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Abstract

Background: Adverse childhood experiences (ACEs) and day-to-day discrimination (hereafter, "discrimination") both contribute to mental health symptomatology in young adulthood, but how these constructs interact and whether they are associated with mental health remains unclear. This study evaluated whether the relation between discrimination in young adulthood and mental health symptomatology varied as a function of ACEs exposure.

Methods: Undergraduates ($n = 251$) completed self-report measures related to ACEs, discrimination, and mental health symptomatology (i.e., depression, anxiety, somatization, and psychological distress). Linear and logistic regression models were implemented to test for potential exacerbation effects of ACEs on the relation between discrimination and mental health symptomatology.

Results: Participants with greater discrimination exposure and ACEs reported significantly more depression, anxiety, and somatic symptoms, along with more psychological distress, relative to those with less discrimination exposure and few or no ACEs.

Limitations: Data were cross-sectional, thus, causality cannot be inferred. ACEs and discrimination measures examined ACE counts and general discrimination, respectively, which did not allow for examination of possible differences across specific ACEs (e.g., childhood sexual abuse vs. neglect) or specific types of discrimination (e.g., sexual-orientation-based discrimination vs. race-based discrimination).

Conclusions: These results are among the first to inform the conceptualization of ACEs and discrimination in etiological models of young adults' mental health. Both ACEs and discrimination, rather than exposure to only one of these stressors, may be synergistically associated with young adults' mental health symptomatology. Clinicians could address stress-sensitive mental health issues by assessing for both ACEs and discrimination exposure.

Keywords

Adverse childhood experiences; Discrimination; Mental health symptoms; Young adults; Undergraduate college students

1. Introduction

Reducing adverse childhood experiences (ACEs; e.g., child sexual abuse, neglect, exposure to domestic violence) represents a clear public health priority. The Centers for Disease Control and Prevention reported that 61% of adults in the United States endorse at least one ACE, and one in six endorse numerous (i.e., four or more) types of ACEs (CDC, 2020). ACEs have been consistently linked to psychiatric disorders during adulthood, particularly among those who have experienced multiple types of ACEs (CDC, 2020; Petruccelli et al., 2019). A recent meta-analysis found that adults with four or more ACEs, relative to those with no ACEs, were over four times as likely to report depression and nearly four times as likely to report anxiety (Hughes et al., 2017). Nevertheless, few studies have examined how cumulative exposure to adversity (e.g., ACEs, discrimination) is associated with mental health symptomatology among young adults (Mersky et al., 2013).

An important framework for understanding how ACEs may contribute to sustained negative health outcomes is stress sensitization theory, which posits that childhood adversities may sensitize individuals to subsequent stressors, leading to poor health in adulthood (Hammen et al., 2000; Nurius et al., 2016; Post, 1992; Stroud, 2020). There is evidence that ACEs contribute to allostatic load (i.e., "wear and tear" on the body from cumulative stress), which disrupts the functioning of numerous biological systems (e.g., nervous, endocrine, and immune systems; Danese and McEwen, 2012). Recent research has also found neural differences (e.g., reduced hippocampal and amygdala volume) among children exposed to childhood adversity that may sensitize them to depression later in life (Weissman et al., 2020). Psychologically, there is evidence that adversity contributes to developing negative beliefs about the world (e.g., the world is dangerous) and negative beliefs about the self (Heinonen et al., 2018; Kendall-Tackett, 2002; Wright et al., 2009). Allostatic load and associated biological, neural, and psychological disruptions are implicated in the development of depression and anxiety (McEwen, 2003). Thus, an individual with early adversity may be more affected by subsequent stressors (e.g., discrimination) given that they are potentially encountering such stressors with increased biological, neural, and psychological vulnerability.

Childhood maltreatment can serve to mobilize subsequent stressors by threatening stress-exposed individuals' adaptive capacities across the lifetime (Nurius et al., 2015; Pearlin, 2010; Pearlin et al., 2005). For example, McLaughlin et al. (2010) examined the stress-

sensitizing effect of childhood adversity in a national population-based sample of adults and found that past-year stressful life events (e.g., being fired, going through a breakup) increased the risk of depression and anxiety disorders. Notably, this increased risk was greater in those with a history of ACEs relative to those without a history of ACEs. Consistent with these findings, other studies have demonstrated that depression seems to be affected by exacerbating effects of childhood adversity and stressful life events (Espejo et al., 2007; Harkness et al., 2006; Kendler et al., 2004).

Whether ACEs exacerbate association between specific stressors, such as discrimination, and mental health symptomatology remains unknown. Discrimination has been defined as unfair treatment and/or negative attitudes toward certain groups, often based on identity characteristics such as race/ethnicity, gender, or sexual orientation (Banks et al., 2006; Meyer, 2003; Pascoe and Smart Richman, 2009). Discrimination can refer to cumulative discrimination experiences over the life course (i.e., lifetime discrimination) or as a chronic, ongoing stressor (i. e., day-to-day discrimination; Kessler et al., 1999). In the current study, we focused on day-to-day discrimination.

