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Features of childhood maltreatment and resilient capacity in adulthood: Results from a large, community-based sample

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Abstract

Childhood maltreatment is consistently associated with poor outcomes. However, few epidemiological studies have examined the relationship between childhood maltreatment and adult resilient capacity, defined as one's perceived ability to cope successfully with challenges. This study aimed to determine associations between specific types and features of childhood maltreatment with adult resilient capacity. Participants were African American adults recruited from a public urban hospital in Atlanta, GA (N = 1,962) between 2005 and 2013. Childhood maltreatment, including witnessing domestic violence, physical, emotional, and sexual abuse, was assessed retrospectively using the Traumatic Events Inventory. Perceived resilient capacity was assessed using the Connor-Davidson Resilience Scale. Linear regressions were performed between childhood maltreatment exposure – and specific features of exposure, including type, co-occurrence, and developmental timing – on resilient capacity, adjusting for covariates. Participants exposed to any maltreatment reported lower resilient capacity than unexposed peers (in standard deviation units: $\beta = -0.38$, SE 0.04, $p < .001$). All maltreatment types were negatively associated with resilient capacity, even adjusting for other lifetime trauma. Only emotional abuse remained significantly associated with resilient capacity after accounting for current psychological distress ($\beta = -0.11$, SE 0.05, $p = 0.02$). Maltreatment co-occurrence followed an inverse dose-response relationship with resilient capacity: for each additional maltreatment type, scores decreased by

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0.18 units (SE 0.02, p < .001). Finally, developmental timing of maltreatment did not reveal any differential influences on resilient capacity. Results suggest that childhood emotional abuse and co-occurrence of maltreatment types may be particularly deleterious to adult resilient capacity.

By the time individuals reach late adolescence, an estimated 16% will have been exposed to some form of maltreatment (Gilbert et al., 2009), including physical, emotional or sexual abuse, or witnessing domestic violence (Teicher & Samson, 2013). These experiences are associated with long-term physical and mental health consequences across the life course, such as cardiovascular disease and diabetes (Basu, McLaughlin, Misra, & Koenen, 2017) and mental disorders in adulthood (Green et al., 2010), making them major public health problems. However, there is wide variation in long-term outcomes among youth exposed to maltreatment, with many individuals not developing psychiatric disorders in adulthood (Green et al., 2010).

This observation has led many within public health and other fields to examine individual capacity for resilience, or the ability to function competently and face future challenges or adversities successfully (Cicchetti & Rogosch, 2009). Resilience is typically conceptualized as a dynamic process of adaptation dependent on internal and external factors (Southwick, Bonanno, Masten, Panter-Brick, & Yehuda, 2014). We focus specifically on resilient capacity, an individual-level factor defined here as one's perception of their capability to face future challenges successfully, including perceptions about one's personal qualities such as self-confidence, adaptability, and ability to endure stress (Choi, Stein, Dunn, Koenen, & Smoller, 2019; Mancini & Bonanno, 2006). Resilient capacity should not be conflated with the process of resilience following adversity, which involves multiple factors beyond just intrapersonal traits, including other individual, interpersonal, and ecological factors (Bonanno & Diminich, 2013). Resilient capacity here is preferred to the term "trait resilience", which has been used in previous work (Campbell-Sills, Forde, & Stein, 2009; Daniels et al., 2012), as resilient capacity is expected to be able to change within a person, and is not an inherent, fixed trait. Resilient capacity is closely related but distinct from the more process-focused construct of trauma coping self-efficacy (Benight et al., 2015). Trauma coping self-efficacy focuses on perceptions of one's ability to utilize coping strategies for stress-related demands, while resilient capacity refers more generally to self-perceptions of successful adaptation to future adversity. Resilient capacity may be one of many factors contributing to the resilience process following adversity. As resilient capacity may decrease the risk of negative outcomes following future adversities (Daniels et al., 2012; Hourani et al., 2012), it is relevant to examine how maltreatment may impact this capacity, as such insights could guide public health interventions aimed at promoting mental health.

Several studies have suggested that childhood maltreatment may negatively impact one's self-reported resilient capacity in adulthood. For example, one cross-sectional study found that maltreatment was associated with lower resilient capacity among a community sample (Campbell-Sills et al., 2009). Another cross-sectional survey found childhood exposure to violence was associated with adult resilient capacity, though, this relationship was no longer significant after controlling for depressive and anxiety symptoms (Howell & Miller-Graff,

2014). However, the few studies to date have not considered how specific *features of maltreatment* might shape one's self-reported resilient capacity.

Prior evidence suggests that features of maltreatment, such as its type(s), co-occurrence, and timing, may exert differential impacts on psychological outcomes (Cecil, Viding, Fearon, Glaser, & McCrory, 2017). There has been some specificity in patterns of maladjustment following different types of exposures. For example, relative to other maltreatment types, emotional abuse has been associated with increased risk for negative outcomes, particularly emotion regulation and internalizing symptoms of psychiatric distress in young adulthood (Cecil et al., 2017). In addition, co-occurrence of exposures, often defined with count of maltreatment types (Hodges et al., 2013), may also influence resilient capacity. While there are limitations to the cumulative count approach, evidence from Adverse Childhood Experiences (ACE) studies show a dose-response relationship between number of ACEs and adult mental health risk, suggesting a cumulative burden of adversity on psychological functioning (Sareen et al., 2013). Lastly, the developmental timing of maltreatment exposure could also influence adult resilient capacity. There may be sensitive periods during development when neuroplasticity is particularly high and exposure to negative stimuli is therefore particularly impactful (Knudsen, 2004). Although evidence supporting sensitive periods is mixed, there is some suggestion that maltreatment before age 5 is particularly deleterious for later mental health (Dunn, McLaughlin, Slopen, Rosand, & Smoller, 2013; Dunn, Nishimi, Powers, & Bradley, 2017). However, the effect of the developmental timing of maltreatment on resilient capacity is largely unknown.

