



# Maternal Adverse Childhood Experiences and Perceived Stress During Pregnancy: The Role of Personality

Kristin Fields<sup>1</sup> · Lucia Ciciolla<sup>1</sup>  · Samantha Addante<sup>1</sup> · Gina Erato<sup>1</sup> · Ashley Quigley<sup>1</sup> · Stephanie N. Mullins-Sweatt<sup>1</sup> · Karina M. Shreffler<sup>2</sup>

Accepted: 16 February 2023 / Published online: 20 March 2023  
© The Author(s), under exclusive licence to Springer Nature Switzerland AG 2023

## Abstract

This study explores the role of personality traits in the relationship between maternal adverse childhood experiences (ACEs) and perceived stress during pregnancy. Pregnancy can be a stressful time for new mothers. ACEs have been associated with elevated levels of pregnancy stress, and have also been linked to the Big Five dimensions of personality, including a positive association with neuroticism. The Big Five have also been associated with perceptions of stress, and there is evidence to suggest that personality may be one mechanism through which ACEs disrupt psychosocial functioning during pregnancy. The sample included 177 pregnant girls and women (ages 15–40) from two prenatal clinics serving diverse and low-income patients. Participants completed online questionnaires on perceived stress, ACEs, and the Ten Item Personality Inventory. Results of a path analysis and test of mediation showed significant indirect effects from ACEs to perceived stress mediated independently by neuroticism and conscientiousness. Mothers with high ACEs reported higher neuroticism and lower conscientiousness, and in turn, experienced high levels of perceived stress during pregnancy. High neuroticism and low conscientiousness associated with early adverse experiences increase the risk for perceived stress during pregnancy. Screening for ACEs may help identify mothers at risk for perinatal stress and provide the opportunity for additional support for maternal emotion regulation and mental health.

**Keywords** Child adversity · Pregnancy · Perceived stress · Personality traits

## Significance

What is already known on this subject?

Research has shown that experiencing adversity during childhood is associated with higher levels of stress during pregnancy. Early life adversity has also been associated with all Big Five personality traits and personality has been implicated as an important factor contributing to psychosocial functioning and well-being.

What this study adds?

Findings from the current study indicated that experiences of childhood adversity were associated with perceived stress during pregnancy, with significant indirect effects through the personality dimensions of neuroticism and conscientiousness. That is, mothers with high ACEs reported higher neuroticism and lower conscientiousness, and in turn, reported experiencing high levels of perceived stress during pregnancy.

✉ Lucia Ciciolla  
lucia.ciciolla@okstate.edu

<sup>2</sup> Department of Child and Family Health Sciences, University of Oklahoma Health Sciences Center, Oklahoma City, OK, USA

<sup>1</sup> Department of Psychology, Oklahoma State University, 116 Psychology Building, Stillwater, OK 74078, USA

## Introduction

Pregnancy can be an overwhelming and stressful period for new mothers, and greater perceived stress during pregnancy is associated with adverse maternal and infant outcomes (Dunkel Schetter, 2011; Dunkel Schetter et al., 2016). As such, it is important that we identify risk factors that may contribute to heightened levels of perceived stress. Previous research has found that a history of adverse childhood experiences (ACEs) is strongly associated with high levels of stress (Manyema et al., 2018). Further, this relationship has also been found among pregnant mothers, such that exposure to ACEs is predictive of greater stress during pregnancy (Armans et al., 2020). Stress perception can also be influenced by personality (Ebstrup et al., 2011), and interestingly, previous research shows a connection between ACEs and personality traits (Hengartner, 2015; Moran et al., 2011; Allen & Lauterbach, 2007; Talbot et al., 2000). It is possible that individual differences in personality may be one mechanism through which ACEs disrupt later psychosocial functioning during pregnancy. To our knowledge, studies have not yet examined the role of personality traits on the relationship between ACEs and perceived stress during pregnancy.

## Perceived Stress During Pregnancy

Stress during pregnancy can greatly impact the physical and mental well-being of both mothers and their offspring. It is common for women to experience new challenges during pregnancy, including physiological and psychological stressors like bodily changes, physical symptoms of pregnancy, parenting apprehension, uncomfortable medical procedures, and concern for the well-being of the infant (Guardino & Dunkel Schetter, 2014). Other factors that may put mothers at risk for high stress levels include having an unplanned pregnancy, low social support, financial hardship, and being at a high risk for obstetric complications (Dunkel Schetter, 2011; Dunkel Schetter et al., 2016). However, high levels of stress during pregnancy are considered harmful for the health of the mother and fetus, with increased negative risks to the neuroendocrine, immune, cardiovascular, and metabolic systems (Dunkel Schetter, 2011). Notably, high levels of perceived stress during pregnancy have been associated with increased risk for postpartum depression and anxiety symptoms (Dunkel Schetter et al., 2016), as well as adverse birth outcomes, including preterm birth and low birth weight (Dunkel Schetter, 2011). These outcomes can have significant long-term impacts on infant growth and development.