Understanding the link between day-to-day discrimination and mental health symptomatology among young adults is critical given the importance of identity formation during developmental period (Adams and Marshall, 1996; Meeus, 2011). Consistent findings highlight discrimination experiences in young adulthood are well-established social determinants of poor mental health (Grollman, 2012; Scheer et al., 2021; Sellers et al., 2003; Vargas et al., 2020). Emerging research also demonstrates discrimination during young adulthood contributes to health consequences in later adulthood (e.g., Priest et al., 2013). Spe-cifically among college students, studies have demonstrated that discrimination is associated with worse academic outcomes, mental health, and alcohol use (Billingsley and Hurd, 2019; Hatzenbuehler et al., 2011; Jochman et al., 2019; Kucharska, 2018; Mathies et al., 2019; Zhu et al., 2019). ACEs are also associated with numerous mental, physical, and behavioral health risks among college students, along with worse academic achievement (Grigsby et al., 2020; Hinojosa et al., 2019; Watt et al., 2021). Together, these studies indicate that both discrimi-nation and ACEs are important to the health and academic success of college students, but few studies have focused on the ways in which discrimination in young adulthood and ACEs exposure might be syner-gistically associated with mental health symptomatology in young adults.

Calls for research have been made to examine discrimination in the context of early adversity (Herrick et al., 2013), but ACEs and discrimination have rarely been examined concurrently even though they are both comprised of negative interpersonal experiences and are associated with similar mental health concerns (e.g., depression, anxiety). Emerging research has empirically explored relations between these constructs and how they may work together to affect health outcomes. For example, Campbell et al. (2020) recently found that those with a history of ACEs indicated greater day-to-day and lifetime discrimination as adults relative to those with no history of ACEs. Further, they found that those who endorsed multiple types of ACEs indicated more discrimination relative to those with one type of ACE (Campbell et al., 2020). Another recent study found that ACEs were significantly associated with day-to-day discrimination, which in turn, was significantly associated with

psychological distress (Gangamma et al., 2020). These studies provide preliminary evidence that early adversity is related to discrimination later in life. However, the extent to which childhood adversity exacerbates the association between day-to-day discrimination and mental health symptomatology among young adults remains unclear. Documenting whether young adults' elevated risk of mental health symptomatology associated with discrimination and ACEs could clarify subgroups of young adults that may be particularly at risk for mental health symptoms.

2. The present study

The current study aimed to extend prior research on the association between discrimination and ACEs exposure in a young adult sample of college students by identifying whether childhood adversity moderates the association between general day-to-day discrimination (i.e., discrimination due to any type of identity such as race/ethnicity, physical appearance, level of education, etc.) and mental health symptomatology among college students. Specifically, we aimed to measure depression, anxiety, and somatic symptoms, as college students report high prevalence of depression and anxiety (Eisenberg et al., 2013), and both depression and anxiety are commonly accompanied by somatic symptoms (Lallukka et al., 2019). Depression and anxiety are also the top presenting concerns reported by college counseling centers (Pérez-Rojas et al., 2017). We first sought to examine associations between day-to-day discrimination in young adulthood and mental health outcomes. First, we hypothesized that greater exposure to day-to-day discrimination in young adulthood would be associated with worse mental health symptomatology among young adults. Second, we sought to examine ACEs as a moderator of the association between day-to-day discrimination in young adulthood and mental health. Based on previous literature, we hypothesized that discrimination in young adulthood would be more strongly associated with depression, anxiety, and somatic symptoms, and psychological distress among young adults who were exposed to multiple ACEs relative to those with few or no ACEs.

3. Methods

3.1. Participants and procedures

Participants were undergraduate students ($n = 290$) that completed an online questionnaire study for course credit during the Fall 2019 semester, beginning of the Spring 2020 semester (through February 2020), and during the Fall 2020 semester. Because some data were collected during the coronavirus disease 2019 (COVID-19) pandemic, data were coded as pre-pandemic (0; Fall 2019 – February 2020) or during the pandemic (1; Fall 2020) and time of data collection was controlled for in analyses. This study was approved by the Syracuse University Institutional Review Board. Participants that answered an attention check question incorrectly ($n = 35$) or exited the questionnaire after only completing demographic information ($n = 4$) were removed from analyses, resulting in an analytic sample size of 251. A MANOVA revealed that the 35 excluded participants that answered the attention check question incorrectly did not significantly differ from included participants across study variables (i.e., ACEs, discrimination in young adulthood, or mental health symptomatology variables; ps > 0.05).

3.2. Measures

3.2.1. Adverse childhood experiences—
Adverse childhood experiences (ACEs) were measured with the Center for Youth Wellness Adverse Childhood Experiences Questionnaire, Teen Version (ACE-Q; Harris and Renschler, 2015). This measure was chosen as it was one of the recommended measures from a systematic review of extant ACE measures that assessed all four major categories of ACEs, including abuse, neglect, household dysfunction (e. g., domestic violence, alcohol or other drug problems), and other adversities (e.g., foster care, life-threatening illness) that do not fit within the previous categories (Oh et al., 2018). The lack of inclusion of these other types of adversities on the original ACEs scale is one of the prominent critiques of ACE research (McLennan et al., 2020).

The ACE-Q included two lists that ask participants to report how many types of ACEs they experienced since they were born. The first list included the standard set of 10 ACEs from the original ACEs measure (Felitti et al., 1998); the second list included nine items that represent additional experiences (e.g., foster care, neighborhood violence). Participants indicated an ACE count for each list, and these counts were summed to create a total ACEs score. Items were coded as zero (0), one (1), two (2), three (3), or four or more ACEs (4), similar to previous studies of ACEs among college students suggesting a strong graded relation between ACEs exposure and deleterious outcomes (Grigsby et al., 2020; Watt et al., 2021). The commonly used cutoff of four or more ACEs was indicative of increased risk for many health conditions (Felitti et al., 1998; Hughes et al., 2017; Petruccelli et al., 2019).