Resilient capacity has been found to negatively correlate with psychological distress (Campbell-Sills, Cohan, & Stein, 2006; Edwards, Probst, Rodenhizer-Stampfli, Gidycz, & Tansill, 2014). Though related, these two constructs are distinct: resilient capacity refers to one's perception of their ability to successfully face stress, while psychological distress refers to general affective symptoms including depression and anxiety (Bonanno & Diminich, 2013). If resilient capacity were simply the direct inverse of psychological distress, data on psychological symptoms would be sufficient to understand the impact of maltreatment on adult capacity to respond to future stress. While pre-trauma distress may predict development of psychopathology in the face of later adversity (Sayed, Iacoviello, & Charney, 2015), a range of pre-trauma experiences including factors like coping, cognitive abilities, and personality are also found to impact risk of psychopathology post-trauma (DiGangi et al., 2013). As such, efforts are warranted to determine the impact of maltreatment on resilient capacity above and beyond psychological distress.

Using data from a socioeconomically diverse sample of adults with high trauma exposure, we investigated the relationship between exposure to child maltreatment – as well as the features of that maltreatment – on adult resilient capacity. Our goal was to test whether the following features of maltreatment exposure were associated with lower resilient capacity: (a) certain types of maltreatment, (b) co-occurrence of maltreatment types, and (c) developmental timing of maltreatment exposure. Given evidence suggesting that resilient capacity is a related yet distinct construct from psychological distress, we tested whether (d) the associations between maltreatment and resilient capacity were independent of current psychiatric symptoms. To our knowledge, this study is the first to explore the impact of

maltreatment features on adult resilient capacity, while accounting for current psychological symptoms.

METHOD

Participants and Procedure

Data came from the Grady Trauma Project (GTP), a National Institute of Mental Health funded study of determinants of posttraumatic stress disorder (PTSD) conducted between 2005 and 2013 (Gillespie et al., 2009). Participants were recruited from medical clinic waiting rooms at an urban, non-profit healthcare center in Atlanta, Georgia, US, where they were either patients or patient's family members (e.g., patient's parent or child). Consenting adults participated in structured, verbal interviews administered by trained research assistants about demographics, lifetime adversity exposure, and psychological functioning. Verbal interviews were conducted due to variation in participant literacy levels, and interviewers monitored participant safety and well-being throughout the process. Interviews lasted 45-75 minutes, depending on participant trauma history and availability, as study questions proceeded until the clinic was ready to see the participant/their family member. All study procedures were approved by Emory University's Institutional Review Board and the Grady Health Care System Research Oversight Committee.

Data from 1,962 participants with complete information for all relevant measures were included in the current analysis; most missing data was a function of the clinic waiting room interview procedure. Specifically, participants completed interviews until the clinic was ready to see the participant or their family member, thus ending the interview and leading to missing data on any measures that had not been completed up until that point. From the initial sample of 6,764 individuals, 3,268 (48.3%) had missing exposure information (which was collected at the end of the interview), of these individuals 1,351 (38.6%) had missing outcome information, and of these individuals 183 (8.5%) had missing covariate information. The analytic sample (N = 1,962) did not differ in age, sex, education, or income from those excluded (n = 4,802, $p > .05$); however, those in the analytic sample were more likely to be employed (53.6%) relative to those excluded (48.2%; $p < .05$). Additionally, because only a small proportion of original sample participants identified as white or other (3.6% and 3.8%, respectively) thus limiting power to determine significant racial/ethnic differences, we restricted the analytic sample to African Americans.

Measures

Childhood Maltreatment.—Exposure to childhood maltreatment was collected through the Traumatic Events Inventory (TEI), a 14-item screening questionnaire of a participant's history of trauma exposure (Gillespie et al., 2009). The TEI was developed for use in urban, racially and ethnically diverse samples and has shown strong associations with PTSD in this population, suggesting strong construct validity (Schwartz, Bradley, Sexton, Sherry, & Ressler, 2005). We focused on five items capturing maltreatment: violence between parents or caregivers (i.e., Did you witness violence between your parents or caregivers when you were a child?), physical abuse (i.e., Were you beaten or physically punished in other ways as a child?), emotional abuse (i.e., Did adults who cared for you talk to you in mean ways?), or

sexual abuse before age 18 (i.e., Before age 14, did an adult or older teenager sexually abuse you or have any type sexual contact with you; Between age 14 and 18, did an adult or older teenager sexually abuse you?). Participants were asked whether they had been exposed to each *maltreatment type*, and if so, their age in years at first exposure. *Maltreatment type* exposure was coded as a binary variable for each individual type (0 = unexposed, 1 = exposed) and for any maltreatment (0 = unexposed to all types, 1 = exposed to any type). *Co-occurrence* of child maltreatment was coded as a count variable by summing the number of types reported (ranging from 0 = none to 4 = exposure to all types). Age at first exposure was used to categorize exposed participants by *developmental timing* of first exposure into three time periods, consistent with previous work (Dunn et al., 2017): early childhood (age 0-5 years), middle childhood (6-10 years), and adolescence (11-18 years). We created a categorical variable (4-level for unexposed, early childhood, middle childhood, and adolescence) for developmental timing of any child maltreatment (earliest age of any exposure was used if multiple types were endorsed).

