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Does Adult Attachment Style Mediate the Relationship between Childhood Maltreatment and Mental and Physical Health Outcomes?

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Abstract

Attachment theory has been proposed as one explanation for the relationship between childhood maltreatment and problematic mental and physical health outcomes in adulthood. This study seeks to determine whether: (1) childhood physical abuse and neglect lead to different attachment styles in adulthood, (2) adult attachment styles predict subsequent mental and physical health outcomes, and (3) adult attachment styles mediate the relationship between childhood physical abuse and neglect and mental and physical health outcomes. Children with documented cases of physical abuse and neglect (ages 0–11) were matched with children without these histories and followed up in adulthood. Adult attachment style was assessed at mean age 39.5 and outcomes at 41.1. Separate path models examined mental and physical health outcomes. Individuals with histories of childhood neglect and physical abuse had higher levels of anxious attachment style in adulthood, whereas neglect predicted avoidant attachment as well. Both adult attachment styles (anxious and avoidant) predicted mental health outcomes (higher levels of anxiety and depression and lower levels of self-esteem), whereas only anxious adult attachment style predicted higher levels of allostatic load. Path analyses revealed that anxious attachment style in adulthood in part explained the relationship between childhood neglect and physical abuse to depression, anxiety, and self-esteem, but not the relationship to allostatic load. Childhood neglect and physical abuse have lasting effects on adult attachment styles and anxious and avoidant adult attachment styles contribute to understanding the negative mental health consequences of childhood neglect and physical abuse 30 years later in adulthood.

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Keywords

adult attachment style; physical abuse; neglect; mental health; allostatic load; physical health outcomes

In fiscal year 2014, there were 3.25 million referrals to Child Protection Service agencies for possible maltreatment and over 700,000 of these children were found to be victims of maltreatment (U. S. Department of Health and Human Services, 2016). The majority (75%) were victims of neglect and 17% were victims of physical abuse (U. S. Department of Health and Human Services, 2016). Numerous studies have documented the short- and long-term consequences of child maltreatment across multiple domains of functioning (Cicchetti & Toth, 2005; Gilbert et al., 2009; Hussey, Chang, & Kotch, 2006; Norman et al., 2012), including adverse physical health outcomes (Cicchetti, 2013; Wegman & Stetler, 2009; Widom, Czaja, Bentley, & Johnson, 2012). One estimate of the costs of child maltreatment exceeded \$272 billion (Fang, Brown, Florence, & Mercy, 2012).

Although there are likely to be multiple developmental pathways through which child abuse and neglect lead to problematic outcomes in adulthood, attachment theory offers a useful framework and insecure attachment may represent an important mediator between child abuse and neglect and negative outcomes in adulthood. This paper seeks to determine the extent to which childhood neglect and physical abuse lead to insecure (anxious and avoidant) adult attachment styles and whether these attachment styles mediate the relationship between childhood maltreatment and mental and physical health outcomes.

Child Abuse and Neglect and Attachment

Since Bowlby's (1980) early work on the importance of childhood attachment and its influence on later relationships, adult relationship researchers have extended the concept of attachment to adulthood (Mikulincer and Shaver, 2005) and in particular to close relationships. Adult attachment theory proposes that expectations and responses to interpersonal situations learned in the context of early childhood relationships provide a model for relatively stable patterns of intimate relationships in adulthood. Avoidant individuals may inhibit and control their emotions by avoiding closeness and entering committed relationships. In contrast, adults with an anxious attachment style may become obsessive and hypervigilant to potential loss and may be viewed by others as demanding and clinging.

Some research has shown that childhood family environments predict adult attachment styles (Fraley, Roisman, Booth-LaForce, Owen, & Holland, 2013). There is also evidence for the stability of attachment styles over time (Barnett, Ganiban, & Cicchetti, 1999; Bartholomew & Shaver, 1998; Shapiro & Levendosky, 1999; Toth & Cicchetti, 1996), although other work has shown discontinuity (Weinfeld, Sroufe, & Egeland, 2000). Temporal instability in attachment styles may be meaningful, since changes in a child's relationship with a parent or subsequent positive experiences with others may lead to better functioning and more secure adult attachment relationships.

If parents are neglectful or physically abusive, children may be more likely to develop insecure attachment styles (e.g., avoidant or anxious). Indeed, researchers have reported high levels of insecure attachments in maltreated children (Baer & Martinez, 2006; Cicchetti, Rogosch, & Toth, 2006; see Cyr, Euser, Bakermans-Kranenburg, & Van Ijzendoorn, 2010 for a meta-analysis).

There is also evidence to suggest that outcomes vary by type of maltreatment (Moran, Vuchinich, & Hall, 2004). English et al. (2005) noted an “emerging consensus that different types of maltreatment need to be examined separately, as each appears to have distinct antecedents and consequences” (p. 442). Gauthier, Stollak, Messe, and Aronoff (1996) suggested that neglect may have a different psychological meaning for children, compared to physical abuse, pointing out that neglect often represents psychological rejection and abandonment, whereas physical abuse does not. Given the important role of the caregiver in the development of a person’s attachment, the lack of adequate care that defines childhood neglect is consistent with a prediction of poor quality attachment. Neglected children may learn that they are not effective in communicating their needs and obtaining maternal cooperation to meet their needs, so they increase their demands. If this behavior results in attention, then they will maintain a pattern of clinging and demanding behavior. If their behavior does not result in attention, then they may become depressed and withdrawn and feel unworthy of attention. Physically abused children may feel that they are worthy of attention, even if it is harsh and punitive and may develop an active fear of closeness leading to avoidance in relationships. Furthermore, for children who are removed from the home (temporarily or for longer periods of time) or are placed in foster care, this physical and psychological separation from the mother is also likely to lead to insecure attachment.