3.2.2. Discrimination—
Day-to-day discrimination was assessed using responses to the 10-item Everyday Discrimination Scale (EDS; Williams et al., 1997, 2008). The EDS asks participants, "In your day-to-day life, how often do any of the following things happen to you?" The measure then lists 10 potentially discriminatory experiences (e.g., "You are called names or insulted", "You are threatened or harassed") on a scale with the response options 1 (*Never*), 2 (*Less than once a year*), 3 (*A few times a year*), 4 (*A few times a month*), 5 (*At least once a week*), and 6 (*Almost everyday*). Items are summed to create a total score, with higher scores indicating higher frequency of discriminatory experiences in day-to-day life (possible range = 10 – 60). Prior research has established construct validity of the EDS (Krieger et al., 2005). Further, this scale has also demonstrated good reliability in undergraduate samples (Cronbach's α range = 0.88 – 0.92; Fahey et al., 2021; Hayes et al., 2019). Cronbach's alpha for the current sample was 0.87.

A second section of the scale asks participants to attribute this discrimination experience based on one or more aspects of their identity (e.g., disability status, height, weight). A full list of discrimination attributions are displayed in Table 1.

3.2.3. Mental health symptomatology—
Mental health symptomatology was assessed with the 18-item Brief Symptom Inventory (BSI; Derogatis, 2000), which asks participants about their past-week distress regarding each statement (e.g., "Feeling lonely") on a scale from 0 (*Not at all*) to 4 (*Extremely*). Items are summed to create an overall score indicating psychological distress, along with subscale scores for depression, anxiety, and

somatization. Cronbach's alphas were adequate for depression ($a = 0.90$), anxiety ($a = 0.86$), and somatization ($a = 0.77$) subscales and for the overall scale ($a = 0.93$). We used the depression, anxiety, and somatization subscales as separate outcomes of our linear regression model. In effort to examine ACEs exposure as a potential moderator of the association between day-to-day discrimination exposure and clinical levels of psychological distress, we used the dichotomous clinical cut-off score of the BSI. Specifically, and consistent with prior research (Bird et al., 2012; Rowe et al., 2015; Wilson et al., 2016), the clinical cut-off score was calculated as either not clinically significant levels of psychological distress (0 = < 2 BSI subscales with t scores   62) or clinically significant levels of psychological distress (1 =   2 BSI subscales with t scores   62).

3.3. Analytic plan

Data analyses using the full sample of 251 undergraduate students were conducted using SPSS version 26 (IBM Corporation, 2019IBM Corporation, 2019). There were no missing data across study variables in the analytic sample. Study variables were examined for outliers with boxplots at the level of three times the interquartile range (Sim et al., 2005). No outliers were identified; all participants were retained for analysis. Descriptive statistics were calculated to describe the sociodemographic characteristics of the sample. Then, bivariate correlations (for continuous variables) and binary logistic regressions (for dichotomous variables) were examined for discrimination exposure, ACEs exposure, depression symptoms, anxiety symptoms, and somatic symptoms, and covariates that have been linked to mental health in prior research among young adults, namely age, race/ethnicity, education (i. e., year in college for undergraduates), sexual orientation, gender, and household income (Dashiff et al., 2009; Lee and Chen, 2017; Liu et al., 2019; Miranda-Mendizabal et al., 2019; Pachankis et al., 2018; Scheer et al., 2019). We also controlled for whether data was collected prior to the COVID-19 pandemic (Fall 2019 to February 2020) or during the pandemic (Fall 2020 semester) given the likelihood that pandemic-related stress might be correlated with our dependent variables (Liu et al., 2020). Dependent variables were assessed for normality using skewness and kurtosis thresholds of ±2 (Field, 2013; George and Mallery, 2010). All outcome variables demonstrated normal distribution.

Next, three moderated linear regression models were estimated to test ACEs exposure as a potential moderator of the association between day-to-day discrimination exposure and recent mental health symptoms (i.e., depression, anxiety, and somatic). Prior research examining sample size needed to detect a moderated linear regression effect indicates that our analyses were sufficiently powered (Shieh, 2009). A meta-analysis examining studies using structural equation models found that 80% of the included articles were considerably underpowered (Westland, 2010), even though the median sample size was larger than our sample ($n = 260$; Kline, 2016, p. 16). As such, separate moderated linear regression models were conducted for each dependent variable rather than including all dependent variables in a structural equation model (i. e., examining mental health as a latent variable).

For each linear regression, we used Model 1 from the SPSS PROCESS Macro Version 3.40 (Hayes, 2017). Specifically, three linear regression models using 1000 bootstrap resamples examined interactions between day-to-day discrimination exposure and ACEs exposure

on self-reported depression symptoms, anxiety symptoms, and somatic symptoms. The PROCESS procedures use ordinary least squares regression and bootstrapping methodology, which confers more statistical power than standard approaches to statistical inference and does not rely on distributional assumptions (Hayes, 2017). Next, we employed a moderated logistic regression model to test ACEs exposure as a potential moderator of the association between day-to-day discrimination exposure and clinical levels of psychological distress using a validated clinical cut-off score of the BSI. The goodness of fit of the moderated logistic regression model was examined by pseudo R-squared methods (Cox and Snell, 1989; McFadden, 1973; Nagelkerke, 1991). In general, a higher pseudo R-squared value indicates a better model fit (Hu et al., 2006). Prior to creating interaction terms, continuous independent variables were mean-centered to reduce the risk of multicollinearity and to increase the interpretability of the intercept. For significant interaction effects, we used the Johnson-Neyman procedure to identify at what level of ACEs exposure the association between discrimination and mental health symptomatology becomes significant (Johnson and Neyman, 1936). To visualize significant interactions for the moderated linear regressions, simple slopes were plotted separately for participants who reported zero ACEs, two ACEs, and four or more ACEs (Aiken and West, 1991; Preacher et al., 2006), and slopes that significantly differed from zero were indicated on the plots with an asterisk. To visualize a significant interaction for the moderated logistic regression, we plotted the probability of reporting clinical severity in psychological distress at different values of ACEs exposure (i.e., 0, 2, and 4 or more ACEs) while holding all covariates constant. A significance level of $a = 0.05$ was applied when testing all study hypotheses.

