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An effective measure of childhood adversity that is valid with older adults

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ABSTRACT

Childhood adversity (CA) has life-long effects that we are just beginning to understand. The Midlife in the United States (MIDUS) data is a rich resource that could contribute to the knowledge of the impact of CA in the later years but, while a number of CA items are included in MIDUS, a cumulative CA scale based on those items has not been created. Development of a CA scale would create numerous research opportunities within MIDUS and overcome some of the challenges of using a secondary dataset. The present study aimed to demonstrate that a cumulative measure of CA that is valid with older adults could be created using retrospective MIDUS Refresher study data (Ryff et al., 2016); analysis included data collected from 2011 to 2014 from 2542 adults ages 23–76 (1017 adults 55–76). The present study provided a rationale for which measures of CA to include in a cumulative scale. The distribution of eight types of CA and the cumulative CA scale were consistent with findings from past studies of CA. The factor structure of the cumulative CA scale was similar to the original ACE study and included two factors: household dynamics and child abuse/neglect. Consistent with past studies, the CA scale predicted a negative association with life satisfaction and a positive association with number of chronic conditions. This study demonstrated that an effective cumulative measure of CA could be created that would be of value to other studies using MIDUS data to explore outcomes with older adults.

1. Introduction

Current literature found that early traumatic experiences have long-lasting repercussions across the life span, influencing our health as adults, the incidence of chronic disease, and quality-of-life indicators (e.g., Alwin, 2012; Braveman & Barclay, 2009; Schafer, Ferraro, & Mustillo, 2011). Understanding childhood adversity (CA) has become instrumental to public health efforts to address the root causes of health disparities (Braveman & Barclay, 2009; Centers for Disease Control & Prevention (CDC), 2013). Childhood adversities include abuse and neglect, parental psychopathology, and other stressful life events (Cuijpers et al., 2011). In research across numerous study populations, childhood adversity (CA) has been associated with a wide variety of outcomes, including: lower health-related quality of life in adulthood (Corso, Edwards, Fang, & Mercy, 2008), higher disease burden and multimorbidity (Tomasdottir et al., 2015), and mental health challenges (Hughes, Lowey, Quigg, & Bellis, 2016), as well as behavioral health risk factors, sexual and reproductive health issues, and substance abuse (Anda et al., 2006).

The seminal Adverse Childhood Experiences (ACE) study examined CA experiences reported retrospectively by 17,337 adults 18 and older (approximately 1/3 were 65 and older) with health insurance in San Diego, CA (Anda et al., 2006; Centers for Disease Control & Prevention (CDC) & Kaiser, 2016; Felitti et al., 1998). These 10 ACEs were emotional, physical, and sexual abuse and

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emotional and physical neglect as well as household dynamics including alcohol or substance abuse in the home, mental illness of a household member, domestic violence, criminal behavior of a household member, and parental separation or divorce (Anda et al., 2006; Centers for Disease Control & Prevention (CDC) & Kaiser, 2016). The study found that 64% experienced at least one ACE and 13% experienced four or more (Anda et al., 2006; Centers for Disease Control & Prevention (CDC) & Kaiser, 2016). The researchers created a cumulative score of the 10 ACEs and found a strong, graded relationship between the ACE score and 18 different health outcomes (Anda et al., 2006; Centers for Disease Control & Prevention (CDC) & Kaiser, 2016). As the cumulative ACE score increased, disease prevalence and comorbidity increased as well (Anda et al., 2006). High ACE scores have also been associated with premature mortality (Anda, Butchart, Felitti, & Brown, 2010). Longitudinal analysis of mortality records of the original ACE participants found that people with six or more ACEs died an average of nearly 20 years earlier than those without any ACEs (Brown et al., 2009).

Friedman, Montez, Sheehan, Guenewald, and Seeman, 2015 used the nationally representative MIDUS dataset to explore whether the type of adverse childhood event, timing of event, or quantity of events was most strongly associated with cardiometabolic health as an adult. Their research replicated the dose-response relationship seen with the original ACE study cumulative score (Anda et al., 2006; Centers for Disease Control & Prevention (CDC) & Kaiser, 2016). In their study of Philadelphia respondents ages 18–97 years, Wade et al. (2016) used the original 10 ACEs and added experiences including racism, being a witness to violence, bullying, being in foster care, and unsafe neighborhoods. For the original 10 ACEs, the researchers found dose-response relationships consistent with the original ACE study (Anda et al., 2006; Centers for Disease Control & Prevention (CDC) & Kaiser, 2016). The additional factors, which they labeled community-level stressors, were not as strongly associated with health outcomes, which the researchers concluded reinforced the importance of family-level dynamics during childhood (Wade et al., 2016).

The nationally representative MIDUS Refresher study is a rich dataset providing opportunities for researchers to explore a broad array of issues of importance to adults. Life satisfaction is a common outcome of interest in research about successful aging (Banjare, Dwivedi, & Pradhan, 2015; Douglass & Duffy, 2015; Krause, 2016; Roh et al., 2015; Skarupski, Fitchett, Evans, & Mendes de Leon, 2013; Zlatar et al., 2015). Measures of life satisfaction allow respondents to use their own evaluations to judge their lives on a general level rather than in specific domains (Pavot & Diener, 1993). Life satisfaction involves an assessment of how well desired goals and actual outcomes have matched (Krause, 2004). Previous studies have established the effect of cumulative adversity, which included childhood experiences as well as adult adverse experiences, on life satisfaction (Krause, 2004; Seery, Holman, & Silver, 2010). Additional literature has shown that life satisfaction is negatively associated specifically with early adversity (e.g., Hughes et al., 2016; Nurius, Logan-Greene, & Green, 2012).