There is empirical support for the theoretical specificity of the effects of certain types of maltreatment on attachment across the life span. Unger and De Luca (2014) found that childhood physical abuse was associated with avoidant attachment in adults. In contrast, neglected children were more likely to manifest anxious attachment (Finzi et al., 2001), compared to physically abused and control group children. Recent work by Oshri et al., (2015) showed different associations between child maltreatment and attachment styles in adults, reinforcing the need to examine these relationships for different types of abuse and neglect.

Attachment and Mental and Physical Health

Secure attachment has been associated with well-being and mental health (Mikulincer & Shaver, 2007). Children with insecure attachments, compared to those with secure attachments, were more likely to manifest psychopathology in adulthood (Cicchetti, Rogosch, & Toth, 1998; Easterbrooks, Biesecker, & Lyons-Ruth, 2000) and to engage in risky behaviors (Oshri, Rogosch, & Cicchetti, 2013). An insecure attachment has been shown to be a risk factor for depression among adults (Hankin, Kassel, & Abela, 2005; Roberts, Gotlib, & Kassel, 1996) as well as other forms of psychological dysfunction (Riggs et al., 2007; Sroufe, Carlson, Levy, & Egeland, 1999).

Other research indicates that attachment relationships and the quality of close relationships affect immune functioning, neuroendocrine functioning, and reactions to stressful events (Coan, Schaefer, & Davidson, 2006; Kidd, Hamer, & Steptoe, 2011; Kiecolt-Glaser, Glaser, Cacioppo, & Malarkey, 1998) and studies have focused on heart rate, blood pressure, and electrodermal reactivity to laboratory stressors (e.g., Diamond, Hicks, & Otter-Henderson, 2006; Fraley & Shaver, 2000; Fraley, Waller, & Brennan, 2000; Kim, 2006). Maunder et al., (2006) found that anxious attachment was associated with greater self-reports of stress or distress, whereas avoidant attachment was associated with differences in physiological regulation of heart rate. In another study, Dewitte et al., (2010) found that anxious attachment was related to physical (cortisol) and subjective emotional distress responses, whereas avoidant attachment was related to subjective and behavioral responses to distress. Puig, Englund, Simpson, and Collins (2013) prospectively found that insecure attachment assessed in infancy was associated with inflammation-based illness 30 years later.

The construct of allostatic load (McEwen, 1998) has been described as the process whereby chronic or recurrent stress leads to cascading, potentially irreversible changes in biological stress-regulatory systems. McEwen (1998) argued that allostatic load can be quantified by cataloging specific biomarkers across the major biological regulatory systems, including cardiovascular, metabolic, endocrine, and immune systems. Research has utilized this concept of allostatic load to increase explanatory power in understanding the relationship between specific stressors and physical health (see Szanton, Gill, & Allen, 2005).

In line with allostatic load theory, it is likely that child maltreatment leads to significant physical wear and tear on a person's body over the lifetime and that this is associated with less healthy stress-related biological profiles. In a study of 8–10 year old children, Rogosch, Dackis, and Cicchetti (2011) found that higher allostatic load and child maltreatment predicted poorer health outcomes and greater behavior problems. Other recent work has shown that individuals with histories of childhood maltreatment have higher levels of allostatic load 30 years later (Widom, Horan, & Brzustowicz, 2015). However, it is unknown whether adult attachment style explains in part the relationship between childhood maltreatment and allostatic load.

Because childhood maltreatment is a risk factor for insecure attachment and insecure attachment is a risk factor for later mental and physical health outcomes, attachment may serve as one of the pathways between childhood maltreatment and adult mental and physical health outcomes (Oshri et al., 2015). Some evidence supports the notion that insecure attachments mediate the relationship between child abuse and adult depression and anxiety (Hankin, 2005; Riggs et al., 2007).

Gaps in the Literature

Although prior research has linked child abuse and adult attachment, there is a heavy reliance on associations based on cross-sectional or short-term longitudinal studies with few long-term longitudinal studies. Similarly, existing studies based on self-reported romantic attachment styles in adulthood have been primarily cross-sectional (McWilliams & Bailey, 2010; Scharfe & Eldredge, 2001), making it difficult to determine temporal sequence. In

addition, relatively few studies include neglect, even though neglect is the most common form of maltreatment reported to agencies (U. S. Department of Health and Human Services, 2016). Finally, to our knowledge, this will be the first study to examine the extent to which adult attachment style mediates the relationship between childhood physical abuse and neglect and objectively measured physical health outcomes. As noted by Kidd et al. (2011), “less is known regarding any association between attachment style and biological response to stress” (p.772).

The Present Study

The present study had three major goals: (1) to determine whether individuals with documented histories of childhood physical abuse and neglect have different attachment styles in adulthood, (2) to examine whether adult attachment styles predict subsequent mental and physical health outcomes, and (3) to determine whether adult attachment styles mediate the relationship between childhood physical abuse and neglect and mental and physical health outcomes. This study differed from earlier research in a number of ways. The prospective longitudinal design allowed for determination of the correct temporal sequence between child maltreatment and these mental and physical health outcomes in adulthood. Information about childhood abuse and/or neglect was obtained through official records and therefore minimized problems and potential biases associated with reliance on retrospective self-reports. We utilized a matched control group to assess the magnitude of the relationships among physical abuse and neglect, adult attachment style, and outcomes, controlling for demographic and social class differences in childhood. We focus on theoretical predictions about outcomes associated with physical abuse and neglect and exclude those in our study who experienced more than one type of maltreatment in an effort to isolate these relationships in adults with histories of these two types of child maltreatment. Finally, we extend the examination of consequences of child abuse and neglect to include physical health outcomes in adulthood and rely on objectively measured health outcomes rather than self-reported health status.