4. Results

4.1. Descriptive statistics

The final sample ($n = 251$) was 61.4% White, 67.7% women, and had a mean age of 19.9 years ($SD = 2.0$). This sample included slightly more White students and more women compared to Syracuse University's undergraduate population (56.4% White, 53.6% women; Syracuse University, 2020). Additional characteristics of the sample, including sexual orientation, income, ACE counts, and reported reasons for discrimination are detailed in Table 1.

The average day-to-day discrimination score across the sample was 22.5 ($SD = 7.9$), with 84% of participants reporting at least one form of discrimination a few times per year (i.e., endorsing a score of 3 or higher). The average number of ACEs reported was 2.1 ($SD = 1.6$), with 76% reporting at least one ACE and 35% reporting 4 or more ACEs. Additional descriptive statistics for study variables can be found in Table 2.

4.2. Associations between sociodemographic characteristics and study variables

Table 2 presents the bivariate associations among continuous covariates and study variables. Among categorical covariates, Chi-square analyses revealed that time of data collection was associated with both gender (X^2 [1, $N = 251$] = 7.0, $p = .008$) and sexual orientation (X^2 [1, $N = 251$] = 5.31, $p = .02$). Gender and sexual orientation were also significantly associated, with women making up more of the sexual minority participants than men, X^2 (1, $N =$

251) = 6.29, $p = .01$. Race/ethnicity was not significantly associated with other categorical cova-riates. Bivariate associations also indicated that sexual minority partic-ipants reported greater psychological distress (using a validated clinical cut-off score of the BSI) compared to heterosexual participants (adjusted odds ratio [AOR] = 2.85, 95% CI = 1.13, 7.18).

Next, we employed five MANOVAs to test for race/ethnicity, sexual orientation, gender, income, and COVID-19 data collection period group differences on our continuous variables. There was a significant effect for sexual orientation (Wilks' $\Lambda = 0.75$, F [5, 245] = 16.59, $p < .001$, $\eta 2p = 0.25$), gender (Wilks' $\Lambda = 0.92$, F [5, 245] = 4.23, $p < .001$, $\eta 2p = 0.08$), and COVID-19 data collection period (Wilks' $\Lambda = 0.91$, F [5, 245] = 5.50, $p < .001$, $\eta 2p = 0.09$). Bonferroni post-hoc comparisons indicated that sexual minority participants reported greater depression, anxiety, and somatic symptoms and greater discrimination exposure compared to heterosexual participants; women reported greater depression, anxiety, and somatic symptoms compared to men; and participants whose data was collected during the pandemic (Fall 2020 semester) reported greater depression and anxiety symptoms and lower discrimination exposure than participants whose data was collected prior to the pandemic (Fall 2019 to February 2020).

4.3. ACEs as a moderator of the association between discrimination and depression symptoms

As indicated in Table 3, the overall model including covariates, ACEs, discrimination, and the interaction between discrimination and ACEs accounted for 33% of the variance in depression symptoms (F [9, 240] = 13.16, $p < .001$). The interaction between discrimination and ACEs was significantly associated with depression symptoms ($b = 0.07$, $SE = 0.02$, $p = .004$, $R^2 = 0.02$). The Johnson-Neyman procedure (see Supplemental Fig.1) identified that the relation between discrimination and depression symptoms became significant at a level of −1.09 (mean-centered value), which corresponds to an ACE score of 1.01. The strength of the association between discrimination and depression symptoms continued to increase as ACEs increased (see Fig. 1, part A).

4.4. ACEs as a moderator of the association between discrimination and anxiety symptoms

The overall model including covariates, ACEs, discrimination, and the interaction between discrimination and ACEs accounted for 31% of the variance in anxiety symptoms (F [9, 240] = 12.18, $p < .001$). The interaction between discrimination and ACEs was significantly associated with greater anxiety symptoms ($b = 0.05$, $SE = 0.02$, $p = .009$, $R^2 = 0.02$). The Johnson-Neyman procedure (see Supplemental Fig. 2) identified that the relation between discrimination and anxiety symptoms became significant at a level of −0.90 (mean-centered value), which corresponds to an ACE score of 1.21. The strength of the association between discrimination and anxiety symptoms continued to get stronger as ACEs increased (see Fig. 1, part B).

4.5. ACEs as a moderator of the association between discrimination and somatic symptoms

The overall model including covariates, ACEs, discrimination, and the interaction between discrimination and ACEs accounted for 19% of the variance in somatic symptoms (F[10, 239] = 5.55, $p < .001$). The interaction between discrimination and ACEs was statistically significantly associated with somatic symptoms ($b = 0.03$, $SE = 0.02$, $p = .04$, $R^2 = 0.01$). The Johnson-Neyman procedure (see Supplemental Fig. 3) identified that the relation between discrimination and somatic symptoms became significant at a level of −1.16 (mean-centered value), which corresponds to an ACE score of 0.95. Simple slopes plots revealed that the association between discrimination and somatic symptoms continued to get stronger as ACEs increased (see Fig. 1, part C).