Extant literature has shown that cumulative CA influences a variety of health outcomes across the lifespan. Analyses from the original ACE study showed that the ACE score increased the risk for adults of autoimmune disease such as arthritis and myocarditis (Dube, Felitti, Dong, Giles, & Anda, 2003), health problems, including depression and alcoholism (Anda et al., 2006; Dube et al., 2009), and problems with sleep and obesity (Anda et al., 2006). Furthermore, other studies reinforced the understanding of a strong relationship between difficult childhoods and experiences of co-occurring problems, or multimorbidity (Anda et al., 2006; Schafer & Ferraro, 2012; Tomasdottir et al., 2015). Adults who experienced maltreatment in childhood show a curvilinear pattern by age in their personal assessments of health-related quality of life (HRQoL; Corso et al., 2008). Age is also associated with increased comorbidity of disease (Calland, Xin, & Stukenborg, 2013).

Using this secondary dataset, researchers interested in the long-reaching impacts of CA must use existing questions rather than designing a questionnaire to their own specifications. Researchers have selected a variety of existing MIDUS Refresher measures to operationalize experiences of CA, either independently or as a cumulative score, in various publications (e.g., Ferraro, Schafer, & Wilkinson, 2016; Friedman et al., 2015; Gruenewald et al., 2012; Jung, 2017; Savla et al., 2013; Schafer et al., 2011; Turiano, Silva, McDonald, & Hill, 2017). Extant literature has shown that a cumulative measure of CA is an important research variable because it is predictive of negative outcomes; furthermore, these relationships are present when variables other than those in the original ACE study are used (Centers for Disease Control & Prevention (CDC) & Kaiser, 2016; Institute on Aging, 2011; Schafer et al., 2011; Schilling, Aseltine Jr., & Gore, 2007). The literature does not show, however, a consistent rationale for which or how many measures to use, or for creating a cumulative measure (Anda et al., 2006; Centers for Disease Control & Prevention (CDC) & Kaiser, 2016). Although the long-reaching impact of CA has been documented (e.g., Alwin, 2012; Anda et al., 2006; Braveman & Barclay, 2009; Schafer et al., 2011), the literature has not provided results that specifically examine later life (e.g., Chartier, Walker, & Naimark, 2010; Schafer et al., 2011). Furthermore, the literature offers few examples of the use of a cumulative CA score specifically among older adults.

1.1. Present study

The lack of a measure of CA based on available MIDUS items that has been shown to be valid with older adults decreases the meaningful use of this rich data source to explore the impact of CA in later life. This study addressed this gap in the literature, and created a cumulative measure of CA using the secondary MIDUS Refresher dataset that is effective for older adults. The present study had two primary objectives. The first was to create a cumulative *CA score* for older adults (ages 55–76) using MIDUS data and to explore its factor structure. The second was to establish convergent construct validity of the scale by demonstrating consistency with the ACEs literature regarding previous findings that *CA score* is an effective measure in predicting life satisfaction and experience of chronic conditions (e.g., Anda et al., 2006; Hughes et al., 2016; Tomasdottir et al., 2015). In these studies, cumulative *CA score* was inversely related to *life satisfaction*. In addition, cumulative *CA score* was positively related to number of *chronic conditions*.

2. Methods

2.1. Sample and design

The sample for this study comes from the National Survey of Midlife Development in the United States (MIDUS) Refresher collected from 2011 to 2014 (Lein, 2015). Two independent national probability samples of non-institutionalized, English-speaking adults ages 25–54 and 55–75 in the United States were conducted utilizing a landline random digit dialing sample, a random cell phone sample, and an age-targeted sample with the goal of recruiting participants evenly distributed by gender and age groups (Lein, 2015). A small number of participants who slightly exceeded the target age range for the study were included in the dataset (Ryff et al., 2015a). A total of 3577 adults completed the initial telephone interview, and 2600 completed the follow-up mail questionnaire (Lein, 2015). Data were analyzed using a weight variable calculated by the Inter-university Consortium for Political and Social Research as a combination of a sample-design weight and a post-stratification weight to align with distributions from the U.S. Census Bureau's Current Population Survey (Palit, Radler, & Lein, 2016). With the weight and filter applied, the valid N for analysis of all participants who completed the phone and mail questionnaires was 2542. Because extant literature shows early mortality among adults with the highest ACE scores (Brown et al., 2009), the definition of "older adults" in the present study was determined to be ages 55–76. In the sample, 1017 (40%) were older adults ages 55–76.

2.2. Independent variables

2.2.1. Childhood adversity (CA)

Although the MIDUS Refresher survey (Ryff et al., Ryff et al., n.d.-a, Ryff et al., n.d.-b, 2015b) did not include an adverse childhood experiences scale, many variables were available that captured traumatic experiences in childhood. In selecting variables for the present study, the original 10 ACE items served as a point of departure (Centers for Disease Control & Prevention (CDC) & Kaiser, 2016). Another reference point was other CA studies and studies using MIDUS data to explore childhood adversities. Some variables used in other research (i.e., school-related variables in Friedman et al., 2015 and Schilling, Aseltine, & Gore, 2007; or having had poor physical or mental health at age 16 in Turiano et al., 2017) were not included in the present measure because these issues could be outcomes of CA (e.g., as the result of altered physiology, brain development, and coping mechanisms; Hébert, Langevin, & Oussaïd, 2018). Health issues in childhood and adolescence can also be associated with traumatic experiences and exposure to toxic stress (e.g., Buske-Kirschbaum et al., 2013; Goldsmith, Chesney, Heath, & Barlow, 2013; Shapiro & Nguyen, 2010), and thus could be confounding variables.

Table 1 presents the variables selected to capture CA in the present study. The MIDUS variables were recoded to create eight dichotomous CA domains (with a "1" indicating the presence of this CA for the individual). The variables are described as representing a standard ACE variable, an adapted version of a standard ACE variable, or a non-standard ACE variable. The variables are categorized according to the factors described within the original ACE study: household challenges, child abuse, and child neglect (Centers for Disease Control & Prevention (CDC) & Kaiser, 2016).