We had three major hypotheses:

1. Individuals with histories of childhood neglect will be characterized by higher levels of anxious attachment style in adulthood, whereas individuals with histories of childhood physical abuse will be characterized by higher levels of avoidant attachment style, compared to individuals without such histories of maltreatment (controls).
2. Anxious and avoidant adult attachment styles will predict higher levels of anxiety and depression, lower levels of self-esteem, and worse physical health outcomes (higher levels of allostatic load).
3. Anxious and avoidant adult attachment styles will in part explain (mediate) the relationship between childhood physical abuse and neglect and mental and physical health outcomes.

Methods

Participants

Participants in this study were 650 adults who were part of a larger study of the long-term consequences of child abuse and neglect (50.5% female and 59.4% White, non-Hispanic, 41.6% Black, non-Hispanic). Mean age was 41.01 ($SD = 3.57$, range 32–49). The current sample is composed of individuals without documented histories of physical abuse or neglect (controls), children with documented histories of neglect (44.9%), and children with histories of physical abuse (5.1%). These maltreatment groups represent pure (only) physical abuse and neglect - to isolate the effects of these types of child maltreatment. In the entire study sample, approximately 11% had documented cases of more than one type of abuse/neglect.

The study utilized a prospective cohort design, in which abused and neglected children were matched with non-abused and non-neglected children and followed prospectively into adulthood. Because of the matching procedure, the subjects were assumed to differ only in the risk factor; that is, having experienced childhood physical abuse or neglect. Since it was not possible to assign subjects randomly to groups, the assumption of equivalency for the groups is an approximation. The control group may have also differed from the abused/neglected individuals on other variables nested within abuse or neglect. (For details of the design, see Widom, 1989a).

Official cases of childhood physical abuse and neglect, based on records of county juvenile (family) and adult criminal courts from 1967–1971, were used. To avoid potential problems with ambiguity in the direction of causality and to ensure that the temporal sequence was clear (that is, child abuse or neglect preceded the outcomes), abuse and neglect cases were restricted to those in which the children were 11 years of age or younger at the time of the abuse or neglect. Excluded from the sample were court cases that represented: (1) adoption of the child as an infant; (2) “involuntary” neglect only—usually resulting from the temporary institutionalization of the legal guardian; (3) placement only; or (4) failure to pay child support.

Physical abuse cases included injuries such as bruises, welts, burns, abrasions, lacerations, wounds, cuts, bone and skull fractures, and other evidence of physical injury. *Neglect* cases reflected a judgment that the parents’ deficiencies in childcare were beyond those acceptable by community and professional standards at the time and represented extreme failure to provide adequate food, clothing, shelter, and medical attention.

A critical element of the design was the identification of a control group, matched with the maltreated children on the basis of age, sex, race/ethnicity, and approximate family social class during the time period under study. Matching for approximate family social class was important because it is theoretically plausible that any relationship between child abuse and neglect and subsequent outcomes may be confounded with or explained by social class differences (MacMillan et al., 2001; Widom, 1989c). It was difficult to match exactly for social class because higher income families could have lived in lower social class neighborhoods and vice versa. The matching procedure used here was based on a broad

definition of social class that included neighborhoods in which children were reared and schools they attended. Shadish, Cook, and Campbell (2002) recommended using neighborhood and hospital controls to match on variables that are related to outcomes, when random sampling is not possible. Where possible, two matches were found to allow for loss of comparison group members. Any comparison group child with an official record of abuse or neglect was eliminated. This occurred in 11 cases and the original matches were replaced.

Children who were under school age at the time of the abuse and/or neglect were matched with children of the same sex, race, date of birth (± 1 week), and hospital of birth through the use of county birth record information. For children of school age, records of more than 100 elementary schools for the same time period were used to find matches with children of the same sex, race, date of birth (± 6 months), class in elementary school during the years 1967 through 1971, and approximate home address. Overall, there were matches for 75% of the physically abused and neglected children included here.

The initial phase of this research involved an archival records check to compare juvenile and adult criminal arrest records for the abused and neglected children compared to the controls (Widom, 1989b). Later phases of this research involved locating and interviewing both groups during 1989–1995, 2000–2002, and 2003–2005. Although there was attrition associated with death, refusals, and our inability to locate individuals over the various waves of the study, the composition of the sample at the four time points has remained about the same. There were no significant differences in these characteristics across the phases of the study.

After the initial archival phase of the study where the groups were defined, for all subsequent phases, participants were interviewed in person in their home or other quiet location of the person's choosing. For the 2003–2005 interviews, a licensed registered nurse performed the medical status examination. The interviewers and nurses were blind to the purpose of the study, to the inclusion of an abused and neglected group, and to the participants' group membership. Similarly, the subjects were blind to the purpose of the study. Institutional Review Board approval was obtained for the procedures involved in this study and subjects who participated signed a consent form acknowledging that they understood the conditions of their participation and that they were participating voluntarily. For those individuals with limited reading ability, the consent form was read to the person and, if necessary, explained verbally.

Measures

Information about attachment was obtained from interviews during 2000–2002 ($M_{age} = 39.4$, $SD = 3.5$). Current mental health (anxiety, depression, and self-esteem) and physical health outcomes were assessed during 2003–2005 ($M_{age} = 41.1$, $SD = 3.5$).

Adult attachment style—Historically, the quality of children's attachment with their parents has been classified into discrete categories (e.g., secure, anxious-ambivalent, anxious-avoidant, disorganized). However, some evidence suggests that working models for romantic relationships in adulthood may be better represented along two dimensions—*anxiety and avoidance*—than by categories (see Brennan et al., 1998; Fraley & Waller,

1998). For example, based on the results of a confirmatory factor analysis of over 300 attachment items from many self-report instruments, Brennan, Clark, and Shaver (1998) concluded that a two dimensional, continuous measure of attachment style labeled “attachment related anxiety” (fear of loss and anxiety about abandonment, loss, rejection and being unloved) and “attachment-related avoidance” (characterized by avoidance of intimacy and dependence) was compatible with the conceptualization of Bartholomew (Bartholomew, 1990; 1991). In our study, the Relationship Style Questionnaire (RSQ: Griffin & Bartholomew, 1994a, 1994b), a self-report instrument, was used. In a confirmatory factor analysis of the RSQ items, Roisman et al., (2007) reported that the dimensions of avoidance ($\alpha = .86$) and anxiety ($\alpha = .84$) were the best fitting model with the secure scale showing a substantially lower alpha. In term of validity, high levels of attachment anxiety and avoidance on the RSQ predicted psychopathology under conditions of low and high life stress (Fortuna & Roisman, 2008).

