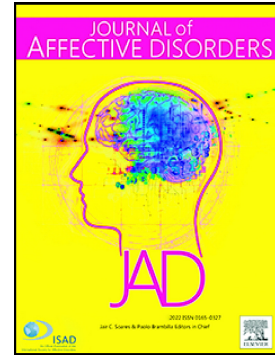


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Associations of Childhood Adversity with Emotional Well-Being and Educational Achievement: A Review and Meta-Analysis

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Abstract

Background: Profound negative implications of adverse childhood experiences (ACEs) have raised public health concern worldwide.

Method: This systematic review and meta-analysis examined associations of three types of ACEs (abuse, neglect, and household dysfunctions) with experiential (emotional quality of momentary and everyday experiences) and reflective (judgments about life satisfaction, sense of meaning, and ability to pursue goals that can include and extend beyond the self) facets of emotional well-being (EWB) and educational achievement. The systematic review yielded 100 studies with 176 effect sizes that met criteria for inclusion in the meta-analysis.

Results: ACEs were related particularly strongly to lower EWB, $r = -0.32$, $p < 0.001$; [95% CI: -0.44 to 0.01], but also to lower educational achievement, $r = -0.18$, $p < 0.001$; [95% CI: -0.21 to -0.05]. Associations were stronger for abuse and composite indicators of ACEs than for household dysfunctions. Associations of ACEs with EWB and educational achievement were stronger in childhood and adolescence than in emerging or later adulthood. Associations did not differ for males and females or for Eastern versus Western cultural groups. Analyses provided evidence for the causal role of ACEs in the development of lower EWB and academic achievement as well as their reciprocal associations.

Limitations: There is no standard conceptualization of well-being and studies are not always clear about the types of ACEs examined, with limited research on educational achievement.

Conclusion: Findings have important implications for mental health professionals, policy makers and social service agencies in developing resources and intervention services that target ACEs to protect individuals and promote well-being and academic achievement.

Keywords: *Child adverse experiences, Abuse, Neglect, Household dysfunctions, Emotional well-being, Educational achievement, Review and meta-analysis*

Introduction

Adverse childhood experiences (ACEs) refer to traumatic experiences in the first 18 years of life, such as abuse, neglect, and living in a stressful household or community environment (Boullier & Blair, 2018). An extensive body of work has accumulated for more than two decades since the original ACE study conducted in the late 1990s in the United States (Felitti, et al., 1998). Researchers on the original ACEs study found that close to two-thirds of adult participants reported having at least one ACE, and most of the ACEs co-occurred with one or more additional ACEs (Felitti, et al., 1998). ACEs are common in many other countries, too (Felitti, et al., 1998). For instance, in Japan, China, Taiwan, and Hong Kong, approximately 66.26% of students reporting at least one ACE, with higher rates among lower income Asian societies (e.g., 74.8% in Tunisia and 76% in Vietnam; El Mhamdi et al., 2017; Ho et al., 2020; Tran et al., 2015).

The original seminal work on ACEs has raised public health concern worldwide on the profound negative implications of ACEs on health, well-being, and educational outcomes, with a significant dose-response relation (Wang et al., 2021; Youssef et al., 2017). Prolonged exposure to ACEs is associated with subsequent illnesses, disease, disability and early mortality, poorer mental health, such as emotion dysregulation, greater post-traumatic stress disorder (PTSD), depression and anxiety, and lower life satisfaction and educational achievement (Chapman et al., 2004; Dube et al., 2003). Severity and types of ACEs also relate to developmental outcomes (Warmingham et al., 2019; Witt et al., 2016). Numerous reviews and meta-analyses have provided evidence on the deleterious, long-lasting implications of ACEs on poor health outcomes that are linked to changes in the structure and function of the brain, biological impairments of the body's stress response system, and cognitive impairments (e.g., Petrucci et

al., 2019; Su et al., 2019). However, there is no review or meta-analysis on ACEs and positive aspects of well-being. Research on ACEs and well-being is inconsistent in defining and measuring well-being, with most studies focusing on mental illnesses, especially PTSD, anxiety, and depression (Kuzminskaite et al., 2021; Sands et al., 2017), and other studies examining positive mental health functioning (Xiang et al., 2021; Yu et al., 2022).

Following National Institutes of Health Roundtable (2018), positive well-being is conceptualized as emotional well-being (EWB) with three components: (a) eudaimonia—a sense of meaning and purpose in life; (2) evaluative well-being—reflective, general judgments (or perceptions) of life satisfaction; and (3) hedonic (or experiential) well-being—momentary emotional states. EWB is a multi-dimensional composite with experiential features (emotional quality of momentary and everyday experiences) and reflective features (judgments about life satisfaction, sense of meaning, and ability to pursue goals that can include and extend beyond the self; Park et al., 2023). Researchers have called for attention to the use of the EWB model in guiding future work on well-being and its associated antecedents, processes, and outcomes (Park et al., 2023). In addressing this call, the EWB framework is germane to understanding ACEs and well-being, particularly how different types and severity of ACEs associate with experiential and reflective facets of EWB.

ACEs happen in childhood and adolescence, during which a salient developmental task is educational achievement, which has long term implications for multiple domains in adulthood, such as healthy behavior management, career trajectory, and life satisfaction (Brown et al., 2016; Xiang et al., 2021). However, research on ACEs and educational achievement is more limited than research on ACEs and health and well-being outcomes. We addressed the lacunae in existing literature by attending to different types and severity of ACEs, EWB and educational

outcomes, long term implications (causal direction and latency--the duration between ACEs and outcome assessment), and the moderating effects of individual (gender, developmental differences) and contextual factors (cultural contexts) on the associations of ACEs with EWB and educational achievement.

