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Research article

ACEs and counter-ACEs: How positive and negative childhood experiences influence adult health

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ABSTRACT

Background: Numerous studies over the past two decades have found a link between adverse childhood experiences (ACEs) and worse adult health outcomes. Less well understood is how advantageous childhood experiences (counter-ACEs) may lead to better adult health, especially in the presence of adversity.

Objective: To examine how counter-ACEs and ACEs affect adult physical and mental health using Resiliency Theory as the theoretical framework.

Participants and setting: Participants were Amazon mTurk users ages 19–57 years ($N = 246$; 42% female) who completed an online survey.

Methods: We conducted a series of regression analyses to examine how counter-ACEs and ACEs predicted adult health.

Results: Corresponding to the Compensatory Model of Resiliency Theory, higher counter-ACEs scores were associated with improved adult health and that counter-ACEs neutralized the negative impact of ACEs on adult health. Contrary to the Protective Factors Model, there was a stronger relationship between ACEs and worse adult health among those with above average counter-ACEs scores compared to those with below average counter-ACEs scores. Consistent with the Challenge Model, counter-ACEs had a reduced positive effect on adult health among those with four or more ACEs compared to those with fewer than four ACEs.

Conclusions: Overall, the findings suggest that counter-ACEs protect against poor adult health and lead to better adult wellness. When ACEs scores are moderate, counter-ACEs largely neutralize the negative effects of ACEs on adult health. Ultimately, the results demonstrate that a public health approach to promoting positive childhood experiences may promote better lifelong health.

1. Introduction

Children are vulnerable to the long-term consequences of early adverse childhood experiences (ACEs) including chronic conditions, addictions, poorer quality of life and life expectancy in adulthood resulting from abuse, neglect, isolation or other trauma (Chang, Jiang, Mkandarwire, & Shen, 2019; Dong, Anda, Dube, Giles, & Felitti, 2003; Karatekin, 2019). The original study on the

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effect of ACEs on adult health was conducted at Kaiser Permanente clinics, surveying patients on various stressful experiences in childhood (Felitti et al., 1998). ACEs survey questions focused on childhood experience of physical, sexual, and psychological abuse, household members who were substance users, mentally ill, suicidal, or imprisoned, and violence against mother. Findings revealed a strong correlation between experiencing multiple ACEs and adult negative health indicators (e.g., less physical activity and higher BMI, smoking rates, depression, and chronic health conditions). Compared to those with no ACEs, participants with four or more ACEs (i.e., experienced multiple types of abuse and/or household dysfunction) experienced a four to 12-fold increase in negative adult health outcomes including alcoholism, drug abuse, depression, and suicide attempts (Felitti et al., 1998). It was determined that the connection between ACEs and negative health outcomes could be explained by physiological responses to stress and the tendency to adopt risky behaviors in order to cope with stress (Felitti et al., 1998).

Numerous studies in the past two decades have similarly found relationships between ACEs and later health outcomes. For example, experiencing ACEs has been associated with increased sleep disturbances (Salinas-Miranda et al., 2015; Windle et al., 2018), higher stress and anxiety (Anda et al., 2006; Salinas-Miranda et al., 2015), lower consumption of fruits and vegetables (Windle et al., 2018), impaired executive functioning (Majer, Nater, Lin, Capuron, & Reeves, 2010), lower perceived psychological well-being (Nurius, Green, Logan-Greene, & Borja, 2015), lower levels of gratitude (Wu, Chi, Lin, & Du, 2018), and lower family closeness in middle and older adulthood (Savla et al., 2013).

More recently, ACEs have been used to promote child well-being through policy and practice. Typical methods include health education and promotion to mitigate the trauma, chronic stress, and behavioral and emotional issues associated with exposures to ACEs (Bethell et al., 2017). Some have criticized the focus on ACEs because it over emphasizes risks and does not adequately address resilience and protective factors, thus shifting too much blame to parents and not enough accountability on environmental factors such as adequacy of resources. These acknowledgements or cautions are important, but there is value in measuring ACEs. In addition to ACEs, in this study we examine advantageous childhood experiences (counter-ACEs) to identify the positive childhood experiences that may also exist in many settings or circumstances.