MIDUS variables did exist that could closely capture several of the standard ACEs (Centers for Disease Control & Prevention (CDC) & Kaiser, 2016; Dong et al., 2004). For example, the standard ACE item for emotional abuse was, "How often did a parent, stepparent, or adult living in your home ever swear at you, insult you, or put you down?" and "How often did a parent, stepparent, or adult living in your home act in a way that made you afraid that you might be physically hurt?" (Dong et al., 2004). Participants who responded "often" or "very often" to either question were marked positive for emotional abuse in childhood (Dong et al., 2004). In the present study, the MIDUS Refresher variables used to capture emotional abuse described similar experiences (Ryff et al., n.d.-b) and responses of "often" were marked as a positive for this CA. Other researchers using MIDUS data included some of the same CA variables in their analyses but treated them differently. For example, some researchers (e.g., Jung, 2017; Savla et al., 2013; Schafer et al., 2011) included physical abuse or emotional abuse during childhood perpetrated by a sibling. In order to maintain consistency with the standard ACE questions, abuse by parents or parental figures was the focus for capturing physical and emotional abuse and emotional neglect and sibling data were not utilized. Through these processes, four of the standard ACE variables were operationalized very similarly for the present study (i.e., substance abuse in the home, emotional abuse by an adult in the home, physical abuse by an adult in the home, and emotional neglect by an adult in the home). There were no variables available to represent the standard ACE domains of domestic violence in the home, mental illness in the home, having a parent who was incarcerated, or physical neglect.

For two additional ACEs (i.e., parents separated or divorced, sexual abuse; Centers for Disease Control & Prevention (CDC) & Kaiser, 2016; Dong et al., 2004), adapted versions were created using MIDUS variables that captured the intent of the standard ACEs (i.e., did not live with both biological parents until age 16, sexual assault). Other researchers used MIDUS variables representing parental divorce, death of a parent, or lacking a male head of household (e.g., Ferraro et al., 2016; Schafer et al., 2011; Turiano et al., 2017). However, in the present study, the variable *did not live with both biological parents until age 16* was selected to represent a CA because it reflected considerations of disrupted child-adult relationships and strain in the household that could contribute to toxic stress. Additionally, this variable comprises the other circumstances (i.e., death of a parent, separation, divorce, adoption, and other factors) and is thus a more comprehensive measure (Ryff et al., n.d.-b). For the other adapted standard ACE, the MIDUS variable capturing whether a respondent experienced *sexual assault* before the age of 18 was selected. Compared to the standard ACE variable of childhood sexual abuse (Ryff et al., n.d.-b), this CA provided a smaller prevalence in the present study.

Although the original ACE questionnaire continues to serve as a reference point for research, many studies have used different operationalizations of CA and have shown that the power of the ACE study was in its use of a cumulative measure of CA rather than in

Table 1
MIDUS Refresher Questionnaire Items Selected to Represent Childhood Adversities.

ACE Study Area	Type of ACE Question[b]	Childhood Adversity (CA) Type	Items (Ryff et al., n.d.-a, n.d.-b, 2015b)
Household dynamics	Adapted standard	Not bio parents until 16	"Did you live with both of your biological parents up until you were 16?" Response: Yes, *No*[a]
Household dynamics	Standard	Substance abuse in home	"Experiences you have had as a child or teenager: One or both parents drank so often it caused problems." Response: *Checked* & happened *< 18 years of age* OR "Experiences you have had as a child or teenager: One or both parents used drugs so often it regularly caused problems." Response: *Checked* & happened *< 18 years of age* OR "When you were growing up, that is during your first 16 years, did you live with anyone who was a problem drinker or alcoholic?" Response: *Yes*, No
Household dynamics	Non-standard	Financial distress	"Experiences you have had as a child or teenager: Father or mother did not have a job when they wanted to be working." Response: *Checked* & happened *< 18 years of age* OR "During your childhood and adolescence, was there ever a period of six months or more when your family was on welfare or ADC?" Response: *Yes*, No OR "Thinking back to your family's financial situation when you were growing up, was your family better off or worse off financially than the average family was at that time?" Response: A lot better off, Somewhat better off, A little better off, Same as average family, A little worse off, *Somewhat worse off, A lot worse off*
Household dynamics	Non-standard	Moved frequently	"When you were growing up, how many times did you move to a totally new neighborhood or town?" Response: scores of *3 or more times*
Child abuse	Adapted standard	Sexual assault	"Experiences you have had as a child or teenager: Sexually assaulted (e.g., forced sexual intercourse or other unwanted sexual contact)." Response: *Checked* & happened *< 18 years of age*
Child abuse	Standard	Emotional abuse	"When you were growing up, how often did your mother, or the woman who raised you, insulted you or swore at you; sulked or refused to talk to you; stomped out of the room; did or said something to spite you; threatened to hit you; smashed or kicked something out of anger?" Response: *Often*, Sometimes, Rarely, Never OR "When you were growing up, how often did your father, or the man who raised you, insulted you or swore at you; sulked or refused to talk to you; stomped out of the room; did or said something to spite you; threatened to hit you; smashed or kicked something out of anger?" Response: *Often*, Sometimes, Rarely, Never
Child abuse	Standard	Physical abuse	Physical abuse: "When you were growing up, how often did your mother, or the woman who raised you, pushed, grabbed, or shoved you; slapped you; threw something at you?" Response: *Often*, Sometimes, Rarely, Never OR Physical abuse: "When you were growing up, how often did your father, or the man who raised you, pushed, grabbed, or shoved you; slapped you; threw something at you?" Response: *Often*, Sometimes, Rarely, Never OR Severe physical abuse: "When you were growing up, how often did your mother, or the woman who raised you, kicked, bit, or hit you with a fist; hit or tried to hit you with something; beat you up; choked you; burned or scalded you?" Response: *Often, Sometimes, Rarely*, Never OR Severe physical abuse: "When you were growing up, how often did your father, or the man who raised you, kicked, bit, or hit you with a fist; hit or tried to hit you with something; beat you up; choked you; burned or scalded you?" Response: *Often, Sometimes, Rarely*, Never
Child neglect	Adapted standard	Emotional neglect	Parental Affection Scale (Ryff et al., 2015b), comprising means of 7 items from a maternal affection scale and 7 items from a paternal affection scale, coded so higher scores reflected greater levels of affection received during childhood (i.e., rating of your relationship, understood problems and worries, could confide in about things that were bothering you, gave you love and affection, gave you time and attention, put effort into watching over you and making sure you had a good upbringing, taught you about life). Response: scores of *2.00 or less*

Note: *Italicized* text describes which responses were treated as a childhood adversity.