## Adverse Childhood Experiences

Early life adversity has been implicated as a potent risk factor for psychosocial stress (Manyema et al., 2018), and those experience high levels of adversity in childhood are at increased risk for experiencing a high number of additional stressors later in life (Felitti et al., 1998). Adverse childhood experiences (ACEs) are events during childhood that can be potentially traumatizing, including abuse, neglect, and household dysfunction, and are known to impact later psychosocial and physical health (Felitti et al., 1998). In the perinatal period, ACEs have been associated with adverse birth outcomes for both mothers and their offspring, including preterm birth and NICU hospitalization (Ciciolla et al., 2021), self-regulation difficulties (Gray et al., 2017), postpartum depression (McDonnell & Valentino, 2016) and insecure attachment (Berthelot et al., 2015). Moreover, research has consistently shown that experiencing adversity during childhood is associated with higher levels of stress during pregnancy (Hudziak, 2018; Racine et al., 2018), and there is evidence that stress associated with commonly challenging situations, including pregnancy-specific stress, may be exacerbated by ACEs history (Armans et al., 2020).

Notably, Hong and colleagues (2018) found that childhood maltreatment and neglect are associated with experiences of stress in adulthood through pathways of emotion regulation and trait resilience. Other research has reported a connection between ACEs and variations in personality traits (Allen & Lauterbach, 2007; Hengartner, 2015; Moran et al., 2011; Talbot et al., 2000). As such, it is possible that ACEs may contribute to impaired or maladaptive personality development, becoming one mechanism through which ACEs may disrupt later psychosocial functioning.

## Personality Factors

The five dimensions of personality, or Big Five Model, is a widely accepted conceptual model of personality that includes the domains of Extraversion, Agreeableness, Openness, Neuroticism, and Conscientiousness (Digman, 1990). These personality domains have been implicated as important factors contributing to a person's psychosocial functioning and well-being, including subjective well-being, development of psychopathology, and behavior patterns (Anglim et al., 2020; Muris, 2006).

Importantly, the Big Five have been linked to an individual's assessment of everyday situations, including perceptions of stress (Ebstrup et al., 2011), and further, have been shown to predict how one copes with stress (Costa et al., 1996). Ebstrup and colleagues (2011) found negative associations between perceived stress and the personality

dimensions of extroversion, conscientiousness, agreeableness, and openness, and a positive association with neuroticism. Further, early life stress has been associated with all Big Five personality traits (Hengartner et al., 2015). More specifically, childhood sexual abuse has been linked to higher neuroticism and lower agreeableness (Moran et al., 2011), and childhood abuse more broadly defined has been associated with higher neuroticism and both high and low levels of openness (Allen & Lauterbach, 2007; Talbot et al., 2000). Notably, neuroticism, also studied as its inverse of emotion stability, has been identified as a significant mediator between childhood adversity and other facets of later adult psychosocial functioning including sleep quality, professional burnout, and geriatric depression (Gomes Jardim et al., 2019; Grist & Caudle, 2021; Ramsawh et al., 2011). As such, there is growing evidence to suggest that personality traits are associated with ACEs exposure and possible disruptions in perceptions of stress, and that personality trait development may be a key psychological mechanism by which early life adversity is linked to subsequent psychosocial functioning during pregnancy (McDonald et al., 2019).

## Current Study

The current study seeks to explore the role of the Big Five dimensions of personality in the relationship between early life adversity (ACEs) and perceived stress during pregnancy. With consideration of previous findings, we expect that higher ACE scores will be associated with higher levels of perceived stress, and based on limited prior studies, we expect higher ACE scores to be associated with higher scores in neuroticism, and lower scores in conscientiousness, agreeableness, openness and extraversion. Further, we expect that the Big Five dimensions of personality will mediate the association between ACEs and perceived stress.

## Methods

### Participants

One hundred and seventy-seven participants were recruited during their first trimester (roughly 10 weeks gestation) from two prenatal clinics that serve a high proportion of diverse and low-income patients. Prospective participants were initially screened by nurses, and interested patients were then brought into a private office where project researchers thoroughly explained participation, confidentiality, and informed consent. For unmarried participants under the age of 18, informed assent and consent were obtained from the youth and their guardian, respectively. Participants completed all

surveys online. All data for the current study were collected during Assessment 1. All study procedures were approved by the University Institutional Review Board.

## Measures

*Demographics.* Participants completed a demographic questionnaire that assessed racial and ethnic background, relationship status, age, and indication of planned or unplanned pregnancy.

*Maternal Perceived Stress During Pregnancy.* Participants also completed the Perceived Stress Scale (PSS; Cohen et al., 1983), a 10-item scale that assesses the degree to which respondents find their life to be stressful. Respondents used a Likert scale from 0 (Never) to 4 (Very Often) to rate how often they found their lives to be unpredictable, uncontrollable, and overloaded over the last month. Higher scores indicate greater perceived stress (possible range 0–40). Within the current sample, the alpha coefficient for the PSS was 0.82.

*Maternal Childhood Adversity.* Participants completed the Adverse Childhood Experiences Scale (ACES; Felitti et al., 1998), an instrument that assesses for the occurrence of adverse events prior to the age of 18. The scale uses yes/no questions to assess for several types of adverse childhood experiences, including emotional and physical abuse, neglect, and household dysfunction. Endorsed items are summed to create a total score, ranging from 0 (no adverse experiences) to 10.