1.1. Counter-ACEs

Less is known about exposure to positive childhood experiences or counter-ACEs and the extent to which they counter risks and provide important protective factors. Research in developmental psychology has demonstrated that advantageous childhood experiences can improve future social experiences and healthy relationships (Narayan, Rivera, Bernstein, Harris, & Lieberman, 2018). For example, research examining how childhood experiences affect adult roles found that certain positive childhood experiences such as interpersonal connection and school engagement predicted significantly better productivity and responsibility in adulthood (Kosterman et al., 2011). Familial warmth and extrafamilial support are linked to more adaptive traits in adults such as optimism (Johnson, Bromley, & McGeoch, 2005). Another study created a positive childhood experiences index using the eight components of high parental education, high perceived social-economic status, two-parent family, residential stability, no smokers residing in the home, high parental warmth, high emotional support, and high instrumental support (Slopen, Chen, Guida, Albert, & Williams, 2017). Participants who scored higher on their positive childhood experiences index had higher cardiovascular health scores (Slopen et al., 2017). Positive experiences and supportive relationships help build resilience in children that helps them to withstand adverse experiences later in life (Poole, Dobson, & Pusch, 2017; Sege et al., 2017).

1.2. The current study

Resiliency Theory (Masten & Cicchetti, 2016) provides a logical theoretical framework for this study of counter-ACEs. Resiliency Theory is grounded in ecological frameworks, suggesting that multiple systems (e.g., individual, family, neighborhoods, schools, etc.) interact to affect the course of development and that resilience itself is constantly evolving within individuals and systems. Resilience includes the capacity to adapt within and across systems and processes (Masten & Cicchetti, 2016) and involves more than just the ability to cope when facing adversity. There are three main models within Resiliency Theory: The Compensatory Model of Resiliency, the Protective Factors Model, and the Challenge Model (Zimmerman, 2013).

The Compensatory Model of Resiliency postulates that positive or protective factors have a direct and independent effect on an outcome separate from a risk factor. Further, these positive factors neutralize the effect of risk factors on an outcome and will have the opposite effect on the outcome (Zimmerman, 2013). Applying this model to our research we would expect that regardless of a person's number of ACEs, their counter-ACEs will have a direct, independent effect on their adult health. Furthermore, while ACEs will likely have a negative effect on adult health, counter-ACEs will protect against poor health and promote wellness and may even neutralize the effects of ACEs on adult health behaviors and outcomes.

The Protective Factors Model states that promotive assets and resources serve to moderate the relationship between risk factors and outcomes (Zimmerman, 2013). For the current study, we would expect the relationship between ACEs and adult health to be lower among those with higher counter-ACE scores.

Finally, the Challenge Model posits that moderate levels of adversity inoculate against subsequent adverse exposures that make people vulnerable to negative outcomes (Zimmerman, 2013). However, if the adversity is too great then it overwhelms the system and inhibits coping. Utilizing the Challenge Model, we would expect to find that moderate levels of ACEs, likely especially in the presence of counter-ACEs, may lead to better adult health. However, if one has a large number of ACEs (e.g., ≥ 4) (Felitti et al., 1998), then ACEs may be particularly harmful to health and counter-ACEs may have less of a positive effect.

This study builds off the original ACEs study (Felitti et al., 1998) by examining the role of ACEs and counter-ACEs using some similar health behaviors and outcomes as the original study (smoking, BMI, physical activity, and depression) and later ACEs studies. In addition to poor health outcomes, we have selected positive health outcomes such as executive functioning, positive psychology traits (e.g., gratitude, forgiveness, locus of control), familial closeness, and healthy eating to examine how counter-ACEs not only protect against poor health but also improve health. This study also builds off a study by Narayan et al. (2018) examining the effects of counter-ACEs on psychopathology among pregnant women. In this study, we use a broader population (adult males and females) and examine physical and mental health outcomes.

In keeping with the Compensatory Model of Resiliency Theory, we expect that 1) Counter-ACEs will predict positive health behaviors and outcomes and protect against poor outcomes; 2) Counter-ACEs will neutralize the negative effects of ACEs on adult health. Further, based on the Protective Factors Model we expect that 3) the relationship between ACEs and adult health will be less among those with higher than average counter-ACE scores. Finally, based on the Challenge Model we hypothesize that 4) counter-ACEs will have less effect on those with 4 or more ACEs compared to participants with 3 or fewer ACEs. We use four as our threshold as the original ACEs study found that adult health problems dramatically worsened with four or more ACEs (Felitti et al., 1998).