[a] Reasons for *No responses* include mother or father died, parents separated/divorced, parents never lived together or never knew biological mother/father, and adoption.

[b] Compared to Adverse Childhood Experience (ACE) types reported in Anda et al. (2006).

exactly which CAs were selected (e.g., Anda et al., 2006; Friedman et al., 2015; Wade et al., 2016). For the selection of additional childhood adversities not included in the standard ACE questionnaire, MIDUS variables were utilized that captured other experiences that could contribute to toxic stress in a household (Corso et al., 2008; Schore, 2001). Financial distress (e.g., Gruenewald et al., 2011; Schafer & Ferraro, 2012; Schilling et al., 2007) and frequent moves (e.g., Institute on Aging, 2011; Oishi & Schimmack, 2010) can cause or reflect significant stress in the household. Though other researchers using MIDUS data included some of the same financial distress variables in their analyses, they treated them differently. For example, Schafer et al. (2011) looked at receipt of welfare and being worse off financially separately, and gave each a count of one in their cumulative CA score. In the present study, these two

experiences were combined with that of having a parent who was unemployed but wanted to be working as a collective measure of financial distress. The financial distress measure in the present study was a single measure where a person who experienced one, two, or all three of these aspects of financial distress was coded positively for this CA.

2.3. Dependent variables

The present study included two dependent variables shown in previous literature to be negatively impacted by CA: *life satisfaction* (e.g., Hughes et al., 2016) and comorbidity of *chronic conditions* (e.g., Anda et al., 2006; Tomasdottir et al., 2015). These variables represented outcomes commonly presented as being associated with childhood adversity that were also available in the MIDUS Refresher dataset.

2.3.1. Life satisfaction

For the present study, an index measure of *life satisfaction* provided in the MIDUS Refresher dataset was selected in order to provide greater variance for analyses (Ryff et al., 2015b). The index combined six variables from the self-administered questionnaire in which respondents used a scale from 0 being "the worst possible" and 10 being "the best possible" to rate their current: life overall, work, financial situation, health, relationship with a spouse/partner, and relationship with children (Ryff et al., 2015b). The index score was an average of the six items (with spouse/partner and children combined into one item) and had strong reliability ($\alpha = 0.717$) (Ryff et al., 2015b).

2.3.2. Chronic conditions

Examining the relation of cumulative CA score to the number of *chronic conditions* experienced in the previous 12 months can serve as a way to validate the CA measure. The present study combined different variables to assess 42 chronic conditions. A calculated variable available in the MIDUS Refresher dataset comprised a count of Yes responses to any of 39 chronic conditions experienced in the past 12 months (Ryff et al., 2015b; Ryff et al., n.d.-b). Examples of conditions included: asthma; arthritis or other bone or joint diseases; recurring backache; persistent skin trouble; thyroid disease; recurring stomach trouble; gall bladder trouble; AIDS or HIV infection; lupus or other autoimmune disorders; persistent trouble with teeth; high blood pressure; anxiety; drug problems; migraine headaches; chronic sleeping problems; diabetes or high blood sugar; neurological disorders; and stroke. In addition to the 39 conditions, three more conditions were included – ever experiencing cancer, ever having heart trouble suspected or confirmed by a doctor, and currently being obese (i.e., calculated BMI based on height and weight of 30.0 or greater; Centers for Disease Control & Prevention (CDC), 2016b). The composite variable, *chronic conditions*, comprised answers to any of these 42 conditions.

2.4. Control variable

2.4.1. Age

Age of participant was included in this study as a control variable in the hierarchical regression in order to remove variance in the dependent variables associated with age among older adults (ages 55–76).

2.5. Statistical analyses

Analyses were conducted using IBM SPSS Statistics software (version 24). Analysis for creating a cumulative score from the CA variables included descriptive statistics, bivariate correlations, and factor analysis. The two hypotheses were tested using hierarchical multiple regression (controlling for *age* in Model 1 and examining additional variance attributed to cumulative *CA score* in Model 2; DV = *life satisfaction*, number of *chronic conditions*).

Older adults who had a missing response for any of the CA variables were included in the analysis and coded as not having the CA, which provided a more conservative estimate of prevalence (Reiser, McMillan, Wright, & Asmundson, 2014). No data were missing in the index for *life satisfaction* and missing data for number of *chronic conditions* (1.6%) was low. Assumptions of regression for the dataset were examined: normality, linearity, homoscedasticity, and tolerance/absence of multicollinearity. A cumulative *CA score* was created as a count of each individual's responses to eight adverse experiences in childhood. According to Comrey and Lee (1992), the sample size of 1017 was good for performing exploratory factor analysis (EFA). EFA was conducted to explore the pattern of relationships between the eight binary CAs and identify subcomponents (Lam & Lee, 2014). EFA identified two factors within *CA score*, and a cumulative variable for each factor was created. Variables lacking sufficiently normal distributions to run regression were transformed after which the necessary assumptions for regression were satisfied.

3. Results

Descriptive statistics for older adults and the total sample in the MIDUS Refresher dataset are provided in Table 2. A larger proportion of older adults were retired than total adults, but were similar in marital status, race/ethnicity, education, and income. Compared to the total sample, older adults had higher average life satisfaction. Older adults also had more chronic conditions, on average. Table 3 shows prevalence of the eight types of CA for older adults and total adults, with comparison data from other studies of CA. Older adults had a smaller average CA score compared to the total sample. The most common types of CA were moving

Table 2
Characteristics of Older Adults in MIDUS Refresher Dataset.