Resilient Capacity.—Participants completed the 10-item Connor-Davidson Resilience Scale (CD-RISC 10) (Campbell-Sills & Stein, 2007), an abbreviated and validated version of the original 25-item CD-RISC, one of the most widely used scale measures of resilience. This unidimensional self-report scale assesses the positive capacity of an individual to cope with stress (Campbell-Sills & Stein, 2007), including perceptions of personal qualities encompassing this positive capacity (e.g., ability to adapt to change, achieving goals despite obstacles, staying focused under pressure). Though referred to simply as “resilient capacity” henceforth, we note this construct refers to one’s *perceived* resilient capacity specifically. Scale scores have demonstrated excellent reliability (sample internal consistency reliability: $\alpha = .88$) and validity (Connor & Davidson, 2003), and have been used in other African American populations (Bailey, Sharma, & Jubin, 2013). Participants indicated how true each of the items was for themselves over the past month on a five point Likert Scale (*never true* to *always true*). A total sum-score was created (range: 0-40), with higher scores indicating higher resilient capacity. For ease of interpretation, sum scores were standardized ($M = 0$; $SD = 1$).

Covariates.—Socio-demographic covariates were included in all regression models: sex (binary variable coded as: male vs female); age (continuous); highest level of education (categorical variable coded as: less than high school, high school graduate or GED, greater than high school graduate or GED/college graduate); household monthly income (categorical variable coded as: $0-499, $500-999, $1,000+); and employment status (categorical variable coded as: unemployed, unemployed receiving disability support, employed with or without disability support). As maltreatment and traumatic exposures tend to cluster within individuals (Breslau, Davis, & Andreski, 1995), and recent trauma may proximally impact adult resilient capacity (Bonanno & Diminich, 2013), we also assessed lifetime trauma exposure. Specifically, we controlled for lifetime trauma using the remaining 10 TEI items, which were clustered into three groups, based on prior research (Breslau et al., 1998): any *other interpersonal violence* (i.e., murder of a friend/family member, being attacked by a romantic partner, sexual abuse after age 18, witnessing an attack on a friend/family member, witnessing an attack on someone else); any *non-interpersonal trauma* (i.e.,

natural disaster, serious accident or injury, sudden life threatening illness); and *any other trauma*. All events besides sexual abuse after age 18 could have occurred at any age. We created a set of binary variables to capture presence versus absence of exposure to any item within each lifetime trauma group, to determine the impact of maltreatment above and beyond later lifetime trauma exposures.

Further, to disentangle the relationship between resilient capacity and psychological distress, we also adjusted for current depressive and posttraumatic stress symptoms. Self-reported depressive symptoms were assessed using the Beck Depression Inventory - Second Edition (BDI-II), a 21-item validated and widely-used inventory of depressive symptoms (Beck, Steer, & Brown, 1996). The BDI-II items are coded on a four-level Likert response of severity (e.g., 0 = *I do not feel sad* to 3 = *I am so sad or unhappy that I can't stand it*); item responses were summed, resulting in total scores ranging from 0-63 (α = .93). Self-reported posttraumatic stress symptoms were assessed using the modified Posttraumatic Stress Symptom Scale (mPSS), a 17-item validated measure of frequency of posttraumatic stress symptoms corresponding to diagnostic criteria defined by the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV-TR) (Coffey, Dansky, Falsetti, Saladin, & Brady, 1998). The mPSS items are on a four-level Likert response of frequency (i.e., 0=*not at all* to 3=*5 or more time per week/very much/almost always*); item responses were summed, resulting in total scores ranging from 0-51 (α = .92). Separate, continuous scores for depressive and posttraumatic stress symptoms were used, with higher scores for each indicating more severe symptoms.

Data Analysis

We performed descriptive analyses to assess distributions of maltreatment and resilient capacity, and to compare levels of resilient capacity by each covariate. We also examined correlations between resilient capacity and psychological symptoms. We then ran a series of hierarchical linear regression models to evaluate the association between features of maltreatment exposure and resilient capacity in adulthood. Models were hierarchical, with each subsequent model building on the prior by adding additional covariates.

Model 1: Any maltreatment exposure and maltreatment types.—To determine the independent effects of maltreatment types, we ran individual models with each of the following variables as the primary predictor: any maltreatment, witnessing violence between caregivers, physical abuse, emotional abuse, and sexual abuse. As maltreatment types tend to co-occur, we also ran a model including all maltreatment types together. With these maltreatment type predictors, we conducted Model 1 in three steps. First, Step A assessed the association between exposure to any child maltreatment (any child maltreatment vs never exposed), and resilient capacity. Second, Step B built on Step A by additionally adjusting for other lifetime trauma, using binary lifetime trauma variables, to determine the effect of maltreatment above and beyond other lifetime exposures. Third, Step C built on Step B by additionally adjusting for depressive and posttraumatic stress symptoms to determine the impact of maltreatment exposure on resilient capacity independent of current psychological distress. All models adjusted for socio-demographic covariates.

