



The Impact of Adverse Childhood Experiences on Body Image Dissatisfaction in Adolescents: A Narrative Review

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ABSTRACT

This narrative review delves into the intricate relationship between Adverse Childhood Experiences (ACEs) and body image dissatisfaction in adolescents, a pressing public health issue linked to a spectrum of psychological disorders. Body image dissatisfaction among adolescents is a significant public health concern due to its association with depression, anxiety, low self-esteem, and risky behaviours such as binge eating, extreme dieting, and substance abuse. Adverse childhood experiences (ACEs) are highly prevalent and have been associated with negative body image. Based on the identity disruption model, adolescence is characterised by a tumultuous period of exploration of self and identity formation. Experiencing adverse events could result in an identity crisis, leading to cognitive dissonance regarding body appearance and body functionality. Consequently, body image dissatisfaction can lead to negative emotions, low self-esteem, anxiety, stress, social withdrawal, and maladaptive coping mechanisms such as extreme dieting or eating.

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This review explored evidence-based interventions for preventing and managing body image dissatisfaction in adolescents, such as psychoeducation to address cognitive dissonance, promotion of physical activity, and implementation of digital interventions focusing on behavioural therapy. The review also identified virtual-reality-based interventions as promising tools for addressing ACEs-induced body image dissatisfaction, as they could make behavioural therapies more engaging and realistic for parents and their children.

However, this review is constrained by the methodological limitations of the literature utilised, primarily consisting of cross-sectional studies, which limited the ability of the study to present meaningful insights on the long-term effects of the interventions. Furthermore, the focus on family dysfunction, child maltreatment, and emotional abuse in the context of ACEs may not comprehensively represent the spectrum of other adverse experiences such as sexual abuse and neglect. Lastly, cultural differences in the perception of body image and the extent of ACEs experienced are not addressed due to the methodological approach of the reviewed literature, limiting the generalizability of the findings presented in this review. It is therefore recommended that future research aim at addressing these research gaps by incorporating diverse cultural perspectives and longitudinal data to better understand the long-term impact of ACEs on body image dissatisfaction.

Keywords: Body Image; adolescents; body image dissatisfaction; adverse childhood experiences.

1. INTRODUCTION

Adolescence is a pivotal period in human development, marked by profound physical, emotional, behavioural, psychological, and social changes. Throughout this transformative period, individuals are exposed to a myriad of experiences and emotions that can disrupt neurodevelopment and cognitive processes, leading to distorted perceptions of body appearance and function.

Moreover, the impact of adverse childhood events (ACEs) on body image dissatisfaction in adolescents cannot be overstated. These experiences can significantly shape an individual's self-perception and attitudes towards their body.

Understanding the interplay between ACEs and body image dissatisfaction is crucial for developing effective interventions to support adolescent mental health and well-being. By examining this relationship, researchers and practitioners can identify protective factors, and potential pathways for intervention.

Consequently, this review aims to explore the role of adverse childhood events in the development of body image dissatisfaction in adolescents. By examining the intricate relationship between these two concepts, this review provides meaningful insight into how ACEs can influence body image development and propose interventions that foster resilience and promote a positive self-image among adolescents.

2. ADVERSE CHILDHOOD EXPERIENCES (ACEs)

Adverse childhood experiences (ACEs) encompass a range of traumatic events experienced in the first 18 years of an individual's life, including emotional, physical, or sexual abuse, family dysfunction, and emotional or physical neglect [1-3].

These experiences constitute some of the most traumatic events and toxic stressors encountered in childhood, including experiencing sexual, physical, or emotional abuse, witnessing domestic violence, residing in households with substance abusers, having family members with mental disorders, witnessing family members' suicide attempts, or facing instability in the home due to parental separation or incarceration [4-6].

The 3 domains and 10 categories of adverse childhood experiences are reflected figuratively below (Fig. 1).

While these definitions focus on the adverse events experienced during childhood, alternative definitions by Hajat et al. [7], HRSA-MCHB [8], and Meeker et al. [9] seek to capture the impact of these events.

In 2020, the 'Health Resources and Services Administration's Maternal and Child Health Bureau (HRSA-MCHB)' defined ACEs as stressful events leading to chronic toxic stress in the absence of mitigating support.