*Maternal Personality.* Participants completed the Ten Item Personality Inventory (TIPI; Gosling et al., 2003), which measures extraversion vs. introversion, agreeableness vs. antagonism, conscientiousness vs. disinhibition, openness vs. closedness to experience, and neuroticism vs. emotional stability (TIPI; Gosling et al., 2003). The variables used in analyses included extraversion, agreeableness, openness, and emotion stability. The inventory contains two items for each of the five dimensions of personality and utilizes a 7-point scale ranging from 1 = Disagree Strongly to 7 = Agree Strongly. The TIPI has shown good reliability and validity (Gosling, 2003).

## Data Analytic Plan

Descriptive statistics and correlations were calculated for all variables. In order to examine the hypothesized model, a path model was estimated in Mplus 8.0 using full information maximum likelihood (FIML) estimation (Muthén & Muthén, 2017). The model included maternal race, level of education, and age as covariates predicting perceived stress.

**Table 1** Demographic characteristics of the sample

| Variable             | <i>M (SD)</i> | <i>n (%)</i> |
|----------------------|---------------|--------------|
| Age                  | 25.2 (5.5)    |              |
| Years of Education   | 12.8 (2.0)    |              |
| Race                 |               |              |
| Black                |               | 50 (28.2%)   |
| Native American      |               | 31 (17.5%)   |
| Hispanic             |               | 24 (13.6%)   |
| First pregnancy      |               | 66 (37.3%)   |
| Unintended pregnancy |               | 62 (35.0%)   |
| Residential Partner  |               | 82 (46.3%)   |

Missing data was handled in Mplus using FIML estimation with bootstrapping procedures to correct for standard error bias associated with missing data and to derive confidence intervals for the mediating effect (Enders, 2010).

## Results

Descriptive statistics on all variables are presented in Table 1. Of the sample, 39.5% of participants reported their race/ethnicity as White; 28.2% as Black, 13.6% as Hispanic, and 17.5% as Native American. Over a third of the sample (35.0%) reported their pregnancy as unintended. Additionally, 37.3% of the sample reported this was their first baby and 46.3% reported having a residential partner.

Participants' ACE scores were examined as both a total sum score and coded into three categories according to low = 0–2 ACEs; moderate = 3–5 ACEs; and high = 6+ ACEs because links between ACEs and psychosocial functioning tend to follow a graded dose-response relationship (Felitti et al., 1998). Participants in the sample reported experiencing an average of 3 ACEs ( $M = 3.00$ ,  $SD = 2.88$ ).

One-way analyses of variance were conducted to examine differences in personality trait scores between ACEs categorical groups (low, moderate, and high). Results suggest statistically significant differences between groups among scores of neuroticism,  $F(10,158) = 2.37$ ,  $p = .012$ , conscientiousness,  $F(10,158) = 2.34$ ,  $p = .014$ , and perceived stress,  $F(10,149) = 2.16$ ,  $p = .023$ . These results appear in Table 2. Correlations among the variables appear in Table 3.

**Table 2** Descriptive statistics and mean comparisons of key study variables according to ACEs category

|                         | Total Sample   | 0–2 ACE       | 3–5 ACEs      | 6+ ACEs       | ANOVA              |
|-------------------------|----------------|---------------|---------------|---------------|--------------------|
|                         | <i>n</i> = 169 | <i>n</i> = 84 | <i>n</i> = 47 | <i>n</i> = 38 |                    |
| Variable                | <i>M (SD)</i>  | <i>M (SD)</i> | <i>M (SD)</i> | <i>M (SD)</i> | $F_{ACEs}(2, 166)$ |
| Emotional Stability     | 4.5 (1.3)      | 4.8 (1.4)     | 4.3 (1.2)     | 4.1 (1.1)     | 2.4*               |
| Conscientiousness       | 5.5 (1.2)      | 5.7 (1.2)     | 5.4 (1.2)     | 5.2 (1.2)     | 2.3*               |
| Agreeableness           | 5.0 (1.1)      | 5.0 (1.1)     | 5.0 (1.1)     | 5.1 (0.9)     | 0.3                |
| Extraversion            | 4.2 (1.3)      | 4.3 (1.2)     | 4.1 (1.4)     | 4.3 (1.3)     | 0.9                |
| Openness                | 5.3 (1.1)      | 5.3 (1.1)     | 5.3 (1.1)     | 5.3 (1.0)     | 0.8                |
| Perceived Stress Scale  | 14.8 (6.4)     | 13.2 (6.1)    | 15.8 (6.1)    | 17.0 (6.9)    | 2.2*               |
| ACEs total <sup>a</sup> | 3.0 (2.9)      | 0.69 (.74)    | 4.0 (.83)     | 7.5 (1.2)     | -                  |

Note. ACEs = Adverse Childhood Experiences; <sup>a</sup> Total ACE scores ranged from 0 to 9.

\* $p < .05$ .

Perceived stress during pregnancy was positively correlated with ACEs. Additionally, the personality traits of conscientiousness and neuroticism were negatively correlated with both ACEs and perceived stress.

A path analysis was analyzed using Mplus 8.0 (Muthén & Muthén, 1998–2017) to simultaneously examine the mediating roles of extraversion, openness, agreeableness, emotional stability, and conscientiousness on the relationship between maternal ACEs and perceived stress during pregnancy. Maternal race, education, and age were included as covariates in the model.