Model 2: Maltreatment co-occurrence.—In order to determine the effect of maltreatment co-occurrence, we assessed in Model 2 the association between the number of specific child maltreatment types reported and levels of resilient capacity, comparing people who had not been exposed to any maltreatment to those who had experienced various combinations of maltreatment types; co-occurrence was modeled both as a continuous (range 0-4) and categorical variable (levels: 0 [unexposed], 1, 2, 3, 4 types) to evaluate linear and threshold effects. Similar to Model 1, we ran models in steps: Step A adjusted for socio-demographic covariates, Step B additionally adjusted for other lifetime trauma exposures variables, and Step C additionally adjusted for psychological symptoms. Tukey post-hoc two-way comparisons were conducted for the categorical co-occurrence variable to determine if the effects of different counts differed from each other.

Model 3: Developmental timing of maltreatment.—Lastly, Model 3 assessed the association between developmental timing of any maltreatment as a categorical variable (0 = unexposed [referent]; 1 = exposed in early childhood, 2 = exposed in middle childhood, and 3 = exposed in adolescence) and resilient capacity. Step A adjusted for socio-demographic covariates, Step B additionally adjusted for other trauma exposure (binary lifetime trauma variables), and Step C additionally adjusted for psychological symptoms. Tukey post-hoc two-way comparisons for each pairwise combination were conducted to determine if the effects of exposure in different developmental time periods differed from each other. All analyses were performed using SAS Version 9.4 (SAS Institute, Inc., Cary, North Carolina).

RESULTS

Sample Characteristics

The analytic sample of 1,962 African American adults ranged in age from 18 to 78 (M = 40.3, SD = 13.6) and was mostly female (73.9%) (Table 1). Average reported level of unstandardized resilient capacity was 31.84 (SD = 7.4) (standardized scores M = 0.00, SD = 1.0) and was normally distributed with slight negative skew (*skewness* = −1.04). Significant differences in resilient capacity were found for all socio-demographic covariates. Participants reported higher resilient capacity in early adulthood, lower levels in middle age, and higher levels again in later life. Compared to their peers, males, those with higher education and income, and those unemployed at the time of assessment were more likely to report higher resilient capacity. Depressive and posttraumatic stress symptoms were normally distributed with slight positive skew (*skewness* = 0.94 and 1.01, respectively). Pearson correlations identified that resilient capacity was negatively correlated with both depressive (r = −.54) and posttraumatic stress symptoms (r = −.34), which were highly correlated with each other (r = .68).

Child maltreatment exposure was common, over half of participants (55.0%) reporting exposure to at least one maltreatment type. There was also high co-occurrence of maltreatment types; among those exposed, only 44.7% reported exposure to only one type, while 25.9% reported exposure to three or four types. Polychoric correlations between maltreatment exposures ranged from r = .36 between witnessing violence and sexual abuse to r = .64 between physical and emotional abuse. Average age of first exposure to any

maltreatment was 8.0 years (*SD* = 3.5 years); among those exposed, 28.0% were first exposed in early childhood (ages 0-5), 49.5% were first exposed in middle childhood (ages 6-10), and 22.5% were first exposed in adolescence (ages 11-18). Exposure to other traumas was also common: 84.1% of the sample were exposed to some other type of interpersonal violence (age at first exposure *M* = 17.44, *SD* = 10.2, *range* 0-64), 75.2% were exposed to non-interpersonal trauma (age at first exposure *M* = 18.90, *SD* = 12.1, *range* 0-64), and 32.0% reported exposure to other traumas not specified (age at first exposure *M* = 27.53, *SD* = 14.1, *range* 1-68).

Effect of exposure to child maltreatment types on resilient capacity (Model 1)

Participants exposed to any type of child maltreatment had significantly lower resilient capacity than those unexposed, controlling for socio-demographic covariates (β = −0.38, standard error (SE) 0.04, $p < .001$; Table 2). When each maltreatment type was assessed separately, exposure to each individual type was associated with significantly lower resilient capacity, with emotional abuse showing the largest magnitude of association (β = −0.47, SE 0.05, $p < .001$). When all four maltreatment types were entered into one model (adjusted for socio-demographic covariates), associations between witnessing violence, emotional abuse, and sexual abuse with resilient capacity remained significant (witnessing violence: β = −0.12, SE 0.05, $p = .019$, emotional abuse: β = −0.36, SE 0.06, $p < .001$, sexual abuse: β = −0.17, SE 0.05, $p = .001$; Table 3), while the effect of physical abuse was no longer significant (β = −0.07, SE 0.06, $p = .273$).

Effects of any maltreatment as well as each individual maltreatment type were slightly attenuated, though persisted, after additionally adjusting for exposure to other traumatic event types (Step B). After adjusting for current psychological symptoms (Step C), all associations with resilient capacity became non-significant except the effect of any maltreatment type (β = −0.09, SE 0.04, $p = .025$) and emotional abuse (β = −0.10, SE 0.05, $p = .022$). This attenuation seemed to be largely explained by depressive symptoms (See Supplement for effect estimates of other trauma and psychological symptoms for Models 1-3).