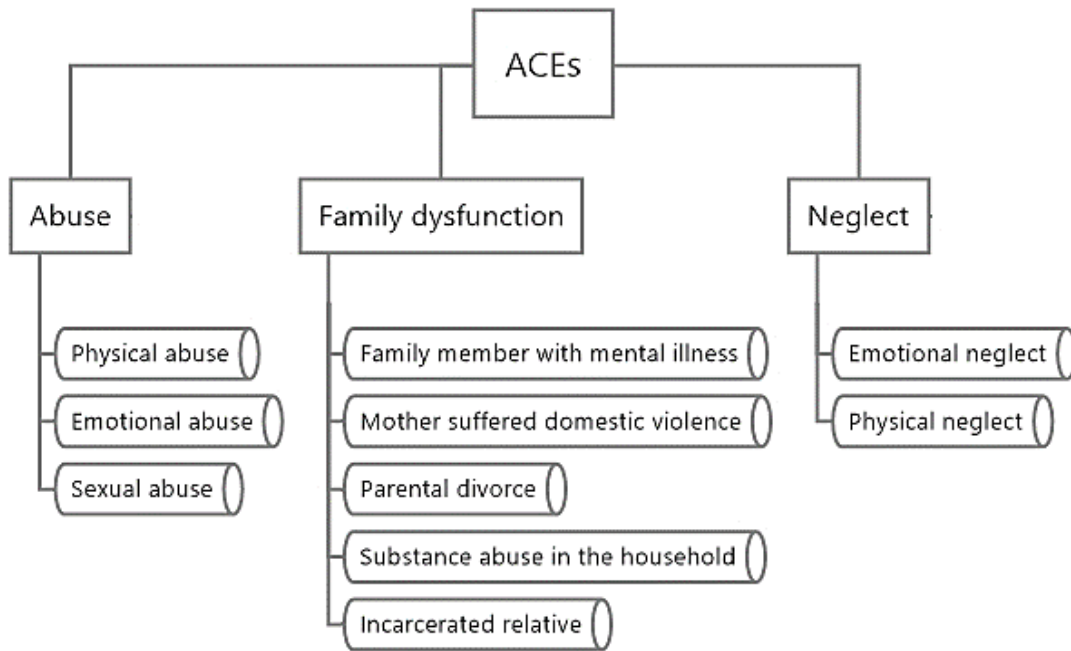


Fig. 1. The 3 domains and 10 categories of adverse childhood experiences (ACEs)

Similarly, Hajat et al. [7] and Meeker et al. [9] describe ACEs as traumatic events occurring during childhood (before 18 years of age) that can have an enduring negative impact on health and well-being. These definitions acknowledge that ACEs may exert a lifelong impact on the health and well-being of those affected. This may be attributable to the prolonged activation of neurotransmitters in stress/threat response, leading to short- and long-term adverse health outcomes [10].

3. IMPACT OF ACEs ON PSYCHOLOGICAL WELL-BEING

Unfortunately, ACEs are highly prevalent, as evidenced by a 2015 survey conducted in Wales, which revealed that 64% of the 2028 adult respondents had experienced at least one traumatic event during their childhood [11]. Based on the systematic review conducted by Carlson et al. [12], the prevalence of ACEs in children and adolescents varies across and within nations – Afghanistan (64 – 79%), China, (71%), Israel (4 – 85%), Iceland (79%), Canada (7%), Lebanon (24-84%), Netherlands (3 - 80%). This implies that the degree and impact of ACEs vary across geographical locations.

A study by HRSA-MCHB [8] in the United States further highlights the ubiquity of ACEs, reporting that one in every child aged 0-17 has

encountered at least one ACE in their lifetime. Of these, 33.3% are linked to family dysfunction, including parental separation (23.4%), parental or guardian alcoholism or drug abuse (8.0%), and parental incarceration (7.4%), Palestine (55 - 90%) and United Kingdom (40%).

This issue constitutes a global public health concern, as individuals who have experienced three or more traumatic events in childhood face a significantly elevated risk of developing cancer, cardiovascular diseases, diabetes, mental disorders, and behavioural problems [11,13,14].

The association between ACEs and adverse health outcomes was initially documented in the late 1900s when Kaiser-Permanente observed a high prevalence of childhood sexual abuse among patients attending their obesity clinic [11].

According to Sheridan and McLaughlin [15], ACEs disrupt neurodevelopment through two primary mechanisms: threat and deprivation. Exposure to threatening events such as emotional, physical, and sexual abuse, violence, or substance use during childhood induces toxic stressors that alter the neural systems involved in learning threat and safety, ultimately leading to heightened emotional reactivity and disruptions in fear learning [15].

Similarly, deprivation, such as neglect from parents or guardians, impairs neurodevelopment due to the absence of social and cognitive stimulation, which can alter synaptic pruning and impair brain structure and function.