Overall, the fit indices indicated acceptable model fit to the data according to widely used standards (Hooper et al., 2008),  $\chi^2 = 20.01$  (17),  $p = .27$ ; RMSEA = 0.032; CFI = 0.98; and SRMR = 0.037. The model predicted 47.8% of the variance in perceived stress, 4.4% of the variance in conscientiousness, and 4.8% of the variance in neuroticism, according to  $R^2$ . The model is presented in Table 4.

Neuroticism was found to be significant mediator in the association between ACEs and perceived stress during pregnancy, indirect effect = 0.81, 95% CI = (0.33, 1.50) (Table 4). Conscientiousness was also found to be significant mediator in the association between maternal ACEs and perceived stress during pregnancy, indirect effect = 0.32, 95% CI = (0.06, 0.82) (Table 4).

## Discussion

Findings from the current study indicated that experiences of childhood adversity were associated with perceived stress during pregnancy, with significant indirect effects through the personality dimensions of neuroticism and conscientiousness. That is, mothers with high ACEs reported higher neuroticism and lower conscientiousness, and in turn, reported experiencing high levels of perceived stress during pregnancy. These findings provide evidence for ACEs as a risk factor for perceived stress during pregnancy, with high levels of neuroticism and low levels of conscientiousness as potential mechanisms that help to explain the relationship between ACEs and perceived stress during pregnancy.

**Table 3** Bivariate correlations among study variables

| Variable               | 1       | 2       | 3      | 4      | 5      | 6     | 7      | 8       | 9       | 10      | 11     |
|------------------------|---------|---------|--------|--------|--------|-------|--------|---------|---------|---------|--------|
| 1. ACEs                | -       |         |        |        |        |       |        |         |         |         |        |
| 2. Perceived Stress    | 0.25**  | -       |        |        |        |       |        |         |         |         |        |
| 3. Emotional Stability | -0.22** | -0.58** | -      |        |        |       |        |         |         |         |        |
| 4. Conscientiousness   | -0.19*  | -0.42** | 0.37** | -      |        |       |        |         |         |         |        |
| 5. Agreeableness       | 0.06    | -0.25** | 0.24** | 0.26** | -      |       |        |         |         |         |        |
| 6. Openness            | 0.01    | -0.24** | 0.22** | 0.30** | 0.28** | -     |        |         |         |         |        |
| 7. Extraversion        | -0.03   | -0.23** | 0.22** | 0.10   | 0.05   | 0.09  | -      |         |         |         |        |
| 8. Maternal Age        | 0.04    | -0.16*  | 0.16*  | 0.17*  | 0.24** | 0.02  | -0.02  | -       |         |         |        |
| 9. Maternal Education  | -0.01   | -0.16   | 0.10   | 0.13   | 0.17*  | 0.20* | -0.01  | 0.37**  | -       |         |        |
| 10. Black              | -0.22** | 0.09    | 0.05   | -0.03  | -0.01  | 0.11  | -0.19* | -0.002  | 0.07    | -       |        |
| 11. Hispanic           | -0.01   | -0.12   | 0.03   | -0.002 | -0.08  | -0.03 | 0.08   | -0.22** | -0.01   | -0.25** | -      |
| 12. Native American    | 0.05    | 0.13    | 0.06   | 0.09   | -0.01  | -0.04 | 0.02   | -0.09   | -0.27** | -0.29** | -0.18* |

Note. ACEs = Adverse Childhood Experiences; ACEs total scores ranged from 0 to 9.

\*  $p < .05$ , \*\*  $p < .01$

**Table 4** Model coefficients for path analysis

|   | $\beta$ | $b(SE)$        | 95% CI         |
|---|---------|----------------|----------------|
| <i>Direct Paths</i>                           |         |                |                |
| ACEs → Emotional Stability                    | -0.22** | -0.36** (0.12) | (-0.60, -0.13) |
| ACEs → Conscientiousness                      | -0.21** | -0.32** (0.11) | (-0.57, -0.10) |
| ACEs → Agreeableness                          | 0.05    | 0.07 (0.10)    | (-0.13, 0.26)  |
| ACEs → Extraversion                           | -0.08   | -0.13 (0.13)   | (-0.37, 0.11)  |
| ACEs → Openness                               | 0.04    | 0.05 (0.10)    | (-0.15, 0.24)  |
| ACEs → Perceived Stress                       | 0.14*   | 1.11* (0.54)   | (-0.003, 2.14) |
| Emotional Stability → Perceived Stress        | -0.46** | -2.25** (0.38) | (-2.97, -1.49) |
| Conscientiousness → Perceived Stress          | -0.19** | -1.01** (0.39) | (-1.77, -0.26) |
| Agreeableness → Perceived Stress              | -0.05   | -0.33 (0.50)   | (-1.33, 0.61)  |
| Openness → Perceived Stress                   | -0.06   | -0.36 (0.46)   | (-1.27, 0.55)  |
| Extraversion → Perceived Stress               | -0.03   | -0.15 (0.38)   | (-0.89, 0.60)  |
| <i>Covariates</i>                             |         |                |                |
| Maternal Age → Perceived Stress               | -0.01   | -0.01 (0.08)   | (-0.17, 0.15)  |
| Maternal Education → Perceived Stress         | -0.02   | -0.05 (0.22)   | (-0.48, 0.39)  |
| Black → Perceived Stress                      | 0.20**  | 2.81** (0.98)  | (0.07, 0.33)   |
| Native American → Perceived Stress            | 0.22**  | 3.74** (1.19)  | (1.34, 6.06)   |
| Hispanic → Perceived Stress                   | -0.02   | -0.38 (1.37)   | (-2.94, 2.40)  |
| <i>Mediated Paths</i>                         |         |                |                |
| ACEs → Emotional Stability → Perceived Stress |         | 0.81* (0.29)   | (0.33, 1.50)   |
| ACEs → Conscientiousness → Perceived Stress   |         | 0.32* (0.18)   | (0.06, 0.82)   |