In the current study, 13 items from the RSQ [that are almost identical to items in the Experiences in Close Relationships Scale - Revised (Fraley et al., 2000)] were used to assess anxious attachment (e.g., “I often worry that romantic partners don’t really love me”) and avoidant attachment (e.g., “I find it relatively easy to get close to others) styles. Participants were asked to think about all of their close relationships, past and present, and respond in terms of how they generally feel (or felt) in these relationships. Items were scored on a 5-point scale ranging from (1) *not at all like me* to (5) *very much like me*. Mean ratings for each of the two adult attachment styles were computed. In the current study, Cronbach $\alpha = .74$ for anxious attachment style and $.72$ for avoidant attachment style. The two scales were significantly correlated ($r = .44, p < .001$).

Depression (CES-D)—Depression was assessed using the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977), a 20-item self-report measure with high internal consistency for general and psychiatric populations. Participants were asked to indicate how they felt during the past week on a 4-point scale ranging from *rarely or none of the time (less than 1 day)* to *most or all of the time (5–7 days)*. Total scores ranged from 0 to 56 ($M = 11.36, SD = 11.38$) with higher scores indicating more depression symptoms ($\alpha = .91$). The depression scale was recoded into a dichotomous variable following the cutoff scores suggested in the literature, where a score of 16 or greater is used to identify people at risk for clinical depression (Lewinsohn, Seeley, Roberts, & Allen, 1997; Pinquart & Sorensen, 2003). The dummy variable used in the study had values 0 = no risk for clinical depression (0–16; 77.7%) and 1 = risk for clinical depression (17–60; 22.3%).

Anxiety (BAI)—The Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988) was used to assess severity of anxiety. The BAI is a 21-item self-report measure in which participants were asked to rate how much they have been bothered by specific symptoms over the past week on a 4-point scale from 0 (*not at all*) to 3 (*severely*). Total scores ranged from 0 to 61 ($M = 7.28, SD = 9.81, \alpha = .93$). High internal consistency, test-retest reliability, and good concurrent and discriminant validity have been reported (Beck et al., 1988; Beck & Steer, 1993). The anxiety scale was recoded into a dichotomous variable following cutoff

scores suggested in the literature (Julian, 2011) with 0 = no/little concern for anxiety disorder (score 0–18; 88.5%) and 1 = concern for anxiety disorder (score 19–63; 11.5%).

Self-esteem—Self-esteem was measured using the Rosenberg (1965) scale, a 10-item self-report measure of global self-esteem that provides 4-point Likert-type responses. The scale has good validity and reliability across adolescent and adult samples (Blascovich & Tomaka, 1991; Hagborg, 1993). Rosenberg, Schooler, Schoenbach, and Rosenberg (1995) reported that global self-esteem is strongly related to measures of psychological well-being. Total scores in the current sample ranged from 11 to 40 ($M = 32.77$, $SD = 5.41$, $\alpha = .90$). Based on prior literature recommending cutoff scores for the self-esteem scale, the following cutoffs were used: 0–20 = low self-esteem, 21–33 = normal self-esteem, and 34–40 = high self-esteem. Almost the entire analytic sample was equally split between the second and third level on the scale with only 10 cases falling into “low self-esteem” category. We therefore recoded and reversed the original scale into a dummy measure using the midpoint of the second level “27” as a cutoff score. The final dichotomy used in the analyses had values of 1 = low self-esteem (score 0–27; 14.5%) and 0 = normal to high self-esteem (28–40; 85.5%).

Allostatic load—Following prior work (Horan & Widom, 2015; Widom, Horan, et al., 2015), allostatic load was operationalized as a composite variable based on nine physical health indicators: (1) Systolic blood pressure; (2) Diastolic blood pressure; (3) HDL (high density lipoprotein) – molecules that remove cholesterol from the bloodstream and carry to the liver; (4) Total cholesterol to HDL ratio; (5) HbA1c (Hemoglobin A1c) – reflects the average blood glucose level over a period of months and risk for diabetes; (6) C-reactive protein – appears in the blood in certain acute inflammatory conditions, associated with risk for arthritis and cardiovascular disease; (7) Albumin—plays a role in transporting amino acids and regulating distribution of water, indicative of nutritional status, including protein deficiency and liver function; (8) Creatinine clearance—volume of blood plasma cleared of creatinine per unit of time, assesses the excretory function of the kidneys; and (9) Peak air flow—how well and fast a person can exhale air, commonly used to assess and monitor lung diseases such as asthma, chronic obstructive pulmonary disease or bronchitis, or emphysema. Allostatic load was computed by counting the number of indicators for which the participant’s scores were in the highest risk quartile (see Horan & Widom, 2015; Widom, Horan, et al., 2015). Scores on the allostatic load composite used here, which ranged from 0 (*low, fewer health problems*) to 7 (*high, more health problems*) ($M = 1.94$, $SD = 1.61$), were comparable to scores reported in other studies using this type of index (Crimmins, Johnston, Hayward, & Seeman, 2003; Schulz et al., 2012). Because cases with high levels of allostatic load were relatively rare (about 1.5% of the analytic sample scored 6 and above), this measure was recoded to an upper limit of 5 plus.