4.6. ACEs as a moderator of the association between discrimination and psychological distress

As indicated in Table 4, the overall model including covariates, ACEs, discrimination, and the interaction between discrimination and ACEs accounted significant variance in the categorical psychological distress clinical cut-off score (Log Likelihood = 45.99; Cox & Snell = 0.18; Nagelkerke = 0.39; McFadden Pseudo Adjusted $R^2 = 0.32$). The interaction between discrimination and ACEs was statistically significantly associated with more psychological distress (AOR = 1.05, 95% CI = 1.00, 1.11). The Johnson-Neyman procedure (see Supplemental Fig. 4) identified that the association between discrimination and psychological distress became significant at a level of −0.37 (mean-centered value), which corresponds to an ACE score of 1.74. The probability of one endorsing clinical severity of psychological distress increased as ACEs and day-to-day discrimination increased (see Fig. 2).

5. Discussion

Building on prior research, this study is among the first to our knowledge to examine whether day-to-day discrimination in young adulthood is associated with mental health symptomatology among young adults with relatively more ACEs compared to young adults with few or no ACEs. Consistent with our hypotheses, we found that ACE exposure exacerbated the association between discrimination in young adulthood and young adults' mental health symptomatology. For depression, anxiety, and somatic symptoms, the strength of the association between symptomatology and discrimination increased as ACEs increased. A similar relationship emerged with psychological distress. The current study is one of the first to document that young adults who reported relatively higher discrimination exposure and ACEs were more likely to demonstrate clinically elevated scores on two or more scales of the BSI (i.e., higher overall psychological distress) than young adults with relatively lower discrimination or lower ACE exposure.

The results from the current study build upon previously established mediation findings which found that ACEs had an indirect effect on psychological distress through discrimination (Gangamma et al., 2020). Findings from this previous study and the current study indicate that ACEs and discrimination may be related in numerous ways to mental

health outcomes, and future research should continue to assess the potential moderation and mediating roles of ACEs on the relation between discrimination and mental health symptomatology. Our findings are consistent with prior research demonstrating a step-dose pattern whereby greater exposure to multiple adverse experiences can exert sustained mental health damage (Schilling et al., 2008). While this study did not examine potential mechanisms underlying the synergistic association between discrimination in young adulthood and ACEs and mental health symptomatology, prior research demonstrates that the imprint of early life stress can disrupt biological, neural, and psychological processes (Danese and McEwen, 2012; Heinonen et al., 2018; Weissman et al., 2020). Moreover, our findings demonstrating this synergistic association underscores the importance of assessing for ACEs and discrimination exposure among young adults. These findings can inform accurate models of risk for mental health symptomatology and selective prevention and intervention efforts for at-risk young adults (Edwards et al., 2016).

6. Research and clinical implications

Interventions targeting ACEs have been successful in ameliorating mental health symptomatology in both youth and adults (Korotana et al., 2016; Leenarts et al., 2013; Marie-Mitchell and Kostolansky, 2019). Similarly, culturally-adapted interventions aimed at coping with discrimination have begun to be developed and validated among populations that disproportionately experience childhood maltreatment and discrimination, such as racial/ethnic minorities and sexual minorities (Batchelder et al., 2020; Bogart et al., 2018; Pachankis et al., 2020). While these ACE- and discrimination-specific interventions demonstrate promising results separately, the present study's results suggest that an integrated ACE- and discrimination-informed clinical approach may be even more beneficial.

Taking a holistic approach to intervention, clients seeking mental health services should be assessed for ACE history, especially among those experiencing discrimination. This recommendation coincides with increased rationale to assess for ACEs across clinical contexts (Flanagan et al., 2018; Marie-Mitchell et al., 2016; McKelvey et al., 2016), though others argue against routine, universal screening of ACEs without first considering possible unintended consequences (e.g., the potential for ACE screening to be too intrusive and disrupt health care relationships) and without being able to provide access to effective interventions (Finkelhor, 2018). Trauma-informed service delivery approaches should also be expanded to effectively address trauma-exposed students' stigma-related health and psychosocial needs (Antebi-Gruszka & Scheer, 2021). For instance, trauma-focused cognitive-behavioral therapy (TF-CBT) seeks to help youth to identify and correct inaccurate and unhelpful thoughts, distressing feelings, and health-risk behaviors following a stressful event (Cohen et al., 2017). Incorporating these TF-CBT components with stigma-coping strategies (e.g., consciousness raising, assertiveness training; Andersson et al., 2020; Pachankis et al., 2020) may more effectively alleviate the mental health exacerbation effects of ACEs and discrimination as demonstrated in this study. Providers serving ACE-exposed youth with stigmatized identities might use exposure techniques to improve clients' skills for tolerating strong emotions associated with ACE- and stigma-related stress (Antebi-Gruszka & Scheer, 2021; Kaysen et al., 2019).

Beyond individual-level interventions, the results from this study also underscore the need to mitigate and prevent the effects of ACEs exposure at community and structural levels. Emerging research indicates that positive experiences, such as having at least one good friend or having a caring teacher, can attenuate ACE-related negative health outcomes (Crandall et al., 2019; Narayan et al., 2018). Thus, interventions aiming to increase social support among children at-risk for ACE exposure may mitigate the health effects of ACEs. Further, efforts to prevent ACEs exposure (e.g., family-based interventions to improve parenting skills) are needed, particularly among populations at higher risk for ACEs exposure (Edwards et al., 2021).