Associations of ACEs with EWB and Educational Achievement

ACEs comprised abuse, neglect, and household dysfunctions (Boullier & Blair, 2018). Emotional abuse refers to psychological pain and fear inflicted by adult figures at home through swearing, insulting, putting down, or threatening to cause physical hurt. Physical and sexual abuse refer to physical harm (e.g., pushing, grabbing, slapping, hitting that caused marks or injury) and sexual acts (e.g., touching or fondling the child's body in a sexual way, making the child touch the adult in a sexual way). Emotional neglect is defined as not feeling important, loved, looked after, and supported in the family, and physical neglect is the lack of caregiving, protection, food, or clean clothes. Household dysfunction entails violent treatment, substance abuse, and/or mental illness in the household, parental separation or divorce, and having a criminal household member.

Research on ACEs and health outcomes typically employs the cumulative risk approach and assumes that different types of ACEs have equal weight and an additive and linear dose-response relation (Wang et al., 2021). However, some ACE types (e.g., sexual abuse) have stronger associations with outcomes than others (Warmingham et al., 2019; Witt et al., 2016), and ACEs tend to occur in multiple rather than single experiences (Brown et al., 2019). Studies that considered abuse alone have more consistently demonstrated negative associations across well-being and education outcomes (Jordan et al., 2014; Mosley-Johnson et al., 2019). In contrast, studies that investigated a composite measure of ACEs comprising a combination of

abuse, neglect, and household dysfunctions found mixed results—some studies revealed ACEs resulted in poor mental health functioning, such as PTSD, anxiety and depression, lower life satisfaction and academic achievement (Kelifa et al., 2021; Tan et al., 2017; Xiang et al., 2021), whereas others found none (Jeter, 2022; Muwanguzi et al., 2023). The category of ACEs examined is often ambiguous, including one or some combination of the three categories (Boullier & Blair, 2018): (1) abuse; (2) neglect; (3) household dysfunction.

Some findings suggest the need for a more fine-grain distinction of each of the three ACEs (Warmingham et al., 2019; Witt et al., 2016). For instance, physical abuse may be more detrimental to well-being because it is (or regarded as) life-threatening (Lansford et al., 2021; Yoder, 2014). However, few studies examined the different subtype of abuse, neglect, and household dysfunctions in relation to well-being and educational outcomes. Furthermore, ACEs studies are inconsistent in how they conceptualized and operationalized positive well-being (Kelifa et al., 2021; Xiang et al., 2021). Findings have been inconsistent on the associations of ACEs with the same positive well-being outcomes, such as life satisfaction (Mosley-Johnson et al., 2019; Xiang et al., 2021), as well as across different positive well-being outcomes including post-traumatic growth, flourishing, resilience, and emotion-regulation (Davis, 2018; Jeter, 2022; Yu et al., 2022). The EWB framework that considers experiential and reflective facets of positive well-being is germane to a consolidated effort at reconciling the differences in results on the associations of ACEs on positive well-being.

Competing hypotheses can be examined regarding the associations of ACEs with the experiential and reflective facets of EWB. Empirical studies have demonstrated how ACEs resulted in greater emotional problems, emotional volatility, emotion dysregulation, increased negative emotions and higher depressive and anxiety symptoms in a dose-response relation (e.g.,

Kelifa et al., 2021; Treat et al., 2020; Xiang et al., 2021). Reviews and meta-analyses on ACEs and resilience highlight how resilient individuals have better emotion regulation, greater experience of positive emotions, and emotional stability that dampen the negative implications associated with ACEs and buffer individuals from mental health problems (Meng et al., 2018; Watters et al., 2023). Collectively, these findings suggest that ACEs likely associate with lower experiential facets of emotional well-being.

In contrast, ACEs may associate with the reflective facets of EWB in a positive or negative direction. Theories on stress inoculation and post-traumatic growth posit that ACEs can increase resilience, posttraumatic growth, and hardiness (Yoder, 2014; Yu et al., 2022). These qualities embody a renewed perception of meaningfulness of life and increase mastery beliefs and coping ability (Tedeschi & Calhoun, 2004). Based on this reasoning, ACEs are likely to associate with greater reflective facets of EWB. On the other hand, according to the diathesis stress model and theories on PTSD, ACEs increase children's exposure to vulnerability and profound stress conditions, which can result in negatively biased perceptions of life, negative cognitive attributional style, and lower mastery and self-efficacy beliefs (Tranter et al., 2021; Wang et al., 2021). This theoretical reasoning suggests that ACEs are associated with lower reflective facets of EWB. A concerted effort at amalgamating findings on the associations of ACEs with the reflective and experiential facets of EWB addresses an important gap and provides evidence for the EWB framework in guiding future work on ACEs and positive well-being (Dube, 2020).

ACEs happen during the developmental phase when a salient developmental task is educational achievement (Tan et al., 2017). According to transactional and developmental cascade theories (Rutter, 1987; Sameroff & MacKenzie, 2003), maladaptation and inability to

cope with ACEs may create a cascade of cross-domain effects, resulting in risks in other aspects of children's development, including academic functioning (Cassen et al., 2008). ACEs are associated with cognitive impairment, for instance executing functioning and lower IQ, and poor self-regulatory processes, which are linked to lower grades, academic goals, and motivation (Weindl et al., 2018; Welsh et al., 2017). The negative associations of ACEs and children's educational achievement have been well-documented (Tan et al., 2017), but findings are mixed with regards to the associations with different types of ACEs.

For example, findings are somewhat mixed on how divorce affects children's academic outcomes (Tan et al., 2017), although divorce has been commonly shown to have a modest and negative association with children's academic outcomes (Amato & Anthony, 2014; Sun & Li, 2008). Similarly, some studies found that parental incarceration is associated with a decline in children's academic performance (Gifford et al., 2015; Nichols & Loper, 2012), whereas a meta-analysis revealed that parental incarceration and academic performance are not associated (Murray et al., 2012). Unlike for children, research on adolescents and college students with ACEs has focused predominantly on mental health functioning and life adaptation (Welsh et al., 2017), with a dearth of studies examining academic success. A small body of work found that college students who experienced ACEs were more likely to drop out of college and reported lower levels of adaptation to college (Elliot et al., 2009; Maples et al., 2014). One study found that adolescents who were sexually abused had lower GPAs when they entered college and at the end of their first year at college (Jordan et al., 2014). Research attention is warranted for a conclusive understanding of how ACEs relate to the critical milestone of educational achievement.