Effect of co-occurrence of child maltreatment types on resilient capacity (Model 2)

Assessed as a continuous variable, every additional maltreatment type was associated with a 0.18 unit decrease on average in resilient capacity (β = −0.18, SE 0.02, $p < .001$; adjusted for socio-demographic covariates), suggesting greater exposure to multiple maltreatment types was associated with lower resilient capacity in a dose-response fashion. When modelling the level of maltreatment co-occurrence categorically to examine potential threshold effects, participants exposed to any one maltreatment type had significantly lower resilient capacity compared to those unexposed (β = −0.21, SE 0.05, $p < .001$; adjusting for socio-demographic covariates), while participants exposed to all four maltreatment types had even lower resilient capacity (β = −0.63, SE 0.10, $p < .001$) (Table 4). Individuals exposed to two, three, or four maltreatment types relative to unexposed had significantly lower resilient capacity compared with those exposed to only one maltreatment type relative to unexposed (Tukey two-way comparisons $p < .05$); though there were no significant differences between the effects associated with two, three or four types (Tukey comparisons $p > .05$). The

association between maltreatment co-occurrence and resilient capacity was slightly attenuated but remained significant after adjusting for other trauma (Step B), and became largely non-significant after adjusting for current psychological symptoms (Step C). Individuals exposed to two or three types of maltreatment had significantly lower resilient capacity relative to those with no exposure even after adjusting for psychological symptoms.

Effect of developmental timing of child maltreatment on resilient capacity (Model 3)

Exposure to any child maltreatment beginning in any age category was associated with lower resilient capacity compared to those unexposed, adjusting for socio-demographics (Table 5). Although the magnitude of association varied slightly by age at first exposure (i.e., early childhood, middle childhood and adolescence), none of the Tukey two-way comparisons were statistically significant (all $p > .05$), suggesting there was no developmental period where early maltreatment was more strongly associated with resilient capacity relative to other periods.

DISCUSSION

Five key findings emerged from this study. First, adults reporting exposure to any type of maltreatment, meaning witnessing household violence, physical, emotional or sexual abuse, had lower levels of resilient capacity in adulthood, even after accounting for socio-demographic confounders and other lifetime trauma exposure. These effects were observed for each type of maltreatment when examined individually. This finding is generally consistent with one previous cross-sectional study finding significant bivariate associations between emotional abuse, sexual abuse, and neglect in childhood and lower adult resilient capacity (measured with the CD-RISC); however no significant association was found between physical abuse and resilience (Campbell-Sills et al., 2009). Our results are also consistent with another large cross-sectional study of adolescents, which found that childhood maltreatment was negatively correlated with resilient capacity (measured with the CD-RISC; $r = -.40$, $p < .001$), however their analysis did not adjust for potential confounders (Ding et al., 2017).

Second, when comparing effects of maltreatment types after adjusting for their co-occurrence, only witnessing violence, emotional and sexual abuse were associated with lower resilient capacity; physical abuse was no longer associated. This finding differs from Campbell-Sills et al., who found that no individual maltreatment types were associated with adult resilient capacity after adjusting for their co-occurrence (correlations between maltreatment exposures in ranged from $r = .45$ - .65), suggesting any exposure to maltreatment was important, but the effect was not limited to a particular type (Campbell-Sills et al., 2009). Our findings indicate the unique effect of physical abuse on resilient capacity may be explained by co-occurring maltreatment types. However, physical abuse was less common and often co-occurred with other maltreatment types in our sample, making it difficult to detect true independent effects when co-adjusting.

Third, emotional abuse had the highest magnitude of effect on resilient capacity and remained significantly associated after adjusting for psychological distress. These findings are similar to a cross-sectional study showing associations between emotional abuse with

lower levels of positive traits (i.e., coping, stability, control), and higher levels of negative traits (i.e., anger, sensitivity, anxiety); conversely, physical abuse and neglect were associated with higher positive traits (Sudbrack, Manfro, Kuhn, de Carvalho, & Lara, 2015). While much of the association between maltreatment features and resilient capacity was explained by concurrent psychological distress, emotional abuse may have an independently negative impact on adult resilient capacity in our sample. Emotional abuses are known to disrupt the development of one's self-concept, often leading to negative self-perceptions and impairing emotion regulation (Cecil et al., 2017). This psychological impact may be especially deleterious for long-term adjustment, lowering one's confidence in their capacity to face challenge. Emotional abuse also may be more chronic than other maltreatment types thus be more noxious for future psychological functioning, though we could not assess this dimension of exposure.

Fourth, greater co-occurrence of maltreatment types was associated with lower resilient capacity in a dose response fashion. This is consistent with at least two other cross-sectional studies using the CD-RISC that also found negative, though small, correlations between resilient capacity and number of child maltreatment types ($r = -0.10$, $p < .01$) (Edwards et al., 2014) or adverse childhood events ($r = -.19$, $p < .001$) (Poole, Dobson, & Pusch, 2017). It should be noted that cumulative adversity models are limited, assuming additive and equally negative effects across maltreatment types, which may not be an appropriate assumption (Lanier, Maguire-Jack, Lombardi, Frey, & Rose, 2018). Our findings suggest that complexity of maltreatment exposure, indicated by multiple types, may be particularly noxious for adult resilient capacity.