Despite its wide use and general acceptance in the field, this operationalization of allostatic load as an index computed by summing dichotomous indicators of risk has come under criticism by some researchers (Vie, Hufthammer, Holmen, Meland, & Breidablik, 2014), leading to alternative conceptualizations. Therefore, to ensure that our findings were not unduly influenced by the method of operationalization, an alternative operationalization of

allostatic load that has been used in a number of recently published studies (Hill, Rote, Ellison, & Burdette, 2014; Vie et al., 2014) was also created for use here. First, raw scores on each of the nine physical health indicators were standardized and outliers winsorized. Next, a mean score across all nine standardized indicators was created for each participant. This alternative allostatic load variable using standardized scores was highly correlated with the original allostatic load variable ($r = 0.69$, $p < .001$). The results were similar and therefore we present the original allostatic load results in our paper.

Control variables—Because adult attachment styles (Mickelson et al., 1997) and mental and physical health outcomes have been associated with differences in demographic characteristics, all analyses control for age, sex, race/ethnicity, and parental socio-economic status (SES). The parental SES composite variable was created by standardizing and averaging scores indicating whether: (1) the family received welfare when the participant was a child; (2) mother and/or father completed high school; (3) mother and/or father Hollingshead (1975) score; and (4) the participant lived with both natural parents until age 18.

Analytic Sample

The analytic sample was selected based on a listwise deletion of cases. This procedure did not affect the distribution of demographic and maltreatment characteristics. The final sample size equals 650.

Analytic Plan

Univariate statistics on all variables and scales were examined for outliers and skewness. Variables were recoded to reduce the influence of extreme outliers. We recoded the anxious attachment style to cap it at 4+ and the allostatic load to cap it at 5+. In addition, allostatic load was specified as a count variable with a negative binomial link to adjust for over-dispersion. Comparison with a model with Poisson specification showed the superiority of the Negative Binomial specification. Models controlled for age, sex, race, and parental socio-economic status.

To assess mediation, we ran two path models using Mplus 7 (Muthén & Muthén, 1998–2013): one comprehensive model using the three dichotomous measures of mental health (anxiety, depression, and self-esteem) and the other for allostatic load — the count measure of physical health. For the first model, we used Weighted Least Squares estimation with Means and Variances adjustment (WLSMV) with the default Delta parameterization since the hypotheses focused on the parameter estimates rather than residual variances. The preference for the WLSMV estimation in the model for mental health outcomes was based on the fact that it allowed the three mental health dummy variables to covary. In the second model, we specified the negative binomial link for the endogenous measure of allostatic load to adjust for over-dispersion with Maximum Likelihood (ML) estimation. Different estimators produced almost identical results with differences in the p values that did not change the conclusions. In both models, robust standard errors were estimated with the bootstrap procedure with 10,000 iterations. Fit indexes were selected based on the technical literature dealing with categorical model estimation (Beauducel & Herzberg, 2006; Yu &

Muthén, 2002). Mediation effects were examined by inspection of indirect effects of neglect and physical abuse to each outcome through each attachment style. Multiple fit indices were considered in assessing overall model fit (critical ratio [χ^2], root mean square error of approximation [RMSEA, Steiger & Lind, 1980], comparative fit index [CFI, Bentler, 1990], Tucker-Lewis index (TLI), weighted root mean square residual [WRMR]), as were individual path estimates and indirect effects. In addition, R^2 provided a measure of effect size.

Results

Descriptive Analyses

Table 1 presents the bivariate zero-order correlations among the variables included in the study. Avoidant and anxious attachment styles in adulthood are positively associated with depression, anxiety, and allostatic load and negatively with self-esteem, supporting construct validity.

Childhood Neglect and Physical Abuse, Adult Attachment Styles, and Mental Health Outcomes

A path model was run to assess links between childhood neglect and physical abuse, adult attachment styles (anxious and avoidant), and mental health outcomes (anxiety, depression, and mental health) (see Figure 1). Examination of the fit statistics indicated that this model provided an acceptable fit to the data ($\chi^2(8) = 23.07$, RMSEA = 0.05, 90% CI [0.03, 0.08], CFI = 0.99, TLI = .93, WRMR = .70). Childhood neglect was positively related to depression ($\beta = .12$, $p = .027$) and childhood physical abuse was related to self-esteem ($\beta = .11$, $p = .037$) (see Table 2). Both childhood neglect ($\beta = .11$, $p = .006$) and physical abuse ($\beta = .11$, $p = .005$) predicted anxious attachment style, but not avoidant attachment. Anxious attachment style predicted depression ($\beta = .30$, $p < .001$), anxiety ($\beta = .26$, $p < .001$), and self-esteem ($\beta = .31$, $p < .001$). Avoidant attachment style also predicted depression ($\beta = .15$, $p = .005$), anxiety ($\beta = .20$, $p = .002$), and self-esteem ($\beta = .13$, $p = .025$). The indirect links between childhood neglect to depression, anxiety, and self-esteem via anxious attachment style were significant (see Table 2), although the indirect links between childhood neglect and depression, anxiety and self-esteem via avoidant attachment were not. Thus, anxious attachment style in adulthood in part mediated the relationship between childhood neglect and these mental health outcomes while avoidant attachment did not. For childhood physical abuse, the total effect of physical abuse on anxiety and depression was not significant, although it was significant for self-esteem ($\beta = .15$, $p = .007$). However, there were significant indirect paths from physical abuse to anxiety ($\beta = .03$, $p = .02$), depression ($\beta = .03$, $p = .012$), and self-esteem ($\beta = .04$, $p = .012$) through anxious attachment. The substantial R square values for the prediction of depression ($R^2 = .22$, $p < .001$), anxiety ($R^2 = .22$, $p < .001$), and self-esteem ($R^2 = .23$, $p < .001$) should be noted.