Long Term Implications of ACEs on EWB and Educational Achievement (Causal Direction and Latency)

The literature is inconclusive regarding the long term implications of ACEs on EWB and educational achievement (Brumley, 2019; Soffer et al., 2008). Causal influence and latency of ACEs and outcomes on EWB and educational achievement can be gleaned from longitudinal studies (Mosley-Johnson et al., 2019; Shao et al., 2021). These studies provide information to test the following directionality of influence: (a) ACEs \rightarrow EWB/educational achievement, (b) EWB/educational achievement \rightarrow ACEs, and (c) ACEs \leftrightarrow EWB/educational achievement.

The stress sensitization hypothesis asserts that ACEs are associated with lower EWB and educational achievement (ACEs \rightarrow EWB/educational achievement; McLaughlin et al., 2010; McLaughlin, 2018). This occurs at least partly because ACEs are associated with disruption of neuro-development and impairment to areas of the brain that are responsible for stress regulation, resulting in lower threshold to cope with future stressors (McLaughlin et al., 2010; McLaughlin, 2018). According to stress proliferation theory, early adverse experiences are positively associated with subsequent new stressors that were not previously present (Pearlin & Bierman, 2013). Thus, ACEs present toxic stress early in life that triggers other stressors and reduce individuals' intra- and interpersonal capacities and resources (McLaughlin et al., 2010; McLaughlin, 2018), such as executive functioning and emotion regulation, needed for positive well-being and academic pursuit (Welsh et al., 2017).

In contrast, parenting theories propose that EWB and academic functioning are main causal drivers of the presence vs. absence of ACEs (EWB/educational achievement \rightarrow ACEs; Belsky 1984). For example, children with emotion dysregulation may exhibit more externalizing behaviors and academic difficulties and thus increase parenting stress, which may in turn relate

to harsher parenting behaviors (Belsky 1984), and increase the likelihood of these children experiencing ACEs. A third perspective would emphasize bidirectional causation: ACEs and EWBs/educational achievement influence each other reciprocally (ACEs \leftrightarrow EWB/educational achievement). The diathesis stress model would support bidirectional causation between ACEs and the outcomes of EWBs and educational achievement (Hanson et al., 2022). When individuals encounter ACEs, they experience lower emotional quality of momentary and everyday experiences, lower personal mastery beliefs, and reduced ability to pursue academic goals (Welsh et al., 2017; Xiang et al., 2021). Individuals with lower EWB and educational achievement may have increased internalizing and externalizing problems (Lansford et al., 2015) and less personal and social resources (Pearlin, 1989), such as coping and social support, that could increase their vulnerability and risk to emotional and physical abuse and neglect and violent treatment from parents (Belsky, 1984). Thus, ACEs can associate with lower EWB and educational achievement, and conversely, lower EWB and educational achievement can increase vulnerabilities that further perpetuate ACEs.

Longitudinal findings also reveal latency of ACEs with EWB and educational achievement—the duration between ACEs and outcome assessment. For example, if the first measurement for ACEs was taken on January 2018 (Time 1) and the next measurement for EWB and educational achievement was taken on January 2020 (Time 2), the latency is 2 years. Understanding whether and how ACEs relate to change in EWB and educational achievement and the latency of their associations facilitate understanding of developmental cascades involving ACEs and outcomes on EWB and educational achievement (Cassen et al., 2008). With increased adoption of evidence-based prevention and early intervention programs on ACEs, scholars and practitioners have called for attention to elucidate the long-term implications of

ACEs on well-being and educational outcomes, particularly the window of opportunity in which interventions are most effective (Welsh et al., 2017; Yu et al., 2022).

Individual and Contextual Characteristics

Studies that examined associations of ACEs with EWB and educational achievement revealed possible developmental differences; associations may be particularly salient in childhood and adolescence (Liem et al., 1997). However, no studies to date have compared the implications of ACEs across developmental stages, especially contrasting early stages of childhood and adolescence with adulthood. Additionally, gender can modulate associations of ACEs with EWBs and educational achievement. Females with ACEs might be at greater risk for mental health problems than males, despite males' exposure to more emotional and physical abuse (Hagborg et al., 2017). After accounting for demographic differences, the negative associations of different types of ACEs and well-being was consistent across males and females in some prior research (Felitti et al., 1998). In particular, greater severity and longer exposure to ACEs led to higher depressive symptoms for both genders (Benjet et al., 2020). There is less research on ACEs and educational achievement, and no studies have documented gender-specific linkages.

Cultural contexts also warrant attention, in light of how parenting and child development (Lansford, Rothenberg et al., 2021), as well as well-being processes, differ between Western and Eastern contexts (e.g., Krendl & Pescosolido, 2022; Miyamoto & Ryff, 2022). Broadly, parents in Western and Eastern cultural contexts may differ in parenting styles and practices (Lansford, Rothenberg et al., 2021; Lansford et al., 2015). In addition, children's expressions of emotions are socialized differently (Yeo et al., 2022). Confucian ideology is deeply ingrained in most Asian families, where *guan* or *chao shun* (i.e., strict, training; Chao, 1994) especially relating to

educational achievement to bring honor to the family is underscored in parenting practices and children's development (Sorbring et al., 2019). These findings on parenting and child development suggest possible cultural differences in how ACEs are associated with EWB and educational achievement in Western vs. Eastern contexts that warrant research attention. Overall, the current state of research underscores a nuanced and comprehensive approach in elucidating individual and cultural factors that moderate the associations of ACEs and outcomes on EWB and educational achievement.