Finally, we found no differences in resilient capacity based on age at first exposure to maltreatment; this finding is inconsistent with some research, which has identified specific effects particularly for early maltreatment on later psychopathology (Dunn et al., 2013; Dunn et al., 2017). Our results also differ from one other cross-sectional study which found that resilient capacity assessed with the CD-RISC was negatively correlated with a cumulative measure of stress occurring in adolescence, but not in childhood (Petros, Opacka-Juffry, & Huber, 2013). Discrepancies between our study and prior findings may reflect differences in the nature of maltreatment relative to other types of stressors. Maltreatment may indicate a chronic adverse environment across one's development, whereas some stressful experiences may be more acute and occur during specific developmental time periods.

Our results also highlight several important new directions for future research. We found that effects of different features of child maltreatment on resilient capacity were attenuated after adjusting for psychological distress, especially depressive symptoms. Given the cross-sectional design, we are unable to disentangle directionality, though recognize potential bidirectional influences of resilient capacity and depressive symptoms, and concurrent depressed mood may strongly influence one's perception of their resilience. Assessing the extent to which resilient capacity and depressive symptoms influence one another over time may be a promising area of inquiry for future longitudinal studies. It is possible that recent maltreatment among younger adults was more impactful for resilience capacity, relative to more distal childhood experiences among older adults, though these relationships were not

explored in the current study. Future research could examine the relative impact of more recent versus more distal exposures, especially in longitudinal contexts. Additionally, though research suggests perceptions of one's resilience may influence later psychological responses to trauma (Daniels et al., 2012; Hourani et al., 2012), further work should examine the relative importance of *perceived* capability to be resilient and more objective measures of coping strategies or available resources. This distinction between objective and subjective reporting may illuminate the ways in which perception influences manifested resilient outcomes following adversity.

Our findings provided an interesting descriptive examination of resilient capacity across different socio-demographic groups. Resilient capacity was highest among the youngest (18-25 years) and oldest groups (55+ years). This is generally reflected in the literature, as resilience tends to increase with age (Bonanno & Diminich, 2013; Campbell-Sills et al., 2009). Consistent with other findings (Campbell-Sills et al., 2009; Campbell-Sills et al., 2018), resilient capacity was associated with socioeconomic status in our sample, with those of higher education and income level reporting higher resilient capacity. Interestingly, those unemployed in our sample reported higher resilient capacity relative to those employed or on disability. This may be due to a higher proportion of young people (age 18-25) among unemployed (26.4%), compared to those employed (22.6%) and on disability (5.7%), suggesting those unemployed (e.g., students) are younger, and more likely to report higher resilient capacity.

The current study had several limitations. First, the data were collected cross-sectionally, with maltreatment and trauma reported retrospectively. However, retrospective reporting of specific forms of maltreatment is generally accurate, with exposures tending to be *under*, not *over*, reported, biasing effects towards the null (Hardt & Rutter, 2004). Age at maltreatment may be less reliably reported than presence versus absence of exposure, potentiating the role of measurement error in developmental timing models and limiting the detection of significant differences by age of exposure. Second, the maltreatment measure did not capture other forms (e.g., emotional or physical neglect) or important features (e.g., severity, frequency, chronicity) of exposure, precluding examination of these factors with resilient capacity. For example, chronic or longer-lasting maltreatment may strongly impact resilient capacity regardless of developmental time period of exposure onset. Our sample also included predominantly female African Americans with generally low socioeconomic status from one urban US city, so generalizations to other populations are limited. However, average levels of self-reported resilience in our sample are consistent with other community and clinical samples that have also used the CD-RISC10 (Campbell-Sills et al., 2009; Poole et al., 2017). This group is largely under-studied in epidemiological surveys, often experiences high levels of maltreatment, and may have worse health outcomes associated with maltreatment (Liu, Kia-Keating, & Nylund-Gibson, 2018), thus examining adversity and resilient capacity in these individuals is particularly important. Indeed, maltreatment exposure is highly prevalent in our sample, similarly reflected in other analyses of this cohort (Dunn et al., 2017; Powers, Ressler, & Bradley, 2009). Finally, we were unable to determine if people received mental health treatment following child maltreatment, which could influence both psychological distress and resilient capacity.

Despite these limitations, the current study provides more nuanced evidence regarding associations between features of child maltreatment and adult self-reported resilience in a large, community sample of African American individuals with high trauma exposure. This research adds to the growing literature of the influence of early life exposures on later resilient capacity, suggesting that features of maltreatment may be important for determining later capacity. Future research may employ methods such as latent class analyses to explore common types of maltreatment profiles, which could consider multiple maltreatment features in one model. Our findings suggest that features of child maltreatment, such as emotional abuse or accumulation of maltreatment burden, may be particularly deleterious to future adult resilience capacity and may illuminate mechanisms through which negative early life exposures impact later resiliency. It is possible that processes to build resilient capacity (e.g., promoting self-efficacy and personal competency, developing secure social support systems, providing community resources to effectively cope with stress), in addition to treatment to reduce psychological distress symptoms, may be effective to promote resiliency to future stress among individuals exposed to maltreatment. Further research should aim to understand features of maltreatment that impact later resilient capacity across different populations in longitudinal studies to inform targeted early prevention or intervention efforts, potentially promoting resilience from later life adversity.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Distribution of covariates and resilient capacity in the analytic sample (N=1962)