Childhood Neglect and Physical Abuse, Adult Attachment Styles, and Physical Health Outcomes (Allostatic Load)

A second path model was run to assess the links between childhood neglect and physical abuse, adult attachment styles (anxious and avoidant), and physical health outcomes

(allostatic load) (see Figure 2). Examination of the fit statistics indicated that this model provided an acceptable fit to the data (Log likelihood = -2560.56 , AIC = 5159.12 , BIC = 5244.18). Childhood neglect predicted anxious ($\beta = .13$, $p = .002$) and avoidant attachment styles ($\beta = .09$, $p = .018$) and allostatic load ($\beta = .35$, $p = .006$) (see Table 3). Childhood physical abuse predicted anxious attachment ($\beta = .11$, $p = .005$), but not avoidant attachment or allostatic load. Anxious attachment style in adulthood predicted allostatic load ($\beta = .31$, $p = .021$). The total effect of childhood neglect to allostatic load remained significant ($\beta = .23$, $p = .013$), but the indirect paths were not. However, indirect effects from neglect ($\beta = .03$, $p = .061$) and physical abuse ($\beta = .02$, $p = .093$) to allostatic load showed a non-significant trend.

Discussion

This study examined whether adult attachment style mediates the relationship between childhood physical abuse and neglect and mental health indicators of depression, anxiety, and self-esteem and, to our knowledge, is the first study to examine whether adult attachment style predicts allostatic load. We found that anxious adult attachment style, in part, explained subsequent depression, anxiety, and low self-esteem, but not allostatic load, in adults with histories of childhood physical abuse and neglect. Avoidant adult attachment style did not explain the relationship between childhood physical abuse or neglect and these outcomes.

As hypothesized, we found that individuals with documented histories of childhood neglect had higher levels of anxious attachment style in adulthood compared to individuals without maltreatment histories. However, childhood physical abuse also predicted higher levels of anxious attachment style in adulthood. We did not find that adults with histories of childhood physical abuse had higher levels of avoidant attachment style in adulthood as we had hypothesized. These findings are in contrast to earlier literature with young children (Cicchetti & Toth, 1995; Finzi et al., 2001) and the Unger and DeLuca (2014) study with adults. Interestingly, Oshri et al.'s (2015) study with undergraduate students found that physical abuse was not associated with anxious or avoidant attachment. Neglect was not included. Our findings and those of Oshri et al. (2015) suggest that we need to further explore the relationship between childhood physical abuse and adult attachment styles.

In terms of our second hypothesis, we found strong evidence that both adult attachment styles (anxious and avoidant) predicted depression, anxiety, and self-esteem. These findings are consistent with previous studies reporting a relationship between attachment and psychopathology (e.g., Mikulincer & Shaver, 2007) and extend this knowledge base by documenting the long-term effects of these childhood experiences prospectively into adulthood. Nonetheless, while these findings illustrate the role of adult attachment style in relation to these particular mental health problems, it is also possible that there is a reciprocal relationship between attachment and mental health outcomes. These adults with histories of child maltreatment may have developed mental health problems earlier in their lives and that these mental health problems created relationship problems that then led to more anxious attachment styles. Further research is necessary to examine these potentially complicated reciprocal relationships.

Only anxious attachment style in adulthood predicted allostatic load. To our knowledge, this is the first study to examine the relationships among childhood neglect and physical abuse, adult attachment style, and allostatic load using documented cases of childhood experiences followed up prospectively into middle adulthood. Previous studies have been conducted with children (Rogosch et al., 2011) or have examined immune functioning (Puig et al., 2013). In other research looking at attachment styles in relation to distress, the findings have not been consistent. In some research, self-reports of stress were associated with anxious attachment style, whereas objective indicators (e.g., heart rate variability) were associated with avoidant attachment (Maunder et al., 2006). DeWitte et al. (2010) found that anxious and avoidant attachment styles were associated with subjective responses to stress, whereas only anxious attachment style was related to objective (e.g., cortisol) responses to stress. Thus, differences between our findings and those of previous studies may be due to differences in objective indicators or characteristics of the sample studied.

There are other differences between the current and prior studies that may also account for the discrepancy between the findings of this and previous studies of attachment and health outcomes. First, previous research has found that self-reported adult romantic attachment styles are associated with concurrent measures of health (McWilliams & Bailey, 2010; Scharfe & Eldredge, 2001), leaving the direction of the effect ambiguous. Our prospective design has allowed us to draw inferences about childhood physical abuse and neglect and subsequent adult attachment patterns and physical health outcomes. Second, these findings are based on measured physical health outcomes in adulthood, rather than self-reports. Third, it is possible that only certain indicators of physical health would be affected by these childhood adversities and this is certainly an avenue that warrants further analysis. Fourth, the pathway from child abuse and neglect to attachment style and allostatic load in adulthood may be more complicated than previously considered and other factors may need to be taken into account. Fifth, this study differs from other studies in the types of attachment relationships examined (adult partner relationships in the current study versus parent child relationships in most prior studies), the period of life when the attachment was measured (adult versus infancy or early childhood) and the use of observational versus self-report measures.

We found partial support for our third hypothesis that attachment style in adulthood in part mediated the relationship between childhood neglect and physical abuse and these mental health outcomes. For both neglected and physically abused children, there were indirect paths through anxious attachment style to anxiety, depression, and self-esteem. This suggests that anxious attachment may in part explain the relationship between child maltreatment and poor mental health outcomes and highlights the need to focus on anxious attachment styles in therapy with maltreated children and adolescents.

While our findings revealed significant paths between childhood neglect and anxious attachment style and anxious attachment style and allostatic load, we did not find evidence that anxious attachment style mediated the relationship between childhood neglect and allostatic load. The direct effect of neglect on allostatic load remained significant, despite a borderline significant indirect effect. In other work that we have published, we examined a different set of potential mediators to explain the relationship between childhood abuse and

neglect and allostatic load in adulthood (Widom, Horan, & Brzustowicz, 2015), including internalizing and externalizing problems in adolescence and social support and risky lifestyle in middle adulthood. In that study, the direct effect of childhood abuse and neglect also persisted despite the introduction of these potential mediators. Given these provocative findings showing a robust relationship between childhood neglect and allostatic load in adulthood, child maltreatment researchers with longitudinal data might consider replicating these findings using attachment and other potential mediators to determine whether there are better explanations to understand how childhood neglect appears to “get under the skin” and leads to lasting health risk behaviors over 30 years.