Aims of This Review and Meta-Analysis

To our knowledge, no systematic review or meta-analysis has evaluated the associations of ACEs with EWB and educational achievement and moderators of these relations. Towards this end, our efforts at synthesizing findings across studies attended to the main implications of ACEs. First, we investigated ACEs' associations with two facets of EWB—experiential (i.e., positive emotional quality of momentary and everyday experiences) and reflective (i.e., judgments about life satisfaction, sense of meaning, and ability to pursue goals), and educational achievement (e.g., grades, GPA, highest grade completed, academic goals, academic motivation). We hypothesized that ACEs would have negative associations with EWB (H1a) and educational achievement (H1b). Second, we examined how the associations of ACEs with reflective and experiential facets of EWB compare with education achievement as a research question (RQ1), and how the different sources of ACEs: (a) abuse, (b) neglect, and (c) household dysfunction compare in their associations with EWB and educational achievement (RQ2).

Third, we investigated potential moderators of the associations of ACEs with EWB and educational achievement by considering individual characteristics (gender and developmental stages) and culture. We hypothesized that the negative associations of ACEs with EWB and academic achievement would be greater for children and adolescents than for adults (H2a, H2b)

and greater for females compared to males (H2c, H2d). Previous research did not lead to a specific directional hypothesis related to cultural differences, but we sought to examine potential differences in the associations of ACEs with EWB (RQ3a) and educational achievement (RQ3b) in Western and Eastern cultural contexts. Finally, we addressed the gap in current literature about long lasting implications associated with ACEs by attending to the causal influence (RQ4a) and latency between ACEs and outcomes of EWB and educational achievement (RQ4b).

Method

This meta-analysis was conducted according to the guidelines from Quintana (2015) and reported based on the latest version of Preferred Reporting Items for Reviews and Meta-Analyses guidelines (PRISMA 2020; Page et al., 2021). A protocol was registered a priori following the PRISMA guideline (PROSPERO registration number CRD [Blinded]).

Transparency and openness. All data, analysis code, and research materials are available at: https://osf.io/jzwsq/?view_only=7b37a58439974d9d8d652bb7c188daeb.

Literature search. With the assistance of a staff librarian at the first author's institution, two research assistants independently employed three search strategies to systematically identify studies that examined the associations of ACEs with EWB and/or academic outcomes. First, a systematic search was conducted in January 2023 across PsycINFO, PubMed, EMBASE, and CINAHL because these data bases cover two fields pertinent to this review—social science and clinical research. Searches were re-run just before the final analyses in July 2023 to include further articles published between January and July 2023. Limits, when available, were applied to include only academic articles, human studies, and papers written in English or with an English translation. Second, reference lists of the included studies (including other reviews and meta-analyses) were searched manually and cross-referenced for additional articles. Third, we

manually searched in-press or online-first article abstracts in the following journals: *Child Development, Developmental Psychology, Journal of Adolescence, Journal of Child and Family Studies, Journal of Family Psychology, Journal of Research on Adolescence, Journal of Social and Personal Relationships, Journal of Youth and Adolescence, and Social Development.*

Together, these search methods identified 6,107 citations to relevant studies. Table 1 details the search terms developed using the PICO (Population Intervention Comparison Outcome) search strategy and full search strings.

Study selection. Study screening was conducted using Covidence software (Veritas Health Innovation, Melbourne, Australia). Figure 1 presents a flowchart of the study selection process. Of the 6,107 records identified in the initial searches, 351 records selected for full text review were independently screened by two reviewers with any discrepancies resolved through consensus. A third reviewer was contacted if consensus could not be reached. Inclusion and exclusion criteria were established *a priori* (Table 1). One hundred studies with 176 effect sizes were included in our meta-analyses.

Data extraction and coding. Two research assistants extracted and coded data on study design, sample characteristics (e.g., age, sample size, country), types of ACEs—specifically, abuse, neglect, household challenges, and undifferentiated ACEs—a composite ACEs score that combines different types of abuse (i.e., emotional, physical, and sexual), neglect (i.e., emotional and physical), and household dysfunctions (violent treatment, household substance abuse, mental illness in household, parental separation or divorce, and criminal household member). Reviewers also coded theoretical/conceptual frameworks, conceptualizations and operationalizations of EWB outcomes, including experiential and reflective facets, and educational achievement. Reviewers extracted studies' correlation coefficients from cross-sectional and longitudinal

studies on childhood adversity and EWB and educational achievement (see Appendix Table A2 to A4). Coders achieved 79% agreement. Any discrepancies in coding were discussed and resolved. ACEs were assessed primarily with the Adverse Childhood Experience Study Questionnaire (ACE-SQ; Felitti, et al., 1998) and the Child Trauma Questionnaire (Bernstein et al., 2003).

Risk of bias (quality) assessment. Studies were independently evaluated for quality by two reviewers with differences discussed and resolved. Because all 100 studies included in our meta-analysis were field studies¹, we assessed them using the Downs and Black (1998) instrument. The checklist assessed five domains of quality: external validity, study bias, confounding, selection bias, and study power, and generated scores ranged from 0 to 28 with higher scores indicating greater quality. Most studies indicated moderate to high quality ($M = 17.61$, $SD = 1.36$) and had scores that ranged from 13 to 21.