7. Limitations

While this study provides novel findings surrounding the synergistic effect of ACEs and discrimination on mental health symptomatology, it is not without limitations. First, the sample included more women than men relative to the university's undergraduate population gender distribution, which may be indicative of sample bias. Further, because the sample was comprised of undergraduate students, these results may not generalize to community populations without further research. However, previous studies demonstrating associations among discrimination and ACEs were conducted at a mental health clinic serving community samples (Gangamma et al., 2020) and with a population-based national sample (Campbell et al., 2020), providing some confidence that the results from this investigation may be generalizable. Given the sample size, we did not investigate whether the identified relationships between adverse experiences and mental health differed by sociodemographic variables, such as race, ethnicity, sexual orientation, gender identity, income, or education level. In addition, our data were cross-sectional, and thus, we are not able to demonstrate causality. While this cross-sectional study represents a first step in examining the moderation effects of ACEs, future studies should employ methods that allow for testing causality (e.g., ecological momentary assessment approaches). Casual inference is also limited by our use of self-reported ACEs, discrimination, and mental health, given known confounds between mental health status and reports of adverse experiences and limitations of same-source reporting bias (Dohrenwend et al., 1984; Meyer, 2003). Retrospective self-report scales may also be prone to recall bias (Hardt and Rutter, 2004).

There were also measurement-specific limitations in this study. For instance, researchers have critiqued ACE questionnaires based on their limited psychometric properties (McLennan et al., 2020). For the ACE measure we used, we did not require participants to identify specific ACEs, but rather to report a count of the number of ACEs they had experienced. This enabled us to examine cumulative risk of adversity during childhood, but it limited our level of analysis to total ACEs count rather than examining how specific types of ACEs (e.g., abuse, unexpected death of a family member) may differentially interact with day-to-day discrimination. This may be particularly important to examine in future studies, given that research has demonstrated that distinct types of ACEs are differentially associated with mental health (Negriff, 2020). Future studies that allow participants to identify specific ACEs and positive childhood experiences may allow us to further clarify the synergistic association of ACEs and discrimination found in this study and whether positive childhood experiences may serve to mitigate this synergistic association. Future

research could also examine how ACEs and discrimination synergistically impact outcomes beyond those measured in the current study such as PTSD and academic outcomes. Future research could also consider the timing of any synergistic effects of ACEs and discrimination to determine if deleterious effects are immediate (e.g., observed during childhood or adolescence) or if such effects are delayed until adulthood. The measure used to examine discrimination broadly assessed subjective discriminatory experiences which may be related to several identity characteristics (e.g., race/ethnicity, sexual orientation), but did not include all possible types of discrimination (e.g., discrimination related to speech challenges; Boyle, 2018). Given that discrimination and ACEs disproportionately occur in marginalized populations (Banks et al., 2006; Giano et al., 2020; Meyer, 2003), future research would benefit from examining the exacerbating effect of ACEs on specific types of discrimination (e.g., racism, sexism, homophobia) among respective minority groups. Future research could also examine risk and resilience factors that make people more or less vulnerable to the effects of discrimination experiences.

8. Conclusion

This study extends assessment of the relationship between adversity and mental health symptomatology among young adults. Specifically, the results of this study are among the first to our knowledge to indicate that the combination of ACEs and discrimination exposure in young adulthood, rather than exposure to only one of these stressors, may be associated with young adults' depression, anxiety, and somatic symptoms, along with overall psychological distress. Our novel findings indicate that ACEs can amplify the association between discrimination on young adults' mental health symptomatology. Guided by stress-sensitive frameworks, and in line with current literature (e.g., Edwards et al., 2020), our findings underscore that prevention and intervention research targeting ACEs or discrimination should assess and account for both types of stressors. Moreover, to understand life-long mental health consequences of childhood adversity, it is essential to examine subsequent adversity, including day-to-day discrimination, among ACE-exposed young adults.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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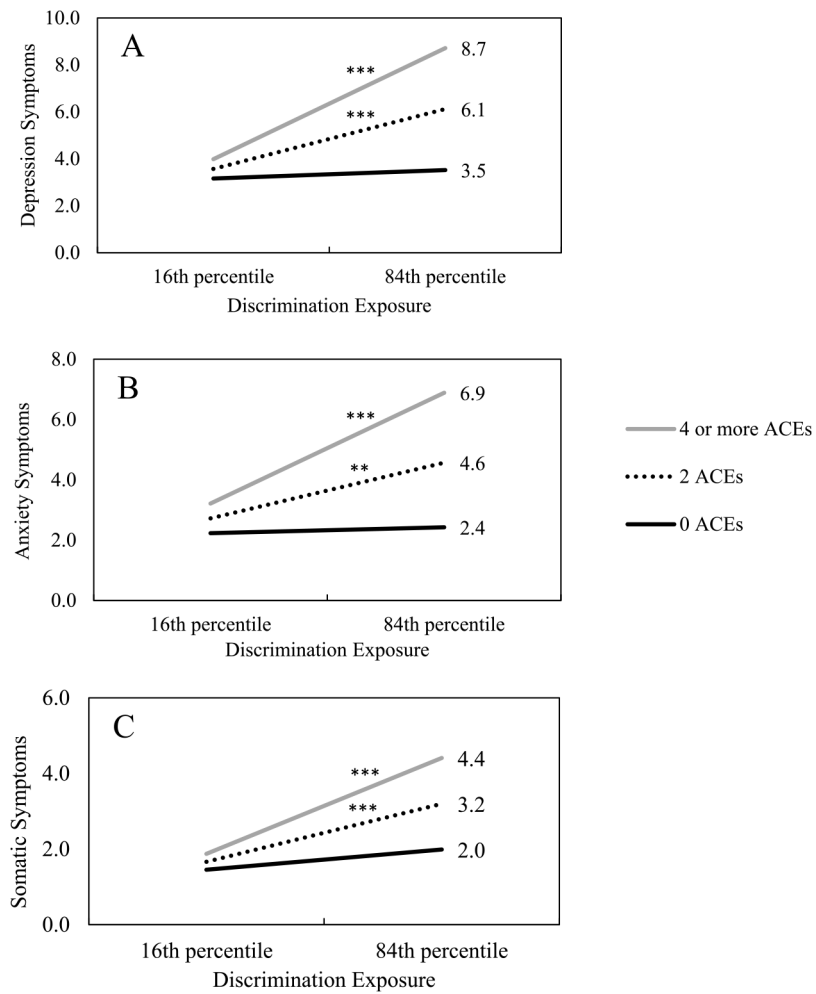
Fig. 1.