2. Methods

2.1. Procedures

Our sample population consisted of 246 adults ages 19–57 years who were Amazon

Mechanical Turk (mTurk) users. Registered mTurk users were able to view a description of the study if they were born between 1962 and 2000. They then completed a survey that was posted on Qualtrics and received $2.50 for survey completion. The study was approved by the university Institutional Review Board (IRB).

Amazon mTurk is a crowdsourcing web service that facilitates the recruitment of “workers” (e.g., participants) who meet a set of criteria determined by the “requester” (e.g., researchers) to complete tasks (e.g., surveys) that require human intelligence (Paolacci, Chandler, & Ipeirotis, 2010). When mTurk workers access the site, they are able to see a list of tasks for which they meet the criteria. A brief description of the task, estimated and maximum time to completion, and size of the reward are available for workers to view and sort tasks by. Requesters can refuse payment for poor quality work, though they must provide sufficient justification for rejecting a worker (Paolacci et al., 2010). Demographic characteristics of mTurk users have been found to be similar to other survey services and more representative of the general population than lab-based samples, allowing researchers to recruit a population of various ethnic, gender, and SES backgrounds (Huff & Tingley, 2015; Woods, Velasco, Levitan, Wan, & Spence, 2015).

2.2. Measures

The survey for this study included measures of physical, social, cognitive, and mental health as well as childhood experiences (ACEs, and counter-ACEs).

2.2.1. Physical health outcomes

Body mass index (BMI) was measured based on the participant’s self-report of height and weight. Fruits and vegetable consumption was self-reported by the number of fruits and vegetables consumed on an average per day using questions from The Fruits and Vegetables Checklist (Townsend, Kaiser, Allen, Joy, & Murphy, 2003). To measure physical exercise, participants reported the average number of days per week that they engaged in at least 10 min of vigorous physical activity (2011 Behavioral Risk Factor Surveillance System Survey) (Centers for Disease Control & Prevention, 2011). Using a question from the 2017 Behavioral Risk Factor Surveillance System Survey we measured sleep difficulties (“Over the last 2 weeks, how many days have you had trouble falling asleep or staying asleep or sleeping too much?”) (Centers for Control and Prevention, 2017). Participants were asked to report if they had ever smoked daily using the Global Adult Tobacco Survey (Global Health Tobacco Survey Collaborative Group, 2011).

2.2.2. Cognitive, mental, and social health outcomes

All mental health and positive psychology constructs were based on participant self-report, using previously validated measures. Participant executive functioning was measured through the 30-item ($\alpha = .96$) Learning, Executive, and Attention Functioning (LEAF) scale (Castellanos, Kronenberger, & Pisoni, 2018), which includes measures of attention, problem-solving, and working memory. Internal locus of control was measured by the 8-item ($\alpha = .84$) Levenson IPC Scale (Lefcourt, 1981). Stress was measured by the 10-item Perceived Stress Scale ($\alpha = .90$) (Cohen, Kamarck, & Mermelstein, 1994). Depression was measured by the 9-item Montgomery Åsberg Depression Rating Scale ($\alpha = .86$) (Svanborg & Åsberg, 2001). Gratitude was measured by the 6-item ($\alpha = .90$) Gratitude Questionnaire-6 Item Form (McCullough, Emmons, & Tsang, 2002). Forgiveness of self and challenging life situations was measured by the 12-item ($\alpha = .91$) Heartland Forgiveness Scale (Thompson et al., 2005). Familial closeness was measured from 16 items ($\alpha = .96$) adapted from the Adult Filial Closeness Scale (Black, 2016). For each multiple-item construct, items were summed and averaged to create a scale score. Higher scores indicate greater respondent agreement with the construct.

2.2.3. ACEs and counter-ACEs

ACEs were measured by the 11-item ACE module of the Center for Disease Control and Prevention’s Behavioral Risk Factor Surveillance System Survey (Centers for Disease Control & Prevention, 2016). Responses options were dichotomized (1 “yes”; 2 “no”),

and scores could range from 0 to 11 ACEs. Counter-ACEs were measured by the 10-item Benevolent Childhood Experiences Scale (Narayan et al., 2018), with scores ranging from 0 to 10 counter-ACEs.

2.2.4. Controls

Given variation in health outcomes by age and gender, age (continuous by year) and gender (1 "female" 0 "male") were included as controls.