Multiple dependent effect sizes. In several instances, studies contributed multiple dependent effect sizes. Following the guidelines provided by Quintana (2015), we dealt with this issue in four ways. First, for cases examining more than one type of ACE, the different effect sizes were used to conduct analyses for associations with EWB and educational achievement separately: (a) abuse; (b) neglect; (c) household challenges, and (d) undifferentiated ACEs—a composite ACEs score that combines different types of abuse, neglect, and household dysfunctions. Second, some studies measured each type of ACEs in a variety of ways, for instance, abuse, neglect, and household challenges were assessed by different measures, and included multiple indicators of EWB and educational achievement. For such cases, we computed the average effect size across all measures of the same type of ACEs and all measures of the

¹Two field studies included in our meta-analysis also included interventions and we excluded them because there were insufficient effect sizes (the 2 interventions contributed 2 effect sizes only) to compare interventions and field studies on childhood adversity and the relations to EWB and educational attainment.

same EWB and educational achievement outcomes within a study. Hence, each study contributed only one effect size for the analyses involving each type of ACEs with EWB and educational achievement.

Third, for longitudinal studies that provided bivariate correlations on the concurrent associations of ACEs with EWB and educational achievement (e.g., T_1 ACEs with T_1 EWB/education achievement) and cross-lagged associations (e.g., T_1 ACEs with T_2 EWB/education achievement, T_1 EWB/education achievement with T_2 ACEs), there were multiple effect sizes. For such cases, we computed the average effect size across all measures of the same outcome within a study (Brewin et al., 2007). To address RQ4 on the long term mental health implications of ACEs, we computed the average effect sizes that relate to each of these associations: (a) ACEs \rightarrow change in EWB/education achievement² (e.g., T_1 ACEs with T_2 EWB/education achievement, T_2 ACEs with T_3 EWB/education achievement) and (b) ACEs \leftrightarrow EWB/education achievement (e.g., T_1 ACEs with T_1 EWB/education achievement, T_2 ACEs with T_2 EWB/education achievement).

Fourth, a few studies reported multiple effect sizes because they investigated different countries, especially concerning representatives of Western and Eastern cultural contexts. Because cultural contexts were examined as moderators in our meta-analyses, a single effect size estimate that aggregated the multiple correlation coefficients was not favoured and we reported effect size estimates separately (Hunter & Schmidt, 2014). For such cases, more than one set of data was collected from the same study, forcing consideration of issues of statistical dependency that stem from the multiple dependent effect sizes (Hunter & Schmidt, 2014). We used the robust

²We took into account the initial level of EWB/educational achievement; there were no studies that examined EWB/educational achievement \rightarrow ACEs.

variance estimation to account for non-independent effect sizes, which can also be adjusted to deal with smaller meta-analyses ($n < 40$; Tipton, 2015).

Computation of Effect Sizes. Pearson's correlation coefficients were used as the effect sizes, but these values first were converted into Fisher's z scale because they are not normally distributed. All effect sizes were transformed back into correlation coefficients for reporting the average effect sizes for the associations of ACEs with EWB and educational achievement. We included 2 forest plots to visualize the effect sizes and Confidence Intervals (CIs) for ACEs with EWB and educational achievement, respectively, with a computed summary effect size for each plot. All analyses were conducted using R studio with the "metafor" and "robumta" packages (Fisher & Tipton, 2015; R Development Core Team, 2017; Viechtbauer, 2010).

Results

Sample Characteristics

Summary and sample statistics of included studies are presented in online supplement Appendix Table A2 to A4. With high heterogeneity observed among studies examining ACEs with EWB and educational achievement in the meta-analyses (see Table 2; Higgins et al., 2003), we used a random-effects model in conducting meta-analyses and meta-regressions on moderating effects. For EWB and educational achievement separately, we included a forest plot to visualize the effect sizes and CIs from the included studies, with a computed summary effect size (Figure 2).

Associations of ACEs with EWB and Educational Outcomes

We found support for H1a—associations between ACEs and experiential and reflective facets of EWB were established with 90 studies and 151 effect sizes that revealed a moderate negative association, $r=-0.34$ and -0.32 , respectively. For H1b, we synthesized 25 effect sizes

from 10 studies that examined the associations of ACEs and educational achievement and found a low negative association, $r=-0.18$. For RQ1, Q statistics analyses comparing the effect sizes of ACEs with the two facets of EWB and educational achievement revealed that they differed significantly. The associations of both facets of EWB and ACEs had similar effect size—experiential facets, $r=-0.34$, and reflective facets, $r=-0.32$, which were higher than the effect size for the relation of ACEs and educational achievement (Table 3).

Types of ACEs

For EWB and educational achievement separately, we performed subgroup analyses using meta-regressions to examine sources of ACEs as moderators. Specifically, we examined three sources of ACEs as a moderator—abuse, neglect, household challenges, and undifferentiated ACEs that comprises all three former components as a composite score, based on the theoretical conceptualization of ACEs (Boullier & Blair, 2018). For RQ2, sources of ACEs moderated the associations between ACEs and experiential facets of EWB, abuse, $r=-0.32$, and undifferentiated ACEs, $r=-0.24$ ³ had similar moderate effect size, which were higher than the effect size for household challenges, $r=-0.15$. In contrast, different sources of ACEs did not display significant differences in their relations with reflective facets of EWB and educational achievement (Table 3).

Individual Characteristics and Cultural Context

Average age of the sample and gender, which was measured as the average proportion of sample participants who were female, were used as continuous predictors in testing their moderating effects. How ACEs were related to EWB was contingent on developmental stages (H2a); the effect size was greater for both adolescents, $r=-0.32$, and children, $r=-0.28$, than for college students (i.e., emerging adults), $r=-0.22$, and adults, $r=-0.23$. In contrast, gender did not

³ There are no studies on neglect and experiential facet of EWB.

moderate the associations of ACEs and EWB (H2c). Developmental stages (H2b) and gender (H2d) did not moderate the relations of ACEs and educational achievement.