Discrimination by ACEs for depression symptoms (A), anxiety symptoms (B), and somatic symptoms (C).

Note. The 16th percentile of discrimination exposure corresponds to a value of 15 on the Everyday Discrimination Scale (indicating relatively lower discrimination exposure) and the 86th percentile corresponds to a value of 31 (indicating relatively higher discrimination exposure).

p < .05, **p* < .01, ***p* < .001.

Fig. 2.
Probability of reporting clinically severe levels of psychological distress at varying levels of discrimination and ACEs exposure.

Table 1

Sample characteristics of undergraduate students ($N = 251$).

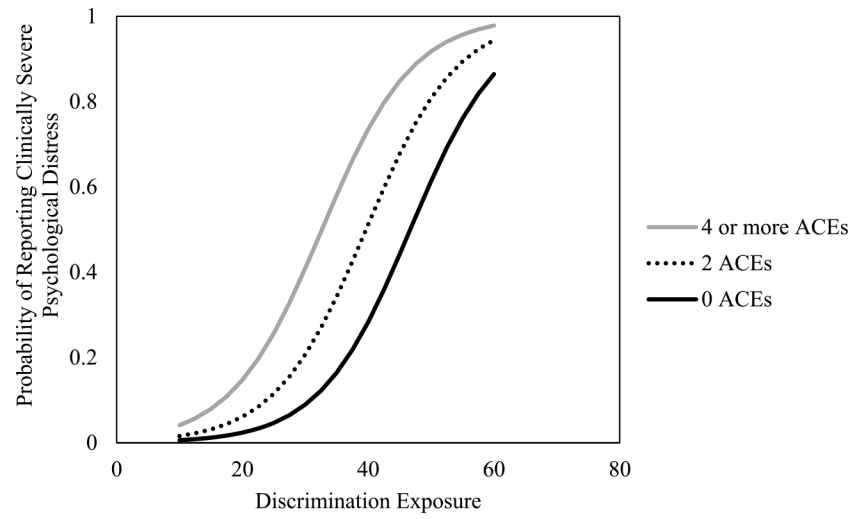| Sample Characteristic	Total Sample	
	n	**%**
Age, years (range: 18 – 45)		
Mean	19.91	
SD	2.06	
Gender		
Cisgender women	170	67.7
Cisgender men	81	32.3
Sexual orientation		
Asexual	4	1.6
Lesbian	4	1.6
Gay	5	2.0
Bisexual	39	15.5
Heterosexual	189	75.3
Questioning or unsure	9	3.6
Something else	1	0.4
Race/ethnicity		
American Indian or Alaska Native	5	2.0
Asian	41	16.3
Black or African American	14	5.6
Hispanic/Latinx	27	10.8
Native Hawaiian or Other Pacific Islander	3	1.2
Multiracial	7	2.8
White	154	61.4
Household income[a]		
Less than $20,000	17	6.8
$20,000 – $34,999	13	5.2
$35,000 – $49,999	19	7.6
$50,000 – $74,999	45	17.9
$75,000 – $99,999	36	14.3
Over $100,000	121	48.2
Year in School		
1	149	59.4
2	61	24.3
3	27	10.8
4	11	4.4
5 or more	3	1.2
ACEs		
0	60	23.9

Sample Characteristic	Total Sample	
	n	*%*
1	49	19.5
2	35	13.9
3	19	7.9
4 or more	88	35.1
Reported Reasons for Discrimination Experiences[b]		
Ancestry or national origins	28	11.1
Gender	121	48.2
Race or skin color	76	30.3
Age	122	48.6
Religion	17	6.8
Height	38	15.1
Weight	34	13.5
Some other aspect of physical appearance	74	29.5
Sexual orientation	26	10.4
Education or income level	37	14.7
Physical disability	6	2.4

Note. ACEs = adverse childhood experiences.

[a] Household income includes income from parents/caregivers if participants are primarily financially supported by parents/caregivers.

[b] Percentages do not add up to 100% as participants were able to select multiple reasons.

Table 2

Bivariate associations among continuous study variables in the full sample of undergraduate students ($N = 251$).

