Protective and compensatory childhood experiences and their impact on adult mental health

Adult mental health is influenced by childhood exposure to both adverse and protective experiences.

The landmark Adverse Childhood Experiences (ACE) study[1] supported an association between ten categories of adversity, experienced from birth to 18 years, and subsequent physical and mental health problems. These ten types of adversity (physical, emotional and sexual abuse; physical and emotional neglect; parental divorce; domestic violence; living with household members with alcohol or substance abuse, mental illness, or criminality) were found to be common, with more than two-thirds of individuals reporting at least one. Moreover, ACEs had a cumulative or dose-response effect on multiple measures of health and well-being.

Research conducted across the globe and in many populations has consistently found that exposure to ACEs between birth and 18 years alters neurobiological adaptation to stress, increasing the likelihood of difficulties in emotion regulation, impulse control, attention, and social attachments, all of which contribute to mental health problems[2]. A cumulative ACE score of 4 or more increases the likelihood (using adjusted odds ratios) of panic reactions by 2.5 times, depression by 3.6 times, anxiety by 2.4 times, and hallucinations by 2.7 times[3].

While trauma and adversity are well-established risk factors for mental illness, the protective factors that promote resilience are less well known. Research on resilience was initially focused on identifying the qualities of children who succeeded as adults in spite of childhood poverty, abuse or neglect[4]. More recently, researchers have begun characterizing the resilience-promoting qualities of children's environments, identifying the types of supportive relationships and resources that mitigate the effects of ACEs.

Just as ACEs appear to have cumulative negative effects, protective experiences also appear to have a cumulative effect on adult functioning, lessening negative impacts. For example, in a large sample in the American Midwest, positive childhood experiences predicted less depression and better mental health among adults even after accounting for exposure to ACEs[5]. Much of the research on positive experiences has been limited to the presence of supportive relationships, emphasizing the importance of children feeling supported and safe as a counterbalance to the feelings of stress associated with ACEs[6].

Numerous studies indicate that positive experiences during childhood set the foundation for adult mental health. We have identified ten specific protective and compensatory experiences (PACEs) that promote positive outcomes in the face of adversity, as well as overall healthy development[2,7]. Like ACEs, we assess PACEs as experiences that occur prior to age 18.

PACEs are categorized into two domains: supportive relationships and enriching resources. Supportive relationships include unconditional love from a caregiver; having a best friend; volunteering in the community; being part of a group; and having a mentor. Positive parenting, social support, and belongingness have been found to facilitate the development of children's empathy, self-regulation and social skills. Our second domain, enriching resources, include living in a safe home where needs are met; getting a quality education; having a hobby; being physically active; and having rules and routines. Both animal and human studies point to the importance of enriched environments for learning, managing stress, and avoiding risky behaviors[8].

Research on PACEs specifically indicates that adults who report more PACEs typically report fewer ACEs, suggesting that protective relationships and resources are less available among children who experience family dysfunction and maltreatment. More PACEs are related to less depression, anxiety, substance use, difficulties in emotion regulation, and life stress. Moreover, PACEs protect adults from depressive symptoms, such that greater PACEs weaken the link between ACEs and depression, acting as a protective factor in adulthood[2].

There is also evidence that PACEs can affect parenting attitudes and behaviors. For example, PACEs have been found to act as a buffer between negative parenting attitudes and adverse childhood experiences[2,8]. Similarly, PACEs have been associated with greater resilience and less stress during pregnancy (e.g., future worries about parenting[9]). Taken together, these findings suggest that PACEs buffer the deleterious effects of ACEs on adult functioning and mental health.

We have identified specific PACEs for different age groups (infants and toddlers, teens and young adults, school-aged children[2]). However, the foundation for PACEs remains the same – relationship and resources – and the basic idea of each PACE is similar. For example, having a best friend in early childhood is having opportunities to play with a child or a sibling of a similar age.

PACEs can be used as a tool for adults to help children handle stress, and this may be particularly important during times of chronic and extreme stress, such as the COVID-19 pandemic. On the other hand, parents' stress and mental health are largely influenced by their children's well-being and mental health, and strategies that promote optimal parenting can have a major impact on parents' own functioning[2].