Studies included in the meta-analyses involved 24 countries, but there were not enough studies from each country to allow for a comparison of effect sizes among individual countries. Instead, we followed the common approach of comparing Western and Eastern cultures. Representatives of Western culture included Austria, Canada, Germany, Italy, and the United States; representatives of Eastern culture included China, Hong Kong, India, Indonesia, and Japan. We did not find significant cultural differences for the associations of ACEs with EWB (RQ3a) and educational achievement (RQ3b) (Table 3).

Long-Term Implications

For RQ4a, using cross-sectional and longitudinal studies, we examined the causal influence of ACEs and EWB by comparing the following: (a) ACEs \leftrightarrow EWB and (b) ACEs \rightarrow EWB. Both causal influences had low negative effect sizes and they were not significantly different. The latency between ACEs and EWB did not significantly moderate their relation. These findings suggest that individuals' experience of ACEs has both immediate and prospective associations with their EWB. The tendency for their ACEs experiences in driving lower EWB does not weaken over time (with increased latency that ranged from 3 months to 20 years; Table 3).

On the contrary for the causal influence of ACEs and educational achievement, subgroup comparison of (a) ACEs \leftrightarrow educational achievement and (b) ACEs \rightarrow educational achievement indicated that their effect sizes were not significantly different. The effect sizes of the

bidirectional associations of ACEs and lower educational achievement, $r=-0.18$, and the associations of ACEs leading to lower educational achievement, $r= -0.16$, were similar (Table 3)⁴.

Publication Bias Analysis

For the associations of ACEs with EWB and educational achievement separately, three analyses were used to ascertain publication bias. Analyses testing for publication bias are presented in Figure 3.

Discussion

ACEs are a public health concern worldwide (Boullier & Elkar, 2018). Reviews and meta-analyses have documented negative implications of ACEs on mental and physical health problems that persist into adulthood (e.g., Petrucci et al., 2019; Su et al., 2019). However, findings on the associations of ACEs with well-being and educational achievement have been inconclusive because of the lack of unifying theoretical models to guide research on understanding well-being and educational implications of ACEs, moderating factors, and long-term implications. This systematic review and meta-analysis is the first to bring together empirical findings on the associations of ACEs with EWB and educational achievement.

Associations of ACEs with EWB and Educational Achievement

Our review and meta-analysis found that ACEs have a moderate negative association with EWB and low negative association with educational achievement, consistent with our hypotheses. ACEs' negative associations with EWB were greater than those with educational achievement. Our findings are consistent with those from studies that have documented how individuals with ACEs had increased risk of emotional problems and dysregulation (e.g., Kelifa et al., 2021; Xiang et al., 2021), and a reduction of self-control, positive expectations of the

⁴We did not examine the moderating effect of latency of ACEs→educational achievement because all the effect sizes on this causal direction had a latency of 13 years.

world, people, future events, and one's personal mastery, goal pursuit beliefs, and ability, especially in childhood and adolescence (Welsh et al., 2017; Xiang et al., 2021). Scholars have noted that ACEs research has rarely focused on educational achievement despite its saliency during the developmental period when individuals experience childhood adversity (Brown et al., 2016; Xiang et al., 2021).

Our review and meta-analysis addresses this gap in research and found that ACEs have negative academic implications, for instance, lower grades, goals, and motivation. The negative association of child maltreatment and academic performance in children has been well documented (e.g., Perzow et al., 2013; Kiesel et al., 2016), and our review and meta-analysis suggests that this also applies to adolescents and college students. ACEs can reduce the belief in oneself and being able to succeed in difficult situations (Valdez et al., 2015), which can affect motivation and performance achievement, and hindered success in the professional career and personal life (Brown et al., 2016), including educational achievement (Elliot et al., 2009; Maples et al., 2014).

Types of ACEs and Moderating Factors

Different types of ACEs may not have equal weight in relating to developmental outcomes (Wang et al., 2021). Some evidence suggests that particular ACEs (e.g., sexual abuse) may have stronger associations with outcomes than others (Warmingham et al., 2019; Witt et al., 2016). Consistent with these findings, we found that abuse and ACEs scores comprising abuse, neglect, and household dysfunction as a composite had greater negative associations with the experiential facets of EWB than household dysfunction. In contrast, different types of ACEs had similar negative associations with one's reflective EWB—specifically, judgments about life satisfaction, sense of meaning, mastery beliefs, and goal pursuit—and educational achievement.

These findings underscore the need for a nuanced approach in understanding different types of ACEs as they relate to EWB and educational achievement.

Our meta-analytic findings lend credence to the transactional theory of development and empirical evidence on the saliency of negative developmental implications of ACEs on children and adolescents more than adults (Liem et al., 1997), supporting our hypothesis, particularly for EWB. More importantly, we found that the associations of ACEs with EWBs and educational achievement held across both males and females and Western and Eastern cultural contexts, which reconciled inconsistent findings in the literature and did not support the hypothesis that ACEs would be related to worse EWB and educational achievement for females than males (Hagborg et al., 2017). Thus, our results make important contributions in advancing understanding of the negative implications of ACEs for EWB and educational achievement that held across developmental stages, genders, and cultures.

Long-Term Implications: Causal Direction and Latency

We compared two causal models: ACEs causing EWB and educational achievement or bidirectional relations (there are no studies examining only how EWB and educational achievement lead to ACEs). The main conclusion was that there was about equal evidence for the two causal models. The finding that ACEs reciprocally influence EWB and educational achievement is consistent with theories, such as the diathesis stress model (Hanson et al., 2022), and empirical findings that support the reciprocal interplay of ACEs with EWB and educational achievement (Belsky 1984). ACEs can lead to lower EWB and educational achievement, and conversely, lower EWB and educational achievement can increase vulnerability, particularly social, behavioral and emotional problems, and reduced intra- and interpersonal resources that further perpetuate ACEs (McLaughlin et al., 2010; McLaughlin, 2018). Our meta-analytic results

also support the stress sensitization and stress proliferation models that undertake a life-course perspective in hypothesizing the long-term impact of early-life adversity that drives lower EWB and educational achievement (Wang et al., 2021). This relation did not attenuate over time (i.e., with increased duration between ACEs assessment at T1 and EWB at T2).