Demographic Variables	Older Adults Ages 55–76 (N = 1017) M (SD) / % (N)	Total Adults Ages 23–76 (N = 2542) M (SD) / % (N)
Age	64.5 (5.7)	50.6 (13.6)
Male	48.0% (488)	45.7% (1163)
Currently married or cohabiting	68.0% (692)	68.8% (1749)
Working now	34.2% (328)	56.7% (1316)
Retired	45.6% (437)	19.4% (451)
Not Hispanic	97.5% (991)	96.1% (2436)
White	87.7% (889)	83.5% (2114)
4-year degree or higher	33.1% (337)	35.2% (893)
Annual pretax income	$46,074 ($45,495)	$45,663 ($45,791)
Life satisfaction[a]	7.4 (1.5)	7.1 (1.6)
Low life satisfaction (> 1 SD below mean)	15.1% (153)	15.7% (400)
Chronic conditions[b]	4.3 (3.4)	3.6 (3.6)
5+ chronic conditions	39.1% (391)	29.7% (736)

[a] Rating on a 10-point scale, life satisfaction, after reverse coding: 0 = Worst possible to 10 = Best possible; the response range was 1.5–10.0 for older adults and 0.5–10.0 for the full sample.

[b] Out of 42 possible chronic conditions comprising the composite index, the response range was 0–21 for older adults and 0–27 for the full sample.

Table 3
Prevalence of Childhood Adversities Experienced by Older Adults (Ages 55–76) Compared to Previous Study Data.

Childhood Adversity (CA) Variables	Older Adults M (SD) / % (N)	Total Adults M (SD) / % (N)	Comparison %
1. Not bio parents until 16	17.2% (175)	26.3% (667)	23.3%[a]
2. Substance abuse in home	24.6% (250)	26.1% (662)	26.9%[a,b]
3. Financial distress	21.9% (223)	25.7% (653)	17.6%[c]
4. Moved 3+ times	29.7% (302)	31.1% (790)	27%[d]
5. Sexual assault	5.4% (55)	7.2% (182)	20.7%[a,e]
6. Emotional abuse	12.4% (126)	13.3% (339)	10.6%[a]
7. Physical abuse	20.3% (207)	20.7% (527)	28.3%[a]
8. Emotional neglect	8.4% (86)	9.4% (239)	14.8%[a]
Cumulative CA score[f]	1.4 (1.5)	1.6 (1.6)	–
0 CAs	35.0% (356)	31.2% (793)	36.1%[a]
1-3 CAs	54.0% (550)	54.9% (1396)	51.4%[a]
4+ CAs	11.0% (112)	13.9% (353)	12.5%[a]

[a] ACE Study of adults ages 18 and older in San Diego, CA (CDC & Kaiser, 2016); approximately 1/3 of participants were ages 65 and older when the study began (Felitti et al., 1998).

[b] Comparison data represents “parents divorced or separated.”.

[c] Study of high school seniors in Boston CMSA (Schilling et al., 2007); other studies using financial distress measures did not report prevalence: “mother or father out of work for a long time” in a study of older adults ages 65 and older (Krause, 2004); “socioeconomic index” and “occupational status rubric” in a study of at-risk urban children selected based on poverty status (Appleyard et al., 2005).

[d] MIDUS study of adults 25–74 (Institute on Aging, 2011).

[e] Comparison data represents “sexual abuse.”.

[f] Out of 8 possible childhood adversities (CA) comprising the *CA score*, the range was 0–8.

frequently during childhood (29.7% for older adults and 31.1% for total adults), followed by substance abuse in the home (24.6% for older adults and 26.1% for total adults). Table 4 shows the correlations among the eight types of CA for older adults. CA types were significantly correlated (except for sexual assault, which was correlated with five of the other seven), with the highest correlation between emotional abuse and physical abuse (0.51).

3.1. Creating an effective CA score

Negative experiences often co-occur, and it can be difficult to determine the impact of any single event over the life course (Seery et al., 2010). One approach by researchers of early traumatic experiences has been to explore the relationship between the total number of different adversities a child has experienced and various outcomes (Seery et al., 2010). Studies using composite scales of CA have found strong, graded relationships such that an increase in the total number of adversities has been predictive of worse outcomes in mental and physical health (e.g., Anda et al., 2006; Friedman et al., 2015; Seery et al., 2010; Wade et al., 2016).

In the present study, CA was operationalized using available MIDUS variables in eight areas. Since variables were not dichotomous initially, each CA area was recoded as a binary variable (a “1” represented that the individual had experienced that CA area). Extant literature regarding CA shows that, within an additive variable or an index capturing a latent construct, the items may cluster

Table 4
Correlations Among Types of Childhood Adversity for Older Adults.

Childhood Adversity (CA) Variables	Correlations Among Types of CA in Present Study							
	1	2	3	4	5	6	7	8
1. Not bio parents until 16	1.00	–	–	–	–	–	–	–
2. Substance abuse in home	0.14**	1.00	–	–	–	–	–	–
3. Financial distress	0.19**	0.22**	1.00	–	–	–	–	–
4. Moved 3+ times	0.12**	0.11**	0.22**	1.00	–	–	–	–
5. Sexual assault	0.11**	0.04	0.10**	0.05	1.00	–	–	–
6. Emotional abuse	0.12**	0.11**	0.18**	0.14**	0.15**	1.00	–	–
7. Physical abuse	0.08*	0.10**	0.13**	0.12**	0.13**	0.51**	1.00	–
8. Emotional neglect	0.22**	0.14**	0.23**	0.17**	0.20**	0.34**	0.31**	1.00

*p < .05; **p < .01; Note: Significance of correlations were examined using Phi coefficients as a measure of association.

Table 5
Rotated Exploratory Factor Analysis Loadings of Childhood Adversity Items for Older Adults and Total Adults.