2.3. Data analysis

All physical and social, cognitive, and mental health outcomes, except history of smoking (binary), were continuous. As such, we conducted a series of regression analyses, utilizing linear regression for eleven continuous outcomes and logistic regression for the one binary outcome. For hypothesis 1, two separate unadjusted regression models were constructed to independently assess the effect of ACEs and Counter-ACEs on each of the outcome measures. Adjusted regression models were then conducted for all outcomes with each model including the ACE score, the Counter-ACE score, and controlling for age and gender (Hypothesis 2). To examine the potentially moderating effect that counter-ACEs have on the relationship between ACEs and adult health (hypothesis 3), we stratified the sample by Counter-ACE score into two groups using a mean split (≤ 8.0 vs. > 8.0). Regression models included the ACEs score and controlled for gender, and age. Finally, to examine whether counter-ACEs were less beneficial for those with a high ACE score (≥ 4) we stratified the sample into high and low ACE score (hypothesis 4). The regression models included the counter-ACE score and controlled for age and gender. Data were analyzed in Stata version 15.

3. Results

3.1. Descriptive statistics

The final study sample consisted of 246 registered mTurk users. Descriptive data on the sample is presented in Table 1. Briefly, the sample was 42% female and had a mean age was 34.6 years. The mean counter-ACEs score was 8.15 (SD: 2.30) and 39% of the sample reported having all 10 counter-ACEs. Nearly three-quarters (74%) of participants had at least 1 ACE with a mean score for the sample of 2.67 (SD: 2.67) mean. Mean BMI of the sample was 27.31 (SD: 6.11), and 41% reported having ever smoked regularly. Table 1 has the full results of the descriptive statistics.

Table 1
Descriptive Statistics, $N = 246$.

	Mean or %	SD
Demographics		
Female (%)	41.87	NA
Age (years)	34.55	8.77
Employed (%)	87.80	NA
Live in single family, detached home (%)	48.78	NA
Bachelor's degree or higher (%)	55.69	NA
Married (%)	43.09	NA
Childhood experiences		
Counter-ACE (range 0–10)	8.15	2.30
ACE (range 0–11)	2.67	2.67
Physical health outcomes		
BMI (kg/m^2)[a]	27.31	6.11
# Days/week vigorous physical activity[b]	1.91	2.01
# of fruits and vegetable servings/day	3.71	1.62
# of days difficulty sleeping (2 weeks)	3.07	3.63
Ever smoked daily (%)[c]	40.57	NA
Cognitive, mental, and social health outcomes		
Executive functioning (scale range: 1–4)	3.20	0.57
Internal Locus of Control (scale range: 1–6)	4.37	0.81
Stress (scale range: 1–5)	2.52	0.85
Depression (scale range: 1–3)	1.52	0.48
Gratitude (scale range: 1–7)	5.38	1.32
Forgiveness (scale range: 1–7)	4.80	1.17
Family closeness (scale range: 1–6)	4.03	0.63

[a] $n = 237$.
[b] $n = 242$.
[c] $n = 244$.

Table 2
Regression results for adult health outcomes (row headers), $N = 246$.

	ACEs		Counter-ACEs	
Outcome Variable	Unadjusted	Adjusted[a]	Unadjusted	Adjusted[a]
Physical health outcomes				
BMI (kg/m^2)[b]	.17	.15	−.14	−.09
Vigorous physical activity (# of days)[c]	−.04	−.01	.07	.07
Servings of fruits and vegetables	−.05	−.02	.12**	.11*
Sleep difficulties	.22*	.10	−.28**	−.23*
Ever smoked daily (OR)[d]	1.13*	1.18**	.97	1.03
Cognitive, mental, and social health outcomes				
Executive functioning	−.06***	−.05**	.08***	.05**
Internal locus of control	−.07***	.01	.17***	.18***
Stress	.10***	.05*	−.15***	−.12***
Depression	.07***	.05***	−.10***	−.07***
Gratitude	−.09**	.01	.27***	.27***
Forgiveness	−.11***	−.03	.21***	.19***
Family Closeness	−.05**	−.01	.10***	.10***

Independent variables are column headers.
* $p < .05$.
** $p < .01$.
*** $p < .001$.
[a] In adjusted models, independent variables included ACE, counter-ACE, and controls for age and gender.
[b] $n = 237$.
[c] $n = 242$.
[d] $n = 244$.