Limitations, Future Directions, and Conclusion

Our study highlights three major limitations in the broader literature on ACEs with EWB and educational achievement. First, there is no standard conceptualization of well-being in ACE studies. Our results provide evidence for the relevance of experiential and reflective facets of EWB to ACEs research. Second, studies are not always clear about the types of ACEs and tend to examine abuse (Jordan et al., 2014; Mosley-Johnson et al., 2019) or some combination of the three types of ACEs (Kelifa et al., 2021; Xiang et al., 2021), instead of distinguishing abuse, neglect, and household dysfunction. We recommend that future research be clear about the sources of ACEs to facilitate understanding of the conditions under which ACEs demonstrate the strongest associations with developmental outcomes. Third, ACEs research has mainly focused on health (Petrucci et al., 2016), mental health (Infurna et al., 2016), and other life adaptation outcomes (Welsh et al., 2017), with surprisingly little attention to educational achievement.

Collectively, our review and meta-analysis make important theoretical and practical contributions. We found evidence for the EWB framework (Park et al., 2023) and transactional theory of development (Rutter 1987) that may be useful frameworks for researching ACEs' relations with well-being and educational achievement. Our findings can aid policy makers, mental health professionals, and social service agencies in making informed decisions about resources and preventative intervention services in protecting individuals from the harmful developmental implications associated with ACEs (Boullier & Blair, 2018) and promoting well-being and academic achievement.

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Author Statement

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Compliance with Ethical Standards

Conflict of Interest: The authors declare that they have no conflict of interest.

Ethical Approval: Because the research is a literature review and did not involve collection of data from human research participants, it was classified as exempt and did not require further approval of an ethical committee.

Informed Consent: This research is a meta-analysis (secondary data analysis); it did not involve informed consent of human research participants.

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Table 1 Search Terms Used for the Formulation of the Search Strings in the Systematic Search

PICO concept	Search Terms
Population	Children, adolescents, youth, young person, young people, teenage (10-18 years), young adult, emerging adults, older adults
Intervention (or Exposure)	Childhood adversity, adverse events, adverse childhood experiences, maltreatment, physical abuse, emotional abuse, sexual abuse, emotional neglect, physical neglect, household dysfunction
Comparison	NA
Outcome	Emotional well-being (EWB), educational achievement
Inclusion and exclusion criteria	
Inclusion	<p>(a) be a full-text empirical study written in English;</p> <p>(b) provide sufficient statistics for calculation of effect sizes; for studies that lacked statistical information needed to calculate effect sizes, authors were contacted to provide the missing data;</p> <p>(c) include at least one measure of experiential (i.e., emotional quality of momentary and everyday experiences; e.g., positive affect, negative affect, depression, anxiety) or reflective facets (i.e., judgments about life satisfaction, sense of meaning, and ability to pursue goals e.g., self-efficacy, personal mastery, goal pursuit or mastery) of EWB;</p> <p>(d) include at least one measure of educational achievement (e.g., grades, GPA, highest grade completed, academic goals, academic motivation);</p> <p>(e) include at least one measure of ACEs—abuse, neglect, or household challenges (refer to Table A1 in the appendix for the full list of search terms)</p>
Exclusion	<p>Studies were excluded for the following reasons:</p> <p>(a) study designs with no relevant statistics for the calculation of effect sizes (e.g., qualitative studies, theory or protocol papers for intervention; 11 articles);</p> <p>(b) did not report sufficient statistics required to compute effect sizes (e.g., no correlation coefficients; authors of these studies failed to respond to requests for the needed information; 166 articles);</p> <p>(c) wrong population (e.g., assessing traumatic experiences that happened</p>

Outcomes	ACEs					
	<i>k</i>	N	<i>r</i>	95% <i>C. I.</i>	<i>Q</i>	<i>I</i> ²
Emotional Well-Being	151	206354	-0.32**	[-0.44, 0.01]	2999.55**	95.34
Educational Achievement	25	113553	-0.18**	[-0.21, -0.05]	633.69**	88.07

	<p>in adulthood; 4 articles);</p> <p>(d) wrong predictors (e.g., studies that explored the role of other child developmental experiences such as early childhood education; 2 articles);</p> <p>(e) wrong outcomes (e.g., studies that focused on clinical disorders such as psychosis rather than EWB or educational achievement; 68 articles);</p> <p>(f) no English full-text available (29 articles).</p>
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Table 2 *ACEs and Emotional Well-Being and Educational Achievement*

Note. *k* = number of effect sizes; N = sample size; *r* = effect sizes; *C. I.* = confidence interval; *Q* = the ratio of observed variance to within-study variance; *I*² = percentage of observed variation that can be attributed to the actual differences between studies, rather than within-study variance. We used a random-effect model in conducting meta-analyses and meta-regressions on moderating effects. The random-effect model has the assumption of study heterogeneity—that is, the amount of variation in effect sizes that is derived from both study error and true study heterogeneity. The latter stems from variation in study populations, study procedures, measures, and settings. To ascertain true heterogeneity in effect sizes, we used the *Q*-statistic, which calculates the ratio of observed variation to within-study variance. A significant *Q*-statistic provides evidence that the included studies do not share a common effect size. A caveat about *Q*-statistic is that it underestimates heterogeneity in small samples and overestimates that in large

samples. Thus, we also included the I^2 statistic, which is a percentage that indicates the proportion of observed variation that is attributed to the actual differences between studies, rather than within-study variance. I^2 of 25, 50, and 75 percent represent low, moderate, and high variance, respectively. Compared to the Q-statistic, I^2 is not sensitive to the number of studies included and allows for CIs to be calculated (Higgins et al., 2003).