				Resilient Capacity			
Covariate		**N**	**%**	**Mean**	**SD**	**F-stat**	**Pairwise Comparisons**
Age	18-25	405	20.6	0.10	0.9	9.04**	18-25 vs 26-35*, 36-45*, 46-55**; 26-35 vs 56+*; 36-45 vs 56+**; 46-55 vs 56+**
	26-35	370	18.9	−0.05	1.0		
	36-45	352	17.9	−0.09	1.0		
	46-55	555	28.3	−0.16	1.1		
	56+	280	14.3	0.23	0.9		
Sex	Male	513	26.2	0.11	1.0	10.79*	
	Female	1449	73.9	−0.06	1.0		
Education	< HS	432	22.0	−0.28	1.1	24.36**	<HS vs HS grad. or GED**, >HS/college**; HS grad. or GED vs >HS/college*
	HS grad. or GED	844	43.0	−0.01	1.0		
	> HS/College grad.	686	35.0	0.14	0.9		
Household Monthly Income	$0-499	611	31.1	−0.21	1.1	19.65**	$0-499 vs $500-999*, $1,000+**; $500-999 vs $1,000+*
	$500-999	535	27.3	−0.01	1.0		
	$1,000 or more	816	41.6	0.12	0.9		
Employment Status	Employed	1051	53.6	−0.07	1.0	9.38**	Empl. vs unempl.**; Unemp. (with disab.) vs unemp.*
	Unemployed with disability	350	17.8	−0.10	1.1		
	Unemployed	561	28.6	0.14	0.8		

Analysis of Variance (ANOVA) were performed for resilience (in standardized CD-RISC10 total units [$M = 0$, $SD = 1$]) by each covariate, with F-statistics and significant pairwise comparisons. HS=high school.

* $p < .05$

** $p < .001$

Table 2.

Results from Model 1 individual linear regression analyses for the effect of child maltreatment exposure (exposed vs unexposed) on resilient capacity

Maltreatment Type		Beta	SE	F-stat	DF_{reg}	DF_{res}	R^2	ΔR^2 %
Any Child Maltreatment N=1079 (55.0%)	Step A: covariates	−0.38**	0.04	19.27	9	1952	0.08	--
	Step B: other traumatic events	−0.37**	0.05	14.58	12	1949	0.08	0.1
	Step C: depressive and PTSS	−0.09*	0.04	63.06	14	1947	0.31	23.0
Witnessing Violence N=608 (31.0%)	Step A: covariates	−0.27**	0.05	14.49	9	1952	0.06	--
	Step B: other traumatic events	−0.25**	0.05	11.37	12	1949	0.07	0.3
	Step C: depressive and PTSS	−0.07	0.04	62.79	14	1947	0.31	25.0
Physical Abuse N=370 (18.9%)	Step A: covariates	−0.32**	0.06	14.38	9	1952	0.06	--
	Step B: other traumatic events	−0.30**	0.06	11.29	12	1949	0.07	0.3
	Step C: depressive and PTSS	0.01	0.05	62.54	14	1947	0.31	25.0
Emotional Abuse N=484 (24.7%)	Step A: covariates	−0.47**	0.05	20.84	9	1952	0.09	--
	Step B: other traumatic events	−0.46**	0.05	15.88	12	1949	0.09	0.1
	Step C: depressive and PTSS	−0.11*	0.05	63.09	14	1947	0.31	22.0
Sexual Abuse N=592 (30.2%)	Step A: covariates	−0.31**	0.05	15.48	9	1952	0.07	--
	Step B: other traumatic events	−0.30**	0.05	12.00	12	1949	0.07	0.2
	Step C: depressive and PTSS	−0.04	0.05	62.62	14	1947	0.31	24.0

Cells are beta coefficients, standard error (SE), F-statistic from model ANOVA and degrees of freedom (F-stat, $DF_{regression}$, $DF_{residual}$), proportion of variance explained (R^2), and percent change in R^2 from prior model (ΔR^2 %). 15 linear regression models assessed effects of exposure to any child maltreatment (at least one type) or each maltreatment types (0 = never exposed; 1 = exposed) on resilient capacity (standardized CD-RISC10 units). Step A) age, sex, education, income, and employment status, Step B) adds other traumatic event exposure, and Step C) adds continuous depressive and PTSS.

PTSS = posttraumatic stress symptoms.

* $p < .05$

** $p < .001$; all F-stats significant at $p < .001$

Table 3.