Note. ACEs = Adverse Childhood Experiences total score (range 0–9). Correlations among emotional stability, conscientiousness, agreeableness, openness, age, education, and race variables (Black, Native American, Hispanic) were included in the model.

\*  $p < .05$ ; \*\*  $p < .01$ .

The finding that maternal ACEs was associated with perceived stress during pregnancy is consistent with previous literature documenting associations between early life adversity and elevated stress during pregnancy (Hudziak, 2018; Racine et al., 2018). Our results showed that as the number of ACEs increased, so did the level of perceived stress during pregnancy, with the 6+ACE group endorsing the highest levels of stress. This finding lends support to literature documenting the associations between a history of ACEs and dysregulated maternal stress reactivity (Arman et al., 2020; Hudziak, 2018) and supports the hypothesis that ACEs may place individuals at greater risk for stress-related



disease (Felitti et al., 1998). These findings have important long-term implications for birth outcomes and psychological risk (e.g., depression, anxiety) (Hillis et al., 2004; Hudziak, 2018; Racine et al., 2018).

Additionally, our sample included racially diverse, economically disadvantaged, and medically underserved pregnant women, which likely contributed to elevated stress levels in association with housing, financial stress, and racism. Importantly, in our sample, significant associations between race and perceived stress were documented among Black and Native American women. This is consistent with previous studies that report higher occurrences of ACEs among racially marginalized groups like non-Hispanic Black Americans and Native Americans/Alaska Natives (Goldstein et al., 2021), which may lead to higher levels of stress. Together, these findings underscore the importance of considering the interrelatedness of racial disparities and experiences of ACEs and stress and suggest the importance of future studies continuing to examine these associations among diverse populations.

Consistent with previous personality literature, our findings suggest negative associations between ACEs and emotional stability and conscientiousness, such that levels of neuroticism increase and levels of conscientiousness decrease as ACE scores increase. The results also indicated a mediated pathway that implicated maternal neuroticism and conscientiousness as key factors that contribute to perceived stress during pregnancy. There is evidence that high neuroticism and low conscientiousness can exacerbate the perceptions and effect of stress and interfere with stress appraisal stress-coping mechanisms, particularly in the context of adversity that is chronic and occurs in childhood (Costa et al., 1996; Ebstrup et al., 2011). Ebstrup and colleagues (2011) conclude that high neuroticism and low levels of conscientiousness may influence the likelihood that individuals appraise events as threatening and coping resources as limited. In fact, authors argue the combination of high neuroticism in addition to low conscientiousness is the strongest predictor of high stress exposure and threat appraisals (Ebstrup et al., 2011), which may provide evidence why these personality domains were the only two that contributed to perceived stress levels in our study.

Interestingly, although all Big Five personality domains (extraversion, agreeableness, openness, neuroticism, and conscientiousness) were related to perceived stress during pregnancy, only neuroticism and conscientiousness were associated with ACEs. These findings are inconsistent with the limited literature that suggests there are also associations between openness and extraversion and ACEs (Talbot et al., 2000). However, these inconsistencies may be due to the unique contributions of our sample which included pregnant

women at higher risk for stress, suggesting pregnancy may be a crucial time to understand the role of personality.

Neuroticism and conscientiousness may be particularly important to consider during pregnancy as it is period characterized by numerous physiological and psychological changes and stressors (Dunkel Schetter, 2011; Guardino & Dunkel Schetter, 2014). Cross-sectional and longitudinal measures of emotional stability have been associated with lower levels of stress and lower risk of perinatal psychopathology (Marshall et al., 2015). Also, pregnant women who were more conscientious also reported a higher sense of mastery and self-regulation strategies and were better able to manage stressors as they prepared for motherhood (Asselmann et al., 2020).

### Strengths, Limitation, and Future Directions

The current study consisted of several strengths including being a study that highlights the impact of maternal ACEs on personality factors and perceived stress during pregnancy among a diverse sample of pregnant women. Notably, our study highlights the role of the maternal personality factors in psychosocial functioning during pregnancy and documents the associations between personality and prenatal stress levels, factors that are currently understudied within the literature.

This study is not without limitations. First, the cross-sectional nature of the design may limit information regarding causality or direction of influence and confounding factors that may be contributing to significant associations. Additionally, perceived stress was only measured during the third trimester and not during postpartum, which may limit the scope of our findings. Therefore, future studies would benefit from assessing multiple timepoints that extend into postpartum to capture a more comprehensive look at stress and personality patterns across the perinatal period. Further, perceived stress levels were measured via self-report, which may be particularly sensitive to biased reporting. As such, future research would benefit from assessing stress using biomarkers of stress reactivity, including HPA-axis functioning (e.g., diurnal cortisol and cortisol reactivity) (Bublitz et al., 2018). Lastly, it should be noted that the tool used to assess personality traits consisted of two items for each of the dimensions of personality, which may have limited variability. However, the TIPI has been shown to be a useful tool used in personality research that is strongly associated with other personality trait measures (Gosling et al., 2003).