3.2. Childhood experiences and adult health (hypothesis 1)

Simple and multiple regression estimates are summarized in Table 2. In simple regression, counter-ACEs were associated with lower scores in stress, depression, and sleep difficulties and higher scores for executive functioning, locus of control, forgiveness, gratitude, familial closeness, and daily fruit and vegetable consumption. When ACEs scores, age, and gender were added into the model, all relationships remained significant, though the slope estimates decreased only slightly on all dependent variables except familial closeness ($b = .10$, $p < .001$) and gratitude ($b = .27$, $p < .001$), which remained unchanged.

3.3. Examining whether counter-ACEs neutralize the effect of ACEs on adult health (hypothesis 2)

ACEs were correlated with all outcome measures except for BMI, physical activity, and fruits and vegetables consumption in simple linear regression (Table 2). When age, gender, and counter-ACE were added as controls in the regression model, there were no longer correlations between ACE scores and any health indicators other than having ever smoked daily, depression, stress, and executive functioning. Loss of significance with the inclusion of counter-ACE as a control indicates a potential compensatory effect that counter-ACE scores have on ACE scores.

3.4. Investigating whether counter-ACEs moderate the effect of ACEs on adult health (hypothesis 3)

When stratifying the sample by counter-ACEs score, the relationship between ACEs and adult health was more pronounced among those with above average (e.g., > 8) counter-ACEs as compared to those with average or fewer counter-ACEs (e.g., ≤ 8). In fact, ACEs were associated with seven health outcomes (vigorous physical activity, ever smoked daily, executive functioning, stress, depression, gratitude and forgiveness) among those with above average counter-ACEs scores, but ACEs were only associated with one outcome (depression) among those with fewer counter-ACEs (Table 3).

3.5. Do very high ACEs scores mitigate the positive effect of counter-ACEs on health? (hypothesis 4)

The relationship between counter-ACEs and better adult health was attenuated slightly for some health outcomes among those with 4 or more ACEs as compared to those with fewer than 4 ACEs (Table 4). However, counter-ACEs still had a significant association with adult health in the expected direction for locus of control, stress, depression, gratitude, forgiveness, and familial closeness.

4. Discussion

Overall, these results suggest that regardless of the number of ACEs, counter-ACEs protect against poor health and promote better

Table 3
Testing the protective factor model of resiliency theory, $N = 246$.

	Stratification by counter-ACE score	
	≤8 counter-ACEs $n = 102$	> 8 counter-ACEs $n = 144$
Outcome variable	ACE	ACE
Physical health outcomes		
BMI (kg/m^2)[a]	−.02	.45†
Vigorous physical activity (# of days)[b]	.10	−.17*
Servings of fruits and vegetables	.01	−.12†
Sleep difficulties	.06	.10
Ever smoked daily (OR)[c]	1.15†	1.23*
Cognitive, mental, and social health outcomes		
Executive functioning	−.02	−.07***
Internal locus of control	.01	−.03
Stress	.01	.10**
Depression	.04*	.06***
Gratitude	.07	−.12**
Forgiveness	.03	−.12**
Family closeness	−.03	−.03

Independent variables are column headers. All models control for age and gender.
† $p < .10$.
* $p < .05$.
** $p < .01$.
*** $p < .001$.
[a] $n = 237$.
[b] $n = 242$.
[c] $n = 244$.

Table 4
Testing the challenge model of resiliency theory, $N = 246$.

	Stratification by ACE score	
	< 4 ACEs $n = 165$	≥4 ACEs $n = 81$
Outcome variable	Counter-ACE	Counter-ACE
Physical health outcomes		
BMI (kg/m^2)[a]	−.49†	.01
Vigorous physical activity (# of days)[b]	.27**	−.04
Servings of fruits and vegetables	.22**	.03
Sleep difficulties	−.40*	−.17
Ever smoked daily (OR)[c]	1.08	.96
Cognitive, mental, and social health outcomes		
Executive functioning	.12***	.00
Internal locus of control	.20***	.16***
Stress	−.18***	−.08**
Depression	.45***	.13**
Gratitude	.28***	.11**
Forgiveness	−.12***	−.05*
Family closeness	.11***	.09**

Independent variables are column headers. All models control for age and gender.
† $p < .10$.
* $p < .05$.
** $p < .01$.
*** $p < .001$.
[a] $n = 237$.
[b] $n = 242$.
[c] $n = 244$.