Results from Model 1 linear regression analyses for the effects of all types of child maltreatment exposure (exposed vs unexposed) co-adjusted on resilient capacity

	Maltreatment Type	Beta	SE	F-stat	DF_{reg}	DF_{res}	R^2	ΔR^2 %
Step A: covariates	**Witnessing Violence**	−0.12 *	0.05	17.72	12	1949	0.10	--
	Physical Abuse	−0.07	0.06					
	Emotional Abuse	−0.36 **	0.06					
	Sexual Abuse	−0.17 **	0.05					
Step B: other traumatic events	**Witnessing Violence**	−0.12 *	0.05	14.25	15	1946	0.10	0.1
	Physical Abuse	−0.07	0.06					
	Emotional Abuse	−0.35 **	0.06					
	Sexual Abuse	−0.17 **	0.05					
Step C: depressive and PTSS	**Witnessing Violence**	−0.05	0.04	52.08	17	1944	0.31	21.0
	Physical Abuse	0.06	0.05					
	Emotional Abuse	−0.11 *	0.05					
	Sexual Abuse	−0.02	0.05					

Cells are beta coefficients, standard error (SE), F-statistic from model ANOVA and degrees of freedom (F-stat, $DF_{regression}$, $DF_{residual}$), proportion of variance explained (R^2), and percent change in R^2 from prior model (ΔR^2 %). 3 linear regression models assessed effects of exposure to each of four maltreatment types (0 = never exposed; 1 = exposed) on resilient capacity (standardized CD-RISC10 units). Step A) age, sex, education, income, and employment status, Step B) adds other traumatic event exposure, and Step C) adds continuous depressive and PTSS.

PTSS = posttraumatic stress symptoms.

* $p < .05$

** $p < .001$; all F-stats significant at $p < .001$

Table 4.

Results from the set of Model 2 linear regression analyses for child maltreatment exposure co-occurrence on resilient capacity

	Count of Maltreatment	N	%	Beta	SE	F-stat	DF_{reg}	DF_{res}	R^2	ΔR^2 %
Step A: covariates	**0 types**	883	45.0	Ref	Ref	17.09	12	1949	0.10	--
	1 type	483	24.6	−0.21[a]**	0.05					
	2 types	317	16.2	−0.46**	0.06					
	3 types	179	9.1	−0.55**	0.08					
	4 types	100	5.1	−0.63**	0.10					
Step B: other traumatic events	**0 types**	883	45.0	Ref	Ref	13.75	15	1946	0.10	0.1
	1 type	483	24.6	−0.21[a]**	0.06					
	2 types	317	16.2	−0.45**	0.06					
	3 types	179	9.1	−0.55**	0.08					
	4 types	100	5.1	−0.62**	0.10					
Step C: depressive and PTSS	**0 types**	883	45.0	Ref	Ref	52.09	17	1944	0.31	22.0
	1 type	483	24.6	−0.07	0.05					
	2 types	317	16.2	−0.13*	0.06					
	3 types	179	9.1	−0.15*	0.07					
	4 types	100	5.1	−0.01	0.10					

Cells are sample size (N, %), beta coefficients, standard error (SE), F-statistic from model ANOVA and degrees of freedom (F-stat, $DF_{regression}$, $DF_{residual}$), proportion of variance explained (R^2), and percent change in R^2 from prior model (ΔR^2 %). 3 linear regression models assessed effects of co-occurrence of child maltreatment - number of maltreatment types; categorical (0 [reference], 1, 2, 3, or 4 types) - on resilience (standardized CD-RISC10 units). Step A) age, sex, education, income, and employment status, Step B) adds other traumatic event exposure, and Step C) adds continuous depressive and PTSS.

[a]Significant post-hoc Tukey comparisons (p<.05) for the effects of 1 maltreatment type versus each other maltreatment co-occurrence level (i.e., 2, 3, 4); no other pairwise comparisons were significant (e.g., 2 vs 3).

PTSS = posttraumatic stress symptoms.

*$p < .05$

**$p < .001$; all F-stats significant at $p < .001$

Table 5.

Results from the set of Model 3 linear regression analyses for the effect of age at first exposure to child maltreatment on resilient capacity

	Age at First Exposure	N	%	Beta	SE	F-stat	DF_{reg}	DF_{res}	R^2	ΔR^2 %
Step A: covariates	**Unexposed**	883	45.0	Ref	Ref	16.06	11	1950	0.08	--
	Early Childhood (age 0-5)	302	28.0	−0.46**	0.06					
	Middle Childhood (age 6-10)	534	49.5	−0.34**	0.05					
	Adolescence (age 11-18)	243	22.5	−0.35**	0.07					
Step B: other traumatic events	**Unexposed**	883	45.0	Ref	Ref	12.72	14	1947	0.08	0.1
	Early Childhood (age 0-5)	302	28.0	−0.45**	0.07					
	Middle Childhood (age 6-10)	534	49.5	−0.33**	0.05					
	Adolescence (age 11-18)	243	22.5	−0.34**	0.07					
Step C: depressive and PTSS	**Unexposed**	883	45.0	Ref	Ref	55.18	16	1945	0.31	23.0
	Early Childhood (age 0-5)	302	28.0	−0.10	0.06					
	Middle Childhood (age 6-10)	534	49.5	−0.07	0.05					
	Adolescence (age 11-18)	243	22.5	−0.12*	0.06					

Cells are sample size (N, %), beta coefficients, standard error (SE), F-statistic from model ANOVA and degrees of freedom (F-stat, $DF_{regression}$, $DF_{residual}$), proportion of variance explained (R^2), and percent change in R^2 from prior model (ΔR^2 %). 3 linear regression models assessed effects of age at first exposure to maltreatment, relative to unexposed, on resilient capacity (standardized CD-RISC10 units). Step A) age, sex, education, income, and employment status, Step B) adds other traumatic event exposure, and Step C) adds continuous depressive and PTSS.

PTSS = posttraumatic stress symptoms.

* $p < .05$

** $p < .001$; all F-stats significant at $p < .001$