** $p < .0001$

Table 3 *Moderators of ACEs with Emotional Well-Being (EWB) and Educational Achievement*

Moderator	ACEs with EWB and Educational Achievement			
	<i>k</i>	<i>r</i>	95% <i>C.I.</i>	Between Group Q I^2
<u>EWB vs. Educational Achievement</u>				
Experiential	176	-0.34	[-0.38, -0.18]	34.02**
Reflective		-0.32	[-0.34, -0.24]	
Educational Achievement		-0.18	[-0.21, -0.05]	
<u>Experiential EWB and Types of ACEs⁵</u>				
Abuse	151	-0.32	[-0.42, -0.22]	6.48**
Undifferentiated ACEs		-0.24	[-0.40, -0.02]	
Household dysfunction		-0.15	[-0.39, 0.30]	
<u>Reflective EWB and Types of ACEs</u>				
Abuse	118	-0.20	[-0.26, -0.15]	2.90
Household dysfunction		-0.17	[-0.18, 0.02]	
Neglect		-0.24	[-0.40, -0.10]	
Undifferentiated ACEs		-0.23	[-0.36, -0.12]	
<u>Educational Achievement and Types of ACEs</u>				
Abuse	25	-0.18	[-0.39, 0.13]	3.11
Household dysfunction		-0.14	[-0.21, 0.26]	
Neglect		-0.16	[-0.17, 0.28]	
Undifferentiated ACEs		-0.18	[-0.46, 0.30]	

⁵There are no studies on neglect and experiential facet of emotional well-being.

Moderator	ACEs with EWB and Educational Achievement				Between Group Q	I^2
	k	r	95% <i>C.I.</i>			
<u>Developmental stage</u>						
EWB						
Children		-0.28	[-0.47, -0.07]			
Adolescent		-0.32	[-0.39, -0.26]	9.50*		94.80
Emerging adulthood	151	-0.22	[-0.35, -0.09]			
Adulthood		-0.23	[-0.36, -0.10]			
Educational achievement						
Children		-0.17	[-0.31, 0.18]			
Adolescent	25	-0.19	[-0.28, 0.23]	0.66		85.01
Emerging adulthood		-0.15	[-0.25, 0.21]			
Adulthood		-0.17	[-0.26, 0.25]			
<u>Gender</u>						
EWB						
	150	0.0008	[-0.0002, 0.0019]	2.49		95.31
Educational achievement						
	22	-0.0033	[-0.0018, 0.0012]	0.13		86.39
<u>ACEs with EWB and Educational Achievement</u>						
Moderator	k	r	95% <i>C.I.</i>	Between Group Q		I^2
<u>Cultural contexts</u>						
EWB						
Western	151	-0.23	[-0.27, -0.20]	0.005		95.29
Eastern		-0.23	[-0.05, 0.04]			
Educational achievement						
Western	25	-0.15	[-0.21, 0.01]	0.62		95.26
Eastern		-0.17	[-0.29, 0.04]			
<u>Long-term implications</u>						
Causal influence						
EWB						
ACE \leftrightarrow EWB	147	-0.32	[-0.35, -0.22]	0.44		95.44
ACE \rightarrow EWB		-0.22	[-0.38, -0.14]			
Educational achievement						
ACE \leftrightarrow Educational achievement	25	-0.18	[-0.21, -0.06]	3.54		85.85
ACE \rightarrow Educational achievement		-0.16	[-0.21, 0.04]			

Moderator	ACEs with EWB and Educational Achievement				
	<i>k</i>	<i>r</i>	95% <i>C.I.</i>	Between Group <i>Q</i>	<i>I</i> ²
Latency ⁶ EWB	23	0.002	[-0.003, 0.007]	0.76	97.65

Moderators of ACEs with Emotional Well-Being (EWB) and Educational Achievement

Note. *k* = number of effect sizes; *N* = sample size; *r* = effect sizes; *C. I.* = confidence interval; *Q* = the ratio of observed variation to within-study variance; *I*² = percentage of observed variation that can be attributed to the actual differences between studies, rather than within-study variance.

* *p* < .05; ** *p* < .001

Figure 1 *PRISMA Flow Diagram of Search Strategy or Identification and Screening of Studies, and the Finalised Number of Articles for Meta-Analysis*

Figure 2 *Forest Plot of Data Investigating ACEs with EWB and Educational Achievement*

Note. In the plot, each study is represented by a point estimate and is bounded by a CI for the effect, and at the bottom of the plot, the summary effect size is represented by the polygon, with its width representing 95% CI. Studies with larger squares contributed more to the summary effect size as compared to other studies

Figure 3 *Funnel Plot of the Effect Sizes of ACEs with EWB and Educational Achievement*

Note. The funnel lines indicate the degree of spread that is expected for a given level of standard error and are centered on the summary effect size that is represented by the vertical line. Data points scattered symmetrically on both sides of the funnel line and has the shape of an even funnel provide evidence for an unbiased sample. The funnel plot analyses reveal possible publication bias that is evident by a cluster of data that is non-symmetrical and deviates from the

⁶We did not examine the moderating effect of latency of ACEs → educational attainment because all the effect sizes on this causal direction had a latency of 13 years.

shape of a funnel. The points that fell into the grey area were asymmetrical and indicated that publication bias may exist. Because funnel plots offer only a subjective measure of potential publication bias (Egger et al., 1997), we also used the rank correlation and the Egger's regression tests, which are objective measures of potential bias (Egger et al., 1997). These tests revealed non-significant results, which confirmed an absence of publication bias for studies included in our meta-analyses.

Highlights

- Adverse childhood experiences were related strongly to lower emotional well-being
- Adverse childhood experiences also associated with lower educational achievement
- These associations were stronger for abuse and composite indicators of ACEs
- These associations were stronger in childhood and adolescence
- Adverse childhood experiences influenced and reciprocally associated with outcomes