## Conclusions for Practice

The current findings underscore the importance of prenatal screening for known risk factors for stress, such as ACEs and personality domains, to help identify women who may benefit from additional supports or services. For instance, psychoeducational programs have successfully been utilized with pregnant women with a history of ACEs to promote mental health and pregnancy-related outcomes (e.g., Seng et al., 2011). Thus, it may benefit these programs and women to include education and resources related to building coping strategies and support systems important for prenatal and postpartum functioning. Additionally, research has indicated emotional stability has the potential to change in response to intervention, which may be an important modifiable target to reduce prenatal stress (Roberts et al., 2017).

These findings also provide support for the use of more focused approaches to treating personality-related symptomatology. Dimensional approaches for understanding psychopathology, like the Hierarchical Taxonomy of Psychopathology (HiTOP), may provide a framework for directly targeting personality traits to better individualize treatment plans (Mullins-Sweatt et al., 2020). For example, behavioral treatments targeted specifically at neuroticism (e.g., neuroticism-focused MBCT; Armstrong & Rimes, 2016), rather than the psychopathology that manifests from it (e.g., anxiety, depression, personality disorders), have been shown to reduce levels of neuroticism, generalize to the reduction of other symptoms, and increase beneficial treatment outcomes (Carl et al., 2014; Farchione et al., 2012; Kennedy et al., 2009). Similarly, Widiger and Presnall (2013) suggest there may be differences in treatment effectiveness based on personality traits, hypothesizing that highly structured and homework-based cognitive-behavioral treatments may be particularly beneficial for individuals with high levels of conscientiousness. As such, individuals with childhood adversity and low conscientiousness may benefit from “flexibility within fidelity” in the application of evidence-based treatment protocols to be adaptive or scaffolded to client characteristics and needs, such as having variation in how homework may be completed (Kendall & Frank, 2018; Mullins-Sweatt et al., 2020). Thus, the use of brief personality screening in prenatal visits may provide clinically useful targets for individualized treatment, specifically in pregnant women with a history of adverse childhood experiences who report high levels of neuroticism and low conscientiousness.

**Author Contribution** LC and KS conceptualized the study with support from KF. LC and KF performed statistical analysis. KS obtained funding and lead data collection. All authors contributed to the manuscript development and commented on several drafts of the manuscript. All authors read and approved the final manuscript.

**Funding** This work was supported through pilot funding through the Center for Integrated Research on Child Adversity (CIRCA) and the National Institute of General Medical Sciences (NIGMS) of the National Institutes of Health under Award Number P20GM109097 awarded to Shreffler.

**Data Availability** Not applicable

**Code Availability** Not applicable

## Declarations

**Conflicts of interest** All authors declare that they have no conflict of interest.

**Ethics approval** Ethical approval was received from the Oklahoma State University Institutional Review Board.

**Consent to participate** Informed consent was received from all participants in the surveys and data was handled so that anonymity was ensured. All respondents were told about the content and the purpose of the surveys, the expected time for participating, and that all information would be handled in such a way as to ensure anonymity.

**Consent for publication** Not applicable

## References

- Allen, B., & Lauterbach, D. (2007). Personality characteristics of adult survivors of childhood trauma. *Journal of Traumatic Stress, 20*(4), 587–595. <https://doi.org/10.1002/jts.20195>
- Anglim, J., Horwood, S., Smillie, L. D., Marrero, R. J., & Wood, J. K. (2020). Predicting psychological and subjective well-being from personality: a meta-analysis. *Psychological Bulletin, 146*(4), 279. <https://doi.org/10.1037/bul0000226>
- Armans, M., Addante, S., Ciciolla, L., Anderson, M., & Shreffler, K. M. (2020). Resilience during pregnancy: how early life experiences are associated with pregnancy-specific stress. *Adversity and Resilience Science, 1*(4), 295–305. <https://doi.org/10.1007/s42844-020-00017-3>
- Armstrong, L., & Rimes, K. A. (2016). Mindfulness-based cognitive therapy for neuroticism (stress vulnerability): a pilot randomized study. *Behavior Therapy, 47*, 287–298. <https://doi.org/10.1016/j.beth.2015.12.005>
- Asselmann, E., Kunas, S. L., Wittchen, H. U., & Martini, J. (2020). Maternal personality, social support, and changes in depressive, anxiety, and stress symptoms during pregnancy and after delivery: a prospective-longitudinal study. *PloS one, 15*(8), e0237609. <https://doi.org/10.1371/journal.pone.0237609>
- Berthelot, N., Ensink, K., Bernazzani, O., Normandin, L., Luyten, P., & Fonagy, P. (2015). Intergenerational transmission of attachment in abused and neglected mothers: the role of trauma-specific reflective functioning. *Infant Mental Health Journal, 36*, 200–212. <https://doi.org/10.1002/imhj.21499>
- Bublitz, M. H., Bourjeily, G., D’Angelo, C., & Stroud, L. R. (2018). Maternal sleep quality and diurnal cortisol regulation over pregnancy. *Behavioral Sleep Medicine, 16*(3), 282–293. <https://doi.org/10.1080/15402002.2016.1210147>
- Carl, J. R., Gallagher, M. W., Sauer-Zavala, S. E., Bentley, K. H., & Barlow, D. H. (2014). A preliminary investigation of the effects of the unified protocol on temperament. *Comprehensive Psychiatry, 55*, 1426–1434. <https://doi.org/10.1016/j.comppsy.2014.04.015>

- Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 24, 386–396.
- Costa, P. T., Somerfield, M. R., & McCrae, R. R. (1996). Personality and coping: a reconceptualization. In M. Zeidner, & N. S. Endler (Eds.), *Handbook of coping: theory, Research, Applications* (pp. 44–61). New York: Wiley.
- Digman, J. M. (1990). Personality structure: emergence of the five-factor model. *Annual Review of Psychology*, 41(1), 417–440. <https://doi.org/10.1146/annurev.ps.41.020190.002221>
- Dunkel Schetter, C. (2011). Psychological science on pregnancy: stress processes, biopsychosocial models, and emerging research issues. *Annual Review of Psychology*, 62, 531–558. <https://doi.org/10.1146/annurev.psych.031809.130727>
- Dunkel Schetter, C., Niles, A. N., Guardino, C. M., Khaled, M., & Kramer, M. S. (2016). Demographic, medical, and psychosocial predictors of pregnancy anxiety. *Paediatric and Perinatal Epidemiology*, 30(5), 421–429. <https://doi.org/10.1111/ppe.12300>
- Ebstrup, J. F., Eplöv, L. F., Pisinger, C., & Jørgensen, T. (2011). Association between the five factor personality traits and perceived stress: is the effect mediated by general self-efficacy? *Anxiety Stress & Coping*, 24(4), 407–419. <https://doi.org/10.1080/10615806.2010.540012>
- Enders, C. K. (2010). *Applied Missing Data Analysis*. New York: Guilford Press.
- Farchione, T. J., Fairholme, C. P., Ellard, K. K., Boisseau, C. L., Thompson-Hollands, J., Carl, J. R., & Barlow, D. H. (2012). Unified protocol for transdiagnostic treatment of emotional disorders: a randomized controlled trial. *Behavior Therapy*, 43, 666–678. <https://doi.org/10.1016/j.beth.2012.01.001>
- Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., & Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: the adverse childhood experiences (ACE) study. *American Journal of Preventive Medicine*, 14(4), 245–258. [https://doi.org/10.1016/S0749-3797\(98\)00017-8](https://doi.org/10.1016/S0749-3797(98)00017-8)
- Gray, S. A., Jones, C. W., Theall, K. P., Glackin, E., & Drury, S. S. (2017). Thinking across generations: unique contributions of maternal early life and prenatal stress to infant physiology. *Journal of the American Academy of Child & Adolescent Psychiatry*, 56(11), 922–929. <https://doi.org/10.1016/j.jaac.2017.09.001>
- Grist, C. L., & Caudle, L. A. (2021). An examination of the relationships between adverse childhood experiences, personality traits, and job-related burnout in early childhood educators. *Teaching and Teacher Education*, 105, 103426. <https://doi.org/10.1016/j.tate.2021.103426>
- Goldstein, E., Topitzes, J., Miller-Cribbs, J., & Brown, R. L. (2021). Influence of race/ethnicity and income on the link between adverse childhood experiences and child flourishing. *Pediatric Research*, 89(7), 1861–1869. <https://doi.org/10.1038/s41390-020-01188-6>
- Gomes Jardim, G., Von Gunten, A., Da Silva Filho, I., Ziegelmann, P., Bumaguin, D., Nogueira, E., & Neto, A. (2019). Relationship between childhood maltreatment and geriatric depression: the mediator effect of personality traits. *International Psychogeriatrics*, 31(12), 1759–1767. <https://doi.org/10.1017/S1041610219000073>
- Gosling, S. D., Rentfrow, P. J., & Swann, W. B. Jr. (2003). A very brief measure of the big-five personality domains. *Journal of Research in Personality*, 37(6), 504–528. [https://doi.org/10.1016/S0092-6566\(03\)00046-1](https://doi.org/10.1016/S0092-6566(03)00046-1)
- Guardino, C. M., & Dunkel Schetter, C. (2014). Coping during pregnancy: a systematic review and recommendations. *Health Psychology Review*, 8(1), 70–94. <https://doi.org/10.1080/17437199.2012.752659>
- Hengartner, M. P. (2015). The detrimental impact of maladaptive personality on public mental health: a challenge for psychiatric practice. *Frontiers in Psychiatry*, 6, 87. <https://doi.org/10.3389/fpsy.2015.00087>
- Hillis, S. D., Anda, R. F., Dube, S. R., Felitti, V. J., Marchbanks, P. A., & Marks, J. S. (2004). The association between adverse childhood experiences and adolescent pregnancy, long-term psychosocial consequences, and fetal death. *Pediatrics*, 113(2), 320–327. <https://doi.org/10.1542/peds.113.2.320>
- Hong, F., Tarullo, A. R., Mercurio, A. E., Liu, S., Cai, Q., & Malley-Morrison, K. (2018). Childhood maltreatment and perceived stress in young adults: the role of emotion regulation strategies, self-efficacy, and resilience. *Child Abuse & Neglect*, 86, 136–146. <https://doi.org/10.1016/j.chiabu.2018.09.014>
- Hudziak, J. J. (2018). ACEs and pregnancy: time to support all expectant mother. *Pediatrics*, 141(4), <https://doi.org/10.1542/peds.2018-0232>
- Kendall, P. C., & Frank, H. E. (2018). Implementing evidence-based treatment protocols: flexibility within fidelity. *Clinical Psychology*, 25(4), e12271. <https://doi.org/10.1111/cpsp.12271>
- Kennedy, S. J., Rapee, R. M., & Edwards, S. L. (2009). A selective intervention program for inhibited preschool-aged children of parents with an anxiety disorder: Effects on current anxiety disorders and temperament. *Journal of the American Academy of Child & Adolescent Psychiatry*, 48, 602–609. <https://doi.org/10.1097/CHI.0b013e3181>
- Manyema, M., Norris, S. A., & Richter, L. M. (2018). Stress begets stress: the association of adverse childhood experiences with psychological distress in the presence of adult life stress. *Bmc Public Health*, 18(1), 835. <https://doi.org/10.1186/s12889-018-5767-0>
- Marshall, E. M., Simpson, J. A., & Rholes, W. S. (2015). Personality, communication, and depressive symptoms across the transition to parenthood: a dyadic longitudinal investigation. *European Journal of Personality*, 29(2), 216–234. <https://doi.org/10.1002/per.1980>
- McDonald, S. W., Madigan, S., Racine, N., Benzies, K., Tomfohr, L., & Tough, S. (2019). Maternal adverse childhood experiences, mental health, and child behaviour at age 3: the all our families community cohort study. *Preventive Medicine*, 118, 286–294. <https://doi.org/10.1016/j.ypmed.2018.11.013>
- McDonnell, C. G., & Valentino, K. (2016). Intergenerational effects of childhood trauma: evaluating pathways among maternal ACEs, perinatal depressive symptoms, and infant outcomes. *Child Maltreatment*, 21, 317–326. <https://doi.org/10.1177/1077559516659556>
- Moran, P., Coffey, C., Chanen, A., Mann, A., Carlin, J. B., & Patton, G. C. (2011). Childhood sexual abuse and abnormal personality: a population-based study. *Psychological Medicine*, 41(6), 1311–1318. <https://doi.org/10.1017/S0033291710001789>
- Mullins-Sweatt, S. N., Hopwood, C. J., Chmielewski, M., Meyer, N. A., Min, J., Helle, A. C., & Walgren, M. D. (2020). Treatment of personality pathology through the lens of the hierarchical taxonomy of psychopathology: developing a research agenda. *Personality and Mental Health*, 14(1), 123–141. <https://doi.org/10.1002/pmh.1464>
- Muris, P. (2006). Maladaptive schemas in non-clinical adolescents: relations to perceived parental rearing behaviours, big five personality factors and psychopathological symptoms. *Clinical Psychology & Psychotherapy*, 13(6), 405–413. <https://doi.org/10.1002/cpp.506>
- Muthén, L. K., & Muthén, B. O. (2017). *Mplus Statistical analysis with latent variables user's guide (Version 8)*. Los Angeles, CA: Authors.
- Racine, N., Plamondon, A., Madigan, S., McDonald, S., & Tough, S. (2018). Maternal adverse childhood experiences and infant development. *Pediatrics*, 141(4), <https://doi.org/10.1542/peds.2017-2495>