The PACEs Heart model corresponds to the ACEs pyramid model, which posits that ACEs lead to disrupted neurological development; social, neurological and cognitive impairment; adoption of health-risk behaviors; disease, disability and social problems; and early death[1]. The PACEs Heart model posits that supportive relationships and resources lead to optimal neurological development; social, emotional and cognitive functioning; healthy behaviors; achievement of developmental milestones; and health and longevity[8]. These models integrate developmental science, clinical psychology, and mental and physical health research, by detailing possible life course trajectories that stem from childhood experiences.

Fairy tales, folklore and myths from around the world are re-

plete with examples of the youthful hero or heroine's journey from adversity and despair to triumph and success, supporting the empirical evidence that the path to resilience is paved with protective relationships and resources. What is lacking from many trauma-focused interventions is an acknowledgement that PACEs are powerful elements of everyday life that already exist, or can be engineered to occur routinely and frequently, and can be leveraged to support treatment goals and activities.

Our research indicates that adults can benefit from current PACEs as well as previous experiences from childhood. We have created an Adult PACEs Plan that encourages adults to choose one or two PACEs to work on each month with a group of adults. As with PACEs for children of different ages, adult PACEs focus on relationships and enriching experiences[2]. Anecdotally, we have found that individuals benefit from focusing on simple activities that strengthen relationships and impose structure and routine.

In summary, PACEs are often overlooked but powerful tools, that can support therapeutic interventions and mental health throughout the life course.

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Clearing the air: clarifying the causal role of smoking in mental illness

Decades of observational research have identified a vast range of risk factors which may contribute to the onset of various mental health conditions. A recent review published in this journal[1] brought together data from 380 meta-analyses on this topic, finding over 1,000 different associations for even just non-genetic factors which may influence the risk of mental disorders. Examples of well-established risk factors include adversity/abuse in childhood and stressful employment circumstances in adulthood[1]. Additionally, a more recent body of research has strongly implicated a range of physical health conditions/behaviors – such as diabetes, physical inactivity and obesity – as being associated with an increased risk of mental illness[1,2].

Within this framework, tobacco smoking has emerged as holding particularly strong associations with the onset of mental health conditions. Meta-analyses of longitudinal studies have found strong evidence for a prospective association between smoking and mental disorders, particularly major depression, psychotic disorders and opioid use disorder[1,2]. However, findings from these traditional observational studies may be subject to bias from reverse causation (for example, through unmeasured prodromal symptoms leading individuals to initiate smoking) and residual confounding (for example, through other unmeasured behaviors that influence both smoking and mental health).

Mendelian randomization (MR) is an increasingly applied epidemiological methodology which can address these biases, by using genetic variants known to predispose individuals to certain behaviors/outcomes (e.g., initiating smoking, or smoking heavily), and examining their associations with other outcomes (e.g., mental health diagnoses)[3,4]. In MR, the genetic variants act as instrumental variables, inherited at random and fixed at conception, thus reducing bias from confounding and reverse causation[3]. A number of MR studies on smoking and mental health have already been conducted to examine causal relations, and a recent systematic review of this literature identified high-quality evidence for an effect of smoking on depression, schizophrenia and bipolar disorder[4].

However, there are several limitations of these studies that must be considered[3]. First, although MR studies suggest that smoking behaviors are causal for some mental health outcomes, there is a high degree of bidirectionality, with strong evidence for reverse effects also apparent for depression and schizophrenia[2,4]. This presents the possibility of a vicious cycle, whereby symptoms of mental illness increase smoking and dependence, while smoking increases the risk and severity of mental health conditions. Second, we do not fully understand as yet the biological mechanisms underlying the majority of smoking genetic instruments used in MR analyses. Therefore, the strongest evidence for causal effects of smoking on mental illness will ultimately come from triangulating results across different research methodologies.

The gold standard approach to determine causality would be to conduct a randomized controlled trial (RCT), but it would be unethical to test the effects of tobacco smoking as an experimental exposure directly in this way (due to the addictive potential, and known effects on physical health). Nonetheless, the mental health outcomes of smoking cessation interventions in RCTs can instead be used to infer causal relations. Indeed, a 2021 Cochrane review of 102 studies on this topic consistently showed that people who quit smoking, on average, experienced an improvement in all mental health outcomes examined[5].

Importantly, the observed effects: a) were robust to multiple sensitivity analyses; b) persisted when adjusting for a broad range of socio-demographic, behavioral and clinical covariates; and c) were evident across the 56 RCTs, collectively showing improved mental health outcomes from smoking cessation among participants who had decided to quit smoking *before* being randomized to smoking cessation vs. control interventions (thus eliminating