health and wellbeing throughout adulthood. The results support our first hypothesis that counter-ACEs are associated with the report of greater fruit and vegetable intake, better executive functioning, higher internal locus of control and report of positive psychology, and more connection with families of origin as adults. Further, counter-ACEs protect against depression, stress, and difficulties with sleep. These results hold true regardless of the ACEs score, which is consistent with the results of a prior study on women's health and

counter-ACEs (Narayan et al., 2018). Our second hypothesis, which measured the Compensatory Model of Resiliency Theory, was also met. Both ACEs and counter-ACEs had a direct effect on health behaviors and outcomes. However, when including both ACEs and counter-ACEs in the same model, counter-ACEs largely neutralized the effect of ACEs on health. However, we did not find evidence of the Protective Factors Model (hypothesis 3). Rather, the relationship between ACEs and adult health was stronger among those with above average counter-ACEs scores compared to those with average or lower counter-ACEs. Finally, our fourth hypothesis was verified. Although counter-ACEs were still beneficial among those with more than three ACEs, the effect was attenuated. Consistent with the Challenge Model, this indicates that in the face of too many difficulties that beneficial experiences have less of a positive or protective effect.

It is somewhat unclear why people who had above-average counter-ACEs experienced a stronger relationship between ACEs and adult health compared to those with average or lower counter-ACEs scores. We investigated a number of factors that may have contributed to this result. The type of ACEs experienced was similar between the counter-ACEs groups and thus is not an explanation for the results. Those with higher counter-ACEs reported significantly better health for all of the cognitive, mental, and social health indicators and the sleep indicator (results available from the first author on request). This means that those with higher counter-ACEs started at a higher baseline level of adult health than their peers with average or low counter-ACEs scores. Thus, when ACEs occurred the high counter-ACEs group experienced a more dramatic shift in health. Whereas, an ACE would have resulted in a less noticeable shift in adult health for participants with average or low counter-ACEs scores who were already at-risk for worse adult health due to a deficit in counter-ACEs. One interpretation of this may be that although ACEs harm health, the absence of counter-ACEs could be more detrimental to lifelong health than the presence of ACEs. There are also other possible explanations for the relationship between ACEs and health indicators between counter-ACEs groups. These may include the role of shame, availability of services for middle-class families, and timing of the ACE occurrence.

4.1. The role of shame

Having an ACE was common. Even among participants who had high counter-ACEs, 64% had at least one ACE and 19% had four or more ACEs. However, prevalences of all ACEs were lower among those with higher than average counter-ACEs. Given that ACEs were less common among those with high counter-ACEs, it is possible that participants in this group felt disproportionately more shame within their family and in their neighborhoods when ACEs occurred. Thus, they may have been less likely to discuss their experiences with their families or social networks. This is particularly problematic as being able to discuss things that matter with parents and social networks is important to developing resilience (Sege et al., 2017). Shame is an intense or debilitating feeling of flaw, inadequacy, inferiority, unworthiness, and regret marked by the inability to differentiate the incident from the person (Lamia, 2011). In a 2010 study of HIV-positive adults with a history of childhood sexual abuse, shame was negatively associated with adult global well-being and emotional, social, and cognitive functioning (Persons, Kershaw, Sikkema, & Hansen, 2010). Shame was not measured in the current study, but it is a possible unmeasured factor that merits further study.

4.2. Availability of services for middle class families

Those with higher counter-ACEs scores had slightly higher socioeconomic status compared to their counterparts with average or fewer counter-ACEs in our sample. Experiencing ACEs is associated with later psychopathology (Herzog & Schmahl, 2018; Kim, Talbot, & Cicchetti, 2009; Oral et al., 2016) and the negative consequences of abuse and other adverse experiences are often not seen until years later (e.g., sleeper effect) (Holmes, 2013). Although primary prevention of ACEs is best, when ACEs do occur secondary and tertiary prevention services are needed to reduce the immediate, short-term, and long-term consequences (Oral et al., 2016). Secondary and tertiary treatment services are often funded through public providers with income-level requirements. Thus, middle-class families may be ineligible for services. Historically in the United States, many privately-funded health insurances have had a high copay or have not covered mental health services (Sharfstein & Patterson, 1983). As a result, mental health services have historically been inaccessible and hard to navigate for some middle-class families, which suggests that some participants with high counter-ACEs may have been less likely to receive secondary or tertiary prevention services (Bogin, 2006; Sharfstein & Patterson, 1983).