Although our hypotheses were not always supported, we did find evidence that anxious and avoidant attachment styles represent two functionally distinct components. We also demonstrated that self-reported anxious and avoidant attachment styles predicted clinically significant levels of anxiety and depression and substantively lower self-esteem and that self-reported anxious attachment style predicted allostatic load, all of which supports the validity of the attachment construct.

Future research ought to examine the mechanisms whereby these adult attachment styles lead to increased anxiety and depression and lower levels of self-esteem in physically abused and neglected children and how anxious attachment style in adulthood influences higher allostatic load, a composite variable reflecting the accumulation of stress over multiple biological systems. Future research might also benefit from examining other outcomes for these individuals based on these findings about adult attachment styles. Finzi et al. (2001) suggested examining aggression and violence, particularly for children with histories of physical abuse. In some of our work, we have found that neglected children, in addition to physically abused children, are at increased risk for violence (Maxfield & Widom, 1996; Widom, 1989b). Our new findings suggest that further study of the role of attachment styles in physically abused and neglected children may help us better understand the association between child maltreatment and violence. Future research should also consider other types of attachment styles that we were unable to examine such as secure and disorganized attachment styles.

Limitations

While this investigation of the role of adult attachment styles in the relationship between childhood physical abuse and neglect and mental and physical health outcomes has numerous strengths, several caveats should be kept in mind. First, because this sample is predominantly from the lower end of the socioeconomic spectrum, these findings cannot be generalized to cases of abuse and neglect that might occur in middle or upper class families. Second, since the child abuse and neglect cases were identified through the courts, these findings are not generalizable to unreported or unsubstantiated cases of maltreatment. Third, although the gold standard to assess attachment is the Adult Attachment Interview (George, Kaplan, & Main, 1985), because time and financial resources limited our ability to conduct an interview-based assessment of attachment, the self-report measures used here may be subject to response biases (Brennan et al., 1998). Fourth, because these results are based on self-reports of adult attachment, for those participants who are not insightful or not willing

to disclose information about themselves to researchers, their responses may not accurately reflect their true attachment styles. Fifth, this investigation did not examine the time point in these individuals' lives when anxiety and depression or physical health problems might have first occurred and when the adult attachment style might have first appeared. Finally, other forms of maltreatment or childhood adversities or personality factors (e.g., neuroticism) may have influenced these mental and physical health outcomes and should be examined.

Implications

These new findings reinforce existing therapeutic interventions that focus on anxious attachment styles and suggest that interventions would be beneficial even in adulthood, especially with regard to mental health. Given that attachment is a characteristic of the individual that is manifested in relationships, attention should be paid to the life history of relationships that might have contributed to the development of an insecure attachment style in these previously maltreated individuals.

Much has been written about the intergenerational transmission of abuse (e.g., Widom, Czaja, & DuMont, 2015) and deficits in attachment have been implicated in the intergenerational transmission of abuse from one generation to the next (e.g., Kwako, Noll, Putnam, & Trickett, 2010). Individuals with histories of abuse and neglect who become parents may benefit from understanding how their adult attachment styles and their views of relationships create expectations that influence how they interact with and perceive their children.

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Figure 1.

Paths from childhood neglect and physical abuse to mental health outcomes (depression, anxiety, and self-esteem) through adult attachment styles. Standardized betas are presented. Solid lines are significant paths, dotted lines are not significant. Analyses control for age, sex, race, and family socio-economic status. Model fit indices: $\chi^2(df=8) = 22.07, p = .005$; RMSEA = .05; CFI = .99; WRMR = .703.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Figure 2.

Paths from childhood neglect and physical abuse and neglect to allostatic load through adult attachment styles. Standardized betas are presented. Solid lines are significant paths, dotted lines are not significant. Analyses control for age, sex, race, and family socio-economic status. Model fit indices: Log likelihood = -2560.56; AIC = 5159.12; BIC = 5244.18.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 1

Zero order correlations for study variables

	Predictors			Attachment			Outcomes				
Predictors	1	2	3	4	5	6	7	8	9	10	11
1. Neglect	--										
2. Physical Abuse	-.21***	--									
Control variables											
3. White, non-Hispanic	-.05	.08*	--								
4. Female	-.01	-.04	-.04	--							
5. Age at interview 3	-.03	.04	-.04	.02	--						
6. SES composite	-.19***	.07	.02	-.03	-.11**	--					
Attachment											
7. Anxious attachment	.10**	.08*	.03	-.03	-.07	-.07	--				
8. Avoidant attachment	.08*	.03	.04	.05	-.06	-.13**	.44***	--			
Outcomes											
9. Anxiety	.07	.05	.06	.10*	.00	.02	.23***	.21***	--		
10. Depression	.11**	.03	.02	.13***	.02	-.06	.30***	.22***	.48***	--	
11. Self-esteem	.06	.10**	.13**	.04	.02	-.05	.29***	.20***	.32***	.55***	--
12. Allostatic load	.11**	.00	.03	.20***	.09*	-.10**	.11**	.09*	.04	.12**	.15***

*
 $p < .05$ **
 $p < .01$ ***
 $p < .001$.

