). Personality and perceived social support both moderate changes in perceived stress, contributing to a sense of security and self-efficacy (Kaurin et al., 2021). In addition to personality and perceived social support, the perceived severity of a stressor can be influenced by the speed and severity of its impact, its duration, and the individual's ability to control it (S. Cohen et al., 2016). These factors may be related to an individual's self-efficacy. The more threatening the stressor is to an individual, the greater the likelihood of their perceived stress. Furthermore, factors such as self-confidence, commitment, environmental support, and personality may contribute to high levels of perceived stress (S. Cohen et al., 2016).

While this study demonstrates a link between ACEs

Table 1
Descriptive Data

Variable	*N*	Minimum	Maximum	Mean	Std. Deviation
Total ACE	270	0	11	3,29	2,430
Total PSS	270	4	40	22,93	7,232
Male ACE	58	0	11	3,16	2,870
Male PSS	58	4	40	21,26	8,462
Female ACE	212	0	10	3,32	2,302
Female PSS	212	5	40	23,39	6,808

Table 2
Model Summary for Simple Linear Regression Test of Total, Male, and Female Participants

Model	*R*	*R* Square	Sig.
Total	.453a	.205	.000
Male	.542a	.294	.000
Female	.415a	.172	.000

and PS, the strength of this association and the underlying neuropsychological mechanisms remain unclear. Future research could deepen this understanding, given that the three components of stress—actual stress, perceived stress, and biological mechanisms—are interrelated and require separate consideration (Baker et al., 2020). Limitations

Limitations

This study has several limitations, particularly related to the lack of clear measurement of the severity and depth of adverse childhood experiences (ACEs). Exposure to these experiences was measured solely by the number of aspects experienced, with varying numbers of items per aspect, without accounting for variations in severity or the subjective effects of these experiences. Although the ACE-IQ scale uses a Likert format, each individual who reports an experience is assigned a score of 1, regardless of the level of severity. In addition, the ACE-IQ does not capture individuals' subjective evaluations of their experiences, including whether they perceive them as traumatic.

Another limitation concerns the sample composition, as the number of male participants was relatively small, despite significant findings observed in both males and females. Furthermore, the use of cross-sectional design and retrospective measurement of ACEs in adulthood limits the understanding of the dynamic relationship between ACEs and perceived stress (PS). This approach may introduce recall bias and increase the risk of overinterpretation. Finally, the sample was predominantly drawn from one institution, Universitas Gadjah Mada (UGM), which may limit the generalizability of the findings and introduce potential representational bias.

Conclusion

The study results show that adverse childhood experiences contribute to perceived stress in early adulthood. This means that the more adverse childhood experiences experienced, the higher the perceived stress in early adulthood, which is related to feelings of helplessness and self-efficacy in dealing with existing pressures. The effective contribution of ACEs to perceived stress levels was 20.5%, while the remaining 79.5% was influenced by factors not included in the study.

Implications

The results of this study can pave the way for further research, building on Rahapsari et al. (2021) concern about the limited research on adverse childhood experiences in Indonesia. Furthermore, researchers can replicate this study by considering the variables of severity, subjective assessment, and recovery programs. In addition, researchers can include a more diverse participant population to support findings for male respondents and test for representativeness bias in this study.

This research also provides important input for parents, peers, schools, and communities to ensure that children do not experience violence, neglect, or other negative experiences that can hinder their growth and development and increase their risk of developing more serious problems such as individual problems (emotional regulation or stress coping strategies), social problems such as addiction, or mental/physical health problems. In closing, this research carries a message for individuals who have encountered negative experiences such as violence, neglect, bullying, family dysfunction, and others in childhood, to help heal their wounds by processing them or seeking help if needed.

Recommendations

Future research should incorporate more comprehensive measures of ACEs by including assessments of severity and individuals' subjective evaluations of their childhood experiences. It is also recommended that future studies involve a more balanced sample in terms of gender to enhance the robustness of comparative analyses. To better understand the dynamics between ACEs and perceived stress, future research should consider using longitudinal or mixed-methods approaches, particularly to capture subjective experiences within the Indonesian context.

Table 3
Regression Coefficient of ACE and PS

Model	*B*	Std. Error	*t*	Sig.
Data Total (Perceived Stress)	18,509	,662	27,964	.000
Adverse Childhood Experience	1,347	,162	8,310	.000

Additionally, future studies could examine the extent to which perceived stress reflects actual daily stressors versus individual differences in self-assessment (Baker et al., 2020). Finally, researchers are encouraged to include more diverse and representative samples across different universities or populations in Indonesia to improve generalizability and reduce sampling bias.

Declaration

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Author Contribution

LPH contributed to the study design, data collection, data analysis, and manuscript writing. SR contributed to suggestions for research materials, study feedback, and manuscript review. KWY contributed to manuscript review, research supervision, and oversight of the research process.

Conflict of Interest

The authors declare that they have no conflicts of interest that could influence this study or the publication of this

Declaration of Generative AI in Scientific Writing

The authors acknowledge the use of generative artificial intelligence (AI) tools. Grammarly, ChatGPT, and Google Translate were used during the translation process. Hence, the manuscript has been reviewed and proofread by a legally certified institution to ensure eligibility based on the qualifications. All AI-generated content was reviewed, verified, and edited by the authors, who assume full responsibility for the originality, accuracy, and academic integrity of the work.

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