4.3. Timing of ACE occurrence and chronicity

Prior research has demonstrated that the timing of traumatic events differentially affects later health, with differing effects on health based on whether the event occurred during early, middle, or later childhood and adolescence (Schalinski et al., 2016). We did not assess the timing of the ACE occurrence in our sample, but it is possible that the timing of ACEs differed on average between those with higher versus lower counter-ACEs, resulting in a differential effect on health. Relatedly, the number of occurrences (e.g., chronicity or duration) within an ACE category may be important. For some ACEs indicators, we had information about whether the ACE occurred more than once. We examined whether chronicity of an ACE mattered, but we found that the binary ACEs score (yes/no) was more predictive of adult health than using an ACEs score that accounted for the number of times an ACE occurred. However, since we did not have information on number of occurrences for all ACEs indicators further research on chronicity is merited. Future studies should examine the timing and duration (i.e. chronicity) of traumatic and positive childhood events to better understand the interaction of positive and adverse experiences on later health.

4.4. Practice implications

These results demonstrate that as important as decreasing ACEs may be to improve community health it may be even more important to increase counter-ACEs, particularly in vulnerable populations with lower counter-ACEs and often simultaneously higher ACEs. By so doing, not only will health problems be reduced but also wellness will be increased. Focusing on counter-ACEs provides tangible ways for public health and social welfare programs to intervene in communities or in households at higher risk for ACEs. For example, an agency cannot change that an ACE has already occurred, but they can help families and communities to surround children with counter-ACEs to help neutralize the negative effect of ACEs on health.

Health Outcomes from Positive Experiences (HOPE) is a framework for increasing counter-ACEs and reducing ACEs that has demonstrated some success (Sege & Browne, 2017). This framework emphasizes the important role of positive experiences on fostering attachment and resilience. Key positive experiences include developing skills in four areas: supportive relationships, safe and stable environments, social and emotional skills, and positive social interactions and connections (Sege & Browne, 2017). Using this framework, in prior studies even children with high ACEs still experienced positive outcomes when they reported that they felt that their family stood by them in hard times and that they had someone to talk with about difficult feelings (Sege et al., 2017). Early results from HOPE suggest that it may be particularly important for children that their parents or caregivers know their child's activities and friends, that children feel that they can discuss things that matter with their parents, and that their parents manage their own stress around parenting (Sege et al., 2017).

4.5. Study limitations

Despite the novelty of the results, some limitations exist. This study was conducted on a convenience sample recruited via Amazon mTurk. Limitations of Amazon mTurk include that there is no supervision of the participants while they complete a survey (a limitation of all online surveys), the pool of workers that qualify and are available for a given task likely only numbers up to 10,000, and participants are typically more computer literate and less extroverted than the general population (Woods et al., 2015). Care should be taken to examine the representativeness of results in other populations; threats to external validity are of especial concern in child welfare populations for which ACEs research may be of particular interest but who might be misrepresented by an mTurk sample (Trochim, 2006). Another limitation is that all study variables were based on participant self-report. Self-report of BMI is particularly problematic. Previous research indicates that participants typically underreport their weight and over-report their height (Gorber, Tremblay, Moher, & Gorber, 2007). Thus, the results particularly relating to BMI should be interpreted with caution, and further research examining counter-ACEs, ACEs, and physical health outcomes should include more objective measures of physical health. Given that participant ages ranged from 19 to 57 years, recall bias is a concern and accurate recall may be particularly problematic for older participants. Finally, we treated all health and wellbeing indicators equally and did not examine unique pathways. It may be that some of indicators (i.e., cognitive and social health indicators) may be mediators between childhood experiences and traditional health indicators (i.e., physical and mental health indicators).

5. Conclusions

Counter-ACEs have a positive effect on adult health in the general population regardless of the number of ACEs, and the absence of counter-ACEs may be more detrimental to lifelong health than the presence of ACEs. Therefore, programs focused on childhood experiences should work with families to increase counter-ACEs such as parent–child attachment or household routines. Further research examining the role of shame and attachment, timing and duration of ACEs and counter-ACEs, secondary and tertiary treatment obtainment after experiencing and ACE, and obtaining objective measures of physical health behaviors are important next steps to better understand the intersection of counter-ACEs and ACEs on adult health.

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