Items	Older Adults		Total Adults	
	Factor 1 "household dynamics"	Factor 2 "child abuse and neglect"	Factor 1 "household dynamics"	Factor 2 "child abuse and neglect"
Did not live with both biological parents until 16	**0.570**	0.097	**.707**	.008
Substance abuse in home	**0.598**	0.019	**.551**	.128
Financial distress	**0.694**	0.131	**.629**	.135
Moved 3+ times	**0.518**	0.128	**.579**	.168
Sexual assault	0.092	**0.389**	.222	.289
Emotional abuse	0.075	**0.808**	.095	**.794**
Physical abuse	−0.006	**0.812**	.019	**.794**
Emotional neglect	0.345	**0.590**	.210	**.658**

Note: Bolded factor loadings in each column correspond to that factor.

into fewer constructs, or factors. The original ACE study results have sometimes been labeled using three categories – abuse, neglect, and household dysfunction – but have not been accompanied by analytical evidence for the use of the three categories (Centers for Disease Control & Prevention (CDC) & Kaiser, 2016; Dong et al., 2004). Furthermore, the Centers for Disease Control and Prevention (CDC) (2016a) BRFSS ACE module adapted the original ACE study to being a telephone survey but did not retain the emotional or physical neglect questions, instead using a version of the ACE study that included 9 different types of CA instead of 10 (separating alcohol abuse and drug abuse into two different types). An analysis of 2009–2010 BRFSS ACEs data by Ford et al. (2014) using factor loadings of 0.40 or greater generated a three-factor solution comprising household dysfunction, physical/emotional abuse, and sexual abuse that was consistent for gender and across age groups (18–34 years, 35–49 years, 50–64 years, > 65 years).

In the present study, unrotated factor analysis of the eight factors comprising the *CA score* showed two components with an Eigenvalue greater than 1, which the scree plot confirmed. Varimax rotated factor analysis was then conducted using two factors, and factor loadings of 0.40 or greater were considered as a departure point for inclusion of an item within a factor (Ford et al., 2014). Analysis of the factor loadings of types of childhood adversity items for older adults suggested that a 2-factor model would best fit the data (see Table 5). The loading for sexual assault, while not as strong as the other types of CA, was included in Factor 2. Analysis of the factor loadings for total adults in the present study also suggested a 2-factor model would best fit the data; however, the loading for sexual assault was too low to be associated with either factor. The scree plot did not provide evidence of a third factor among older adults or total adults in the present study.

3.2. Confirming predictive value of CA score

After establishing a *CA score* variable that showed consistency in terms of prevalence of cumulative CA and a factor structure consistent with the standard ACE study, analyses were conducted to determine if the *CA score* operated consistent with outcomes shown by the literature to be impacted by CA. See Table 6 for regression coefficients and significance levels for the analysis of the impact of *CA score* on *life satisfaction* and *chronic conditions*.

To establish convergent construct validity for *CA score*, the relationship between *CA score* and *life satisfaction*, adjusted for *age*, was examined with the overall score and each factor separately. For all three predictors, results of the hierarchical linear regression showed that. among older adults ages 55–76, Model 1 (*age* as the sole predictor) was significant and accounted for 4.5% of the variance in *life satisfaction*, $F(1, 1015) = 49.44$, $p = .000$. Older ages were associated with better life satisfaction ($\beta = .215$, $p = .000$).

In Model 2, when cumulative childhood adversity (*CA score*) was added, the model was significant, $F(1, 1014) = 37.91$, $p = .000$,

Table 6
Summary of Hierarchical Regression Analyses Predicting Life Satisfaction and Chronic Conditions Among Older Adults.

Outcome	Model 1	Comparison of Total CA to CA Factor 1 and 2		
		Model 2 – Total CA	Model 2 – CA Factor 1	Model 2 – CA Factor 2
Life Satisfaction				
R2	0.046	0.070	0.053	0.068
ΔR2	0.046***	0.023***	0.007**	0.022***
F (df)	49.439 (1, 1015)***	37.908 (2, 1014)***	28.458 (2, 1014)***	37.006 (2, 1014)***
β for Age	0.215***	0.215***	0.217***	0.209***
β for CA measure	na	−0.152***	−0.082**	−0.147***
Chronic Conditions				
R2	0.002	0.018	0.013	0.006
ΔR2	0.002	0.016***	0.011**	0.004*
F (df)	1.828 (1, 999)	8.946 (2, 998)***	6.720 (2, 998)**	2.943 (2, 998)
β for Age	0.043	0.043	0.041	0.045
β for CA measure	na	0.126***	0.107**	0.064*

*p < .05; **p < .01; ***p < .001; Notes: for chronic conditions Model 2, with CA Factor 2, the change in R2 was significant at p = .044 but the model itself was not significant; na = not applicable.

and explained a larger amount of variance (7.0%). In this model, *age* was still significant (showing a positive relationship, β = .215, p = .000) and *CA score* showed an inverse relationship with *life satisfaction* (β = -0.152, p = .000). These results are consistent with previous literature showing a negative effect of CA on life satisfaction (Hughes et al., 2016; Nurius et al., 2012).

When Model 2 was run using *CA Factor 1* (household dynamics), the model was significant, F(1, 1014) = 28.46, p = .000, and explained a significantly larger amount of variance (5.3%). Higher levels of *CA Factor 1* were associated with lower *life satisfaction* (β = -0.082, p = .008). When Model 2 was run using *CA Factor 2* (child abuse and neglect), the model was significant, F(1, 1014) = 28.46, p = .000, and explained a significantly larger amount of variance (6.8%). Higher levels of *CA Factor 2* were associated with lower *life satisfaction* (β = -0.147, p = .000). *CA Factor 1* (household dynamics) explained a small, but significant, amount of additional variance in *life satisfaction* (0.07%). In comparison to Model 2 using *CA Factor 1*, Model 2 with *CA Factor 2* (child abuse and neglect) explained a larger amount of additional variance (2.2%). However, the two factors separately did not reach the same level of variance explained by the overall *CA score* (7.0%). These results demonstrate construct validity by showing that the factors did operate differently, but overall were not as predictive as the overall *CA score*. The greater power associated with the overall *CA score* in analyses was consistent with the use of the full cumulative score in extant research (e.g., Anda et al., 2006; Friedman et al., 2015; Wade et al., 2016).