	1	2	3	4	5	6	7	8
1. Age	—							
2. Income	−0.09	—						
3. Education level	0.50 **	−0.06	—					
4. ACEs	0.08	−0.28 **	0.11	—				
5. Discrimination	−0.03	−0.12	0.10	0.37 **	—			
6. Somatic symptoms	−0.03	−0.06	−0.06	0.29 **	0.31 **	—		
7. Anxiety symptoms	−0.03	−0.10	0.11	0.40 **	0.34 **	0.69 **	—	
8. Depression symptoms	−0.02	−0.11	0.10	0.41 **	0.36 **	0.55 **	0.72 **	—
Mean (*SD*)	19.91 (2.06)	3.73 (1.57)	1.64 (0.93)	2.10 (1.62)	22.51 (7.89)	2.56 (3.32)	3.94 (4.90)	5.15 (5.61)
Range	18 – 45	0 – 5	1 – 5	0 – 4	10 – 60	0 – 24	0 – 24	0 – 24

Note. Education level (1 = first-year to 5 = 5 or more years); income (0 = Under $20,000 to 5 = Over $100,000); ACEs = adverse childhood experiences (0 = 0 ACEs to 4 = 4 or more ACEs).

*
 p < .05

**
 p < .01

***
 p < .001.

Table 3

Moderation results of the association between discrimination and somatic, anxiety, and depression symptoms.

Variable	Depression Symptoms			Anxiety Symptoms			Somatic Symptoms		
	B	t	95% CI	B	t	95% CI	B	t	95% CI
Control variables									
Age	-0.11	-0.62	(-0.45, 0.23)	0.07	0.43	(-0.23, 0.37)	0.08	0.71	(-0.14, 0.30)
Race/ethnicity	0.26	0.39	(-1.05, 1.57)	-0.91	-1.54	(-2.07, 0.25)	-0.37	-0.86	(-1.23, 0.48)
Sexual orientation	2.55**	3.32	(1.04, 4.07)	2.59***	3.82	(1.26, 3.93)	0.92†	1.84	(-0.07, 1.90)
Gender	-2.09**	-3.18	(-3.39, -0.80)	-1.50*	-2.57	(-2.64, -0.35)	-0.62	-1.45	(-1.47, 0.22)
Income	0.19	0.93	(-0.22, 0.60)	0.01	0.07	(-0.35, 0.37)	0.06	0.47	(-0.20, 0.33)
Education level	0.38	0.98	(-0.38, 1.15)	0.20	0.57	(-0.48, 0.87)	-0.45†	-1.79	(-0.95, 0.04)
COVID-19 group	0.43	0.65	(-0.86, 1.71)	0.18	0.32	(-0.95, 1.32)	0.06	0.15	(-0.77, 0.90)
Main effects									
Discrimination	0.17***	4.07	(0.09, 0.25)	0.13***	3.51	(0.06, 0.20)	0.10***	3.72	(0.05, 0.15)
ACEs	0.72**	3.20	(0.28, 1.16)	0.65**	3.29	(0.26, 1.05)	0.34*	2.32	(0.05, 0.63)
Interaction effect									
Discrimination × ACEs	0.07**	2.90	(0.02, 0.12)	0.05**	2.64	(0.01, 0.10)	0.03*	2.03	(0.001, 0.06)
Model fit statistics									
R^2	0.33			0.31			0.19		
F	11.94***			10.97***			5.55***		
R^2 for interaction effect	0.02			0.02			0.01		

Note. Unstandardized beta coefficients are reported. ACEs = adverse childhood experiences. Race/ethnicity (0 = white, 1 = racial/ethnic minority); sexual orientation (0 = heterosexual, 1 = sexual minority); gender (0 = women, 1 = men); COVID-19 (0 = data collected pre-COVID-19 [(Fall 2019 to February 2020)], 1 = data collected during COVID-19 [Fall 2020 semester].

†
$p < .10$

*
$p < .05$

**
$p < .01$

***
$p < .001$.

Table 4

Moderation results of the association between discrimination and psychological distress.

Variable	AOR	95% CI
Control variables		
Age	$1.19^{\dagger}$	(0.98, 1.45)
Race/ethnicity		
White	*ref*	
Racial/ethnic minority	0.23^{*}	(0.06, 0.84)
Sexual orientation		
Heterosexual/Straight	*ref*	
Sexual minority	1.17	(0.38, 3.60)
Gender		
Women	*ref*	
Men	0.60	(0.16, 2.28)
Income	0.98	(0.71, 1.36)
Education	0.75	(0.41, 1.39)
COVID-19 group		
Pre-COVID-19	*ref*	
During COVID-19	1.33	(0.42, 4.18)
Main effects		
Discrimination	1.12^{*}	(1.03, 1.23)
ACEs	1.30	(0.78, 2.14)
Interaction effect		
Discrimination × ACEs	1.05^{*}	(1.00, 1.11)
Model fit statistics		
Log Likelihood	49.99	
R^2 (Cox & Snell/Nagelkerke)	0.18/0.39	
McFadden Pseudo R^2 Adjusted	0.32	
χ^2 (df) for interaction effect	$4.29^{*}(1)$	

Note. AOR = adjusted odds ratios; CI = Confidence Interval; ACEs = adverse childhood experiences. Boldface type indicates a significant AOR. Psychological Distress = (0 = < 2 subscales with *t* scores 62; 1 = 2 subscales with *t* scores 62). Race/ethnicity (0 = white, 1 = racial/ethnic minority); sexual orientation (0 = heterosexual, 1 = sexual minority); gender (0 = women, 1 = men); COVID-19 (0 = data collected pre-COVID-19 [(Fall 2019 to February 2020], 1 = data collected during COVID-19 [Fall 2020 semester].

$^{\dagger}p < .10$

$^{*}p < .05$

$^{**}p < .01$

$^{***}p < .001.$