Table 2

Results and fit indices for Model 1 predicting mental health outcomes (depression, anxiety, and self-esteem)

		B (SE)	β	95% CI
Path				
Childhood neglect	Anxious attachment	.19 (.07)	.11 **	[.03 – .19]
	Avoidant attachment	.10 (.06)	.07	[–.01 – .15]
	Depression	.25 (.12)	.12 *	[.01 – .22]
	Anxiety	.23 (.14)	.11	[–.02 – .24]
	Self-esteem	.18 (.13)	.09	[–.03 – .21]
Childhood physical abuse	Anxious attachment	.42 (.15)	.11 **	[.03 – .19]
	Avoidant attachment	.18 (.13)	.06	[–.03 – .14]
	Depression	.20 (.27)	.04	[–.07 – .15]
	Anxiety	.26 (.35)	.06	[–.08 – .19]
	Self-esteem	.50 (.25)	.11 *	[.01 – .20]
Anxious attachment style	Depression	.37 (.07)	.30 ***	[.19 – .40]
	Anxiety	.33 (.08)	.26 ***	[.14 – .38]
	Self-esteem	.39 (.07)	.31 ***	[.20 – .43]
Avoidant attachment style	Depression	.22 (.08)	.15 **	[.04 – .25]
	Anxiety	.29 (.09)	.20 **	[.08 – .32]
	Self-esteem	.20 (.09)	.13 *	[.02 – .25]
Neglect to anxiety: Total effect		.32 (.15)	.16 *	[.02 – .29]
Neglect to anxiety: Total indirect effect		.09 (.04)	.04 *	[.01 – .08]
Neglect → anxious attachment → anxiety		.06 (.03)	.03 *	[.00 – .06]
Neglect → avoidant attachment → anxiety		.03 (.02)	.01	[–.01 – .03]
Neglect to depression: Total effect		.34 (.12)	.16 **	[.05 – .27]
Neglect to depression: Total indirect effect		.09 (.04)	.04 **	[.01 – .08]
Neglect → anxious attachment → depression		.07 (.03)	.03 *	[.01 – .06]
Neglect → avoidant attachment → depression		.02 (.02)	.01	[–.00 – .03]
Neglect to self-esteem: Total effect		.28 (.14)	.13 *	[.01 – .26]
Neglect to self-esteem: Total indirect effect		.09 (.04)	.05 **	[.01 – .08]
Neglect → anxious attachment → self-esteem		.07 (.03)	.04 *	[.01 – .06]
Neglect → avoidant attachment → self-esteem		.02 (.02)	.01	[–.01 – .02]
Physical abuse to anxiety: Total effect		.45 (.35)	.10	[–.04 – .23]
Physical abuse to anxiety: Total indirect effect		.19 (.08)	.04 *	[.01 – .07]
Physical abuse → anxious attachment → anxiety		.14 (.06)	.03 *	[.01 – .05]
Physical abuse → avoidant attachment → anxiety		.05 (.04)	.01	[–.01 – .03]
Physical abuse to depression: Total effect		.39 (.28)	.08	[–.03 – .20]
Physical abuse to depression: Total indirect effect		.20 (.08)	.04 *	[.01 – .07]

		B (SE)	β	95% CI
Physical abuse →anxious attachment→ depression		.16 (.06)	.03 *	[-.01 – .06]
Physical abuse →avoidant attachment→ depression		.04 (.03)	.01	[-.01 – .15]
Physical abuse to self-esteem: Total effect		.70 (.27)	.15 **	[-.04 – .26]
Physical abuse to self-esteem: Total indirect effect		.20 (.08)	.04 *	[-.01 – .08]
Physical abuse →anxious attachment → self-esteem		.17 (.07)	.04 *	[-.01 – .06]
Physical abuse →avoidant attachment → self-esteem		.04 (.03)	.01	[-.01 – .02]
R square	Anxious attachment	.02 (.01)		
	Avoidant attachment	.01 (.01)		
	Depression	.22 (.04) ***		
	Anxiety	.22 (.05) ***		
	Self-esteem	.23 (.05) ***		
Fit indices	Chi square (8 df)	22.07 **		
	CFI/TLI	.99/.93		
	RMSEA	.05		
	WRMR	.70		

Note: B = parameter estimate; SE = standard error; β = standardized coefficient; CI = confidence interval; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; WRMR = weighted root-mean square residual.

*
p < .05

**
p < .01

p < .001

Table 3

Results and fit indices for Model 2 predicting allostatic load

		B (SE)	β	95% CI
Path				
Childhood neglect	Anxious attachment	.21 (.07)	.13 **	[.05 – .20]
Childhood neglect	Avoidant attachment	.13 (.06)	.09 *	[.02 – .17]
Childhood neglect	Allostatic load	.16 (.07)	.35 **	[.10 – .59]
Childhood physical abuse	Anxious attachment	.42 (.15)	.11 **	[.03 – .19]
Childhood physical abuse	Avoidant attachment	.16 (.13)	.05	[–.03 – .13]
Childhood physical abuse	Allostatic load	.10 (.16)	.09	[–.20 – .38]
Anxious attachment style	Allostatic load	.08 (.04)	.32 *	[.05 – .57]
Avoidant attachment style	Allostatic load	.04 (.05)	.11	[–.16 – .38]
Model Fit				
Total effect: Neglect to allostatic load		.18 (.07)	.23 *	[.05 – .41]
Total indirect: Neglect to allostatic load		.02 (.01)	.03	[–.00 – .06]
Neglect→anxious attachment→allostatic load		.02 (.01)	.02	[–.01 – .05]
Neglect→avoidant attachment→allostatic load		.01 (.01)	.01	[–.01 – .02]
Total effect: Physical abuse to allostatic load		.14 (.17)	.08	[–.12 – .27]
Total indirect: Physical abuse to allostatic load		.04 (.02)	.02	[–.00 – .05]
Physical abuse→anxious attachment→allostatic load		.03 (.02)	.02	[–.01 – .04]
Physical abused→avoidant attachment→allostatic load		.01 (.01)	.01	[–.01 – .02]
Fit indices				
Log likelihood		–2560.56		
AIC		5159.12		
BIC		5244.18		

Note: B = parameter estimate; SE = standard error; β = standardized coefficient; CI = confidence interval; AIC = Akaike information criteria; BIC = Bayesian information criteria

* $p < .05$

** $p < .01$.