The measure of cumulative CA was a significant predictor of poorer life satisfaction as expected from the literature, but the amount of variance explained (7.0%) was small. Another way to explore whether the *CA score* in the present study performed as expected was to examine the dose-response relationship of *life satisfaction* with different amounts of CA (e.g., Anda et al., 2006). Low life satisfaction, as defined by scores less than 1 SD from the mean for each age group, showed a consistent dose-response relationship with increasing amounts of CA within the age group. Among older adults, those with a high CA score (i.e., 4 or more) were more than three times as likely to have low life satisfaction compared to older adults with a score of 0 (38.5% and 12.4%, respectively). Thus, the analysis of *life satisfaction* demonstrated construct validity for *CA score*.

To further establish convergent construct validity, the relationship between *CA score* and *chronic conditions*, adjusted for *age*, was also examined. For all three predictors, results of the hierarchical linear regression showed that among older adults ages 55–76, *age* as the sole predictor in Model 1 did not account for a significant amount of the variance in *chronic conditions*, F(1, 999) = 1.828, p = .177. These results underscored the heterogeneity that exists in health status among older adults, and the general ineffectiveness of chronological age as a measure of biological aging (Mitnitski, Howlett, & Rockwood, 2017).

In Model 2, when cumulative childhood adversity (*CA score*) was added, the model became significant, F(2,998) = 8.946, p = .000, and accounted for 1.8% of the variance in number of *chronic conditions* older adults identified as having. In this model, *CA score* contributed significantly to predicting variance in *chronic conditions*, with higher levels of childhood adversity associated with a greater number of chronic conditions (β = .126, p = .000).

When Model 2 was run using *CA Factor 1* (household dynamics), the model was significant, F(2, 998) = 6.720, p = .001, and explained a significant, although small, amount of variance in *chronic conditions* (1.3%). Higher levels of CAs relating to household dynamics were associated with a higher number of chronic conditions (β = .107, p = .001). When Model 2 was run using *CA Factor 2* (child abuse and neglect), the model was still not significant, F(2, 998) = 2.943, p = .053. *CA Factor 1* (household dynamics) explained a significant amount of variance in the number of *chronic conditions* (1.5%), and accounted for nearly all of the variance explained by the total model (1.7%). In comparison to Model 2 using *CA Factor 1*, Model 2 with *CA Factor 2* (child abuse and neglect) was not a significant predictor of variance in the number of *chronic conditions*. These results demonstrated that the positive association between *CA score* and *chronic conditions* was mostly attributable to the influence of *CA Factor 1* (household conditions).

The measure of cumulative CA was a significant predictor of higher numbers of chronic conditions among older adults as expected from the literature. While the addition of CA made Model 2 significant, the amount of variance explained (1.8%) was quite small. Within the older adults' age group, age was not a predictor of chronic conditions, reflecting heterogeneity of biological aging

(Mitnitski et al., 2017). Another way to explore whether the *CA score* in the present study performed as expected was to examine the dose-response relationship of *chronic conditions* with different amounts of CA (e.g., Anda et al., 2006). Average number of chronic conditions showed a consistent dose-response relationship with increasing amounts of CA for this older sample. Among older adults, those with a high CA score had a 33% higher average number of chronic conditions compared to older adults with a score of 0 (mean = 4.81 and mean = 3.61, respectively). Thus, the analysis of *chronic conditions* showed greater comorbidity with greater levels of cumulative CA, demonstrating construct validity for *CA score*.

4. Discussion

The nationally representative MIDUS Refresher dataset is a rich resource being utilized by researchers across the United States. Analyses have covered a wide array of important topics, including cognitive function (e.g., Hahn & Lachman, 2015; Lewis, Turiano, Payne, & Hill, 2016), health behaviors (e.g., Cotter & Lachman, 2010; Lee, Tsenkova, & Carr, 2014), occupation and employment (e.g., Graham, Mroczek, & Elleman, 2015; Hill & Turiano, 2014); physical health (e.g., Birditt, Nevitt, & Almeida, 2015; Ferraro et al., 2016), psychological well-being (e.g., Boehm, Chen, Williams, Ryff, & Kubzansky, 2016; Schafer et al., 2011), social inequalities (e.g., Gruenewald et al., 2012; Schafer et al., 2011), and social relationships (e.g., Lyu & Agrigoroaei, 2016; Savla et al., 2013). Despite the long-reaching effects of CA impacting many of these topic areas (e.g., Alwin, 2012; Braveman & Barclay, 2009; Dube et al., 2003; Hughes et al., 2016; Schafer et al., 2011; Tomasdottir et al., 2015), the MIDUS Refresher dataset did not include a concise measure of CA exposure that could be utilized in analyses. This study provided a rationale for the creation of a cumulative CA scale through operationalization of available measures. Furthermore, the study built a case for convergent validity of the CA index for use with older adults.

For older adults, the distribution of the individual CA items and the cumulative *CA score* were consistent with comparison data from other studies (Table 3). Prevalence for older adults and total adults in the present study was similar to the ACE study distribution for living with both biological parents until age 16 (compared to having parents divorced or separated), substance abuse in the home, and frequent moving. Larger proportions of older adults and total adults had financial distress in their childhood compared to the ACE study; however, the present study used a broader definition of financial distress than the comparison study (Schilling et al., 2007). The proportions of older adults and total adults who experienced sexual assault as a child were smaller than the original ACE study, which asked more broadly about sexual abuse (Centers for Disease Control & Prevention (CDC) & Kaiser, 2016). Furthermore, the overall numerical distribution of CAs was strikingly similar to the original ACE study (Centers for Disease Control & Prevention (CDC) & Kaiser, 2016). Although the present study did not have each of the original ACEs, the similarity in the pattern of CA accumulation points to the tendency for adverse experiences in childhood to co-occur (e.g., Appleyard, Egeland, Van Dulmen, & Sroufe, 2005; Dong et al., 2004). The correlations between the eights types of CA for older adults (Table 4) showed co-occurrence and other studies have found this pattern as well (e.g., Appleyard et al., 2005; Dong et al., 2004).