- Ramsawh, H. J., Ancoli-Israel, S., Sullivan, S. G., Hitchcock, C. A., & Stein, M. B. (2011). Neuroticism mediates the relationship between childhood adversity and adult sleep quality. *Behavioral Sleep Medicine, 9*(3), 130–143. <https://doi.org/10.1080/15402002.2011.583895>
- Roberts, B. W., Luo, J., Briley, D. A., Chow, P. I., Su, R., & Hill, P. L. (2017). A systematic review of personality trait change through intervention. *Psychological Bulletin, 143*(2), 117. <https://doi.org/10.1037/bul0000088>
- Seng, J. S., Sperlich, M., Rowe, H., Cameron, H., Harris, A., Rauch, S. A., & Bell, S. A. (2011). The survivor moms' companion: open pilot of a posttraumatic stress specific psychoeducation program for pregnant survivors of childhood maltreatment and sexual trauma. *International Journal of Childbirth, 1*(2), 111–121. <https://doi.org/10.1891/2156-5287.1.2.111>
- Talbot, N. L., Duberstein, P. R., King, D. A., Cox, C., & Gile, D. E. (2000). Personality traits of women with a history of childhood sexual abuse. *Comprehensive Psychiatry, 41*(2), 130–136. [https://doi.org/10.1016/S0010-440X\(00\)90146-9](https://doi.org/10.1016/S0010-440X(00)90146-9)
- Widiger, T. A., & Presnall, J. R. (2013). Clinical application of the Five-F actor Model. *Journal of Personality, 81*(6), 515–527. <https://doi.org/10.1111/jopy.12004>

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.