Additionally, the factor structure of the cumulative measure (Table 5) operated similarly to the original ACE study (Centers for Disease Control & Prevention (CDC) & Kaiser, 2016). An examination of the two factors comprising *CA score* for older adults demonstrated that each factor differs in its impact on the dependent variables. *CA Factor 1* (household dynamics) was a significant, although small, predictor of *life satisfaction* and a significant predictor of *chronic conditions*. *CA Factor 2* (child abuse and neglect) was a significant predictor of *life satisfaction*, but not of *chronic conditions*. Further exploration of the factors separately may offer important insights into understanding how each affects outcomes differently. However, neither factor independently explained as much variance, underscoring that the total *CA score* was a meaningful index for analysis.

This study also demonstrated the convergent construct validity of this cumulative measure of CA with older adults by examining two outcomes previously shown to be related to traumatic experiences in childhood – life satisfaction and chronic conditions. The efficacy of the *CA score* was supported by hierarchical regression results. Although the overall predictive value of *CA score* was not large for *life satisfaction* or *chronic conditions*, the expected dose-response relationship was still evident, demonstrating that the present study's cumulative *CA score* meaningfully predicted outcomes for older adults decades beyond childhood.

It was important to demonstrate the validity of the CA score in predicting outcomes specifically among older adults for three reasons. One, socioemotional selectivity theory (Carstensen, Fung, & Charles, 2003) explains why a positivity effect is commonly seen among older adults, in which a person shifts focus toward more immediate goals and shows an increased preference for processing of positive emotions (Lynchard & Radvansky, 2012). In the present study, older adults had higher average life satisfaction compared to total adults, but higher CA scores still showed a significant negative association with life satisfaction among older adults. Two, comorbidity is associated with higher ACE scores (Anda et al., 2006; Tomasdottir et al., 2015) but also increases with age (Calland et al., 2013). In this study, older adults had a higher average number of chronic conditions as anticipated by the literature, but increased numbers of chronic conditions for older adults with higher CA scores were still detectable. Three, people with high CA scores die earlier on average than people with lower CA scores (Brown et al., 2009; Ferraro & Shippee, 2009). In the present study, older adults had a smaller average CA score compared to the total sample; premature mortality could have contributed to the smaller average amount of CA among surviving older adults. Nonetheless, significant impacts from CA scores were still detectable among older adults despite overall lower average CA scores than the overall sample.

A *CA score* could provide important predictive value to studies using MIDUS data. Other studies analyzing MIDUS data have included dimensions of CA (e.g., Ferraro et al., 2016; Friedman et al., 2015; Gruenewald et al., 2012; Jung, 2017; Savla et al., 2013; Schafer et al., 2011; Turiano et al., 2017); using the same CA scale would allow for better comparisons across studies. Additionally, many furtherareas of exploration could be done with the MIDUS data using a CA scale, including:

- How CA relates to experiences of adult adversity.
- How CA relates to dimensions of wellness in later adulthood.
- Whether dimensions of wellness function as protective factors between CA and outcomes for older adults, such as life satisfaction and chronic conditions.
- What are the differences between adults that are aging well and those that are not.

Graham et al. (2015) used MIDUS data to study the relationship between personality traits and earnings lost due to poor mental and physical health. The implications of their study included a consideration of personality when looking at occupational and financial outcomes for an individual, and the costs of untreated physical and mental health issues (Graham et al., 2015). However, greater accumulation of CA has also been associated with physical and mental health problems as adults, and with loss of workdays. Inclusion of the individual's *CA score* could provide important predictive value to this study.

Extant literature showed that positive coping strategies are associated with age, and have been given as an example of successful aging (Lynchard & Radvansky, 2012; Martin et al., 2015; Schirda, Valentine, Aldao, & Prakash, 2016). Inclusion of a *CA score* as part of a more in-depth analysis of the impact of age on coping strategies and well-being could provide valuable insight into understanding successful aging among older adults with varying amounts of CA exposure.

There are limitations to the data used in the present study of older adults. Relying on retrospective reports and self-categorization of trauma and disadvantage in childhood was a potential limitation of the research. Studies of the retrospective approach to learning about CA have suggested that underestimation (i.e., reporting fewer adversities than really happened) is more likely than overestimation, resulting in studies that may be more conservative than the actual reality (Alwin, 2007; Dube et al., 2003).

Another important limitation was the study sample. People with the highest ACE scores were shown to die nearly 20 years earlier than those with a score of 0 (Brown et al., 2009). Premature mortality among people suffering the greatest disadvantages can result in less inequality and more homogeneity with age, which is of particular concern to researchers focused on older adults (Ferraro & Shippee, 2009). This previous research demonstrating early mortality among people most strongly affected by cumulative CA contributed to the decision in the present study to include adults ages 55–64 among "older adults."

Underrepresentation of people with experiences of several different types of CA may be possible as a function of sampling bias. Sampling techniques can inadvertently contribute to bias by excluding those of greatest misfortune or marginalization (Bennett, Buchanan, Jones, & Spertus, 2015). Among older adults, people who self-select to be part of research tend to be biased toward being healthier, having better education, and young-old (Homan, 2016). People with a high number of types of CA may be more vulnerable and less reachable for a study, and may be less likely to self-select for a study. This would mean that the prevalence of CA found in the present study may be lower than might be found in the actual population, and that there may also be differences between the people with a high *CA score* who were reachable in the MIDUS Refresher study and those who were not. Additional study methods that more directly reach vulnerable people, such as prison inmates, homeless individuals, or older adults receiving care in institutionalized settings, that are well vetted by an Institutional Review Board could explore what differences may exist.

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