This impaired brain function subsequently leads to compromised emotional regulation, cognitive function, and behavioural control [16]. These impairments often manifest as anxiety, depression, attention-deficit/hyperactivity disorder, and an increased propensity for substance abuse and other risky behaviours, ultimately elevating the risk of premature mortality [16,17].

According to Kessler et al. [18], ACEs account for 28.9% of all documented psychological cases globally. A study conducted on children aged 0-17 years by HRSA-MCHB [8] in the United States demonstrated that children who had experienced more than four ACEs in their lifetime had a higher incidence of special needs (43.5%), poor physical health (25%), social problems and difficulty in forming and maintaining friendships (41.5%), behavioural problems (27.7%), anxiety (21.9%), and depression (19.4%).

A systematic review conducted by Scully et al. [19] on the psychological and social impact of ACEs in adolescents, validates the proposition that ACEs in adolescents eventually result in depression, anxiety, post-traumatic stress disorder, aggression, substance abuse, decreased self-esteem and cognitive delays. A different systematic review of studies on early childhood adverse experiences in children between the ages of 0 -6 years conducted by Liming and Grube [20], also revealed that early exposure to traumatic events results in impaired attention, memory and executive functioning, difficulty in building healthy relationships, intense anger, emotional numbness, and depression. In a systematic review conducted by Scully et al. [19] on the psychological and social impact of ACEs in adolescents, it was confirmed that ACEs in adolescents can lead to depression, anxiety, post-traumatic stress disorder, aggression, substance abuse, decreased self-esteem, and cognitive delays. Another systematic review of studies on early childhood adverse experiences in children between the ages of 0-6 years, conducted by Liming and Grube [20], also revealed that early exposure to traumatic events results in impaired attention, memory, and executive functioning, difficulty in building healthy

relationships, intense anger, emotional numbness, and depression.

Individuals affected by ACEs often have a distorted perception of their self-worth, fixating on perceived flaws and inadequacies, which can result in negative body image perceptions, depressive disorders, and ultimately, suicidal ideation [21-23].

By exploring the relationship between ACEs and body image dissatisfaction, this review endeavours to propose interventions aimed at promoting positive body image in adolescents, with the potential to mitigate adverse outcomes.

4. UNDERSTANDING THE CONCEPT OF BODY IMAGE

Body image, a complex and multidimensional construct, encompasses self-perceptions and attitudes toward physical appearance [24]. Nayir et al. [25] describe it as a mental appraisal of positive and negative emotions related to one's physical body and attributes. Vani et al. [26] provide a more comprehensive definition, characterizing body image as a multidimensional phenomenon that reflects an individual's perceptions, thoughts, emotions, and behaviours regarding their body's appearance and functionality. The authors further delineate four dimensions of body image: perceptual, cognitive, affective, and behavioural.

The perceptual dimension of body image involves the formation of a mental representation of one's bodily appearance and functionality [26,27]. However, this mental image may occasionally deviate from the actual physical characteristics [28].

The cognitive dimension entails evaluating one's body appearance and function based on this mental representation, which can lead to either satisfaction or dissatisfaction with body image.

Individuals experience a spectrum of emotions in response to this evaluation, including social-physique anxiety and self-conscious emotions like shame, guilt, and pride [26]. This emotional journey underscores the personal and psychological implications of body image.

The behavioural dimension of body image encompasses the actions individuals take in response to their perceptions, cognitions, and emotions concerning their body image. These

actions, which may include appearance-fixing or avoidance behaviours, as well as positive rational acceptance [29,30], can profoundly influence individuals' emotions and behaviours, highlighting the practical relevance and applicability of the topic.

5. BODY IMAGE DEVELOPMENT DURING ADOLESCENCE

Studies reveal that adolescence is a critical period for the development of body image, marked by rapid physical, cognitive, social, and psychological changes that influence individuals' perceptions of their physical appearance and function [31,32].

Unfortunately, the prevalence of negative body image among adolescents is high, posing a significant public health concern due to its potential to impair overall well-being and mental health [33].

In a study conducted in Brazil by Carvalho et al. [34] on body image dissatisfaction in adolescents and its associated risk factors, 75% of the 1019 adolescents evaluated expressed dissatisfaction with their bodies, with 41.4% desiring to be thinner and 33.7% wishing for a larger physique.

A longitudinal study in the United Kingdom by Lacroix et al. [35] revealed that, among 757 adolescents evaluated annually over four years, 39.1%, 46.1%, and 14.8% showed positive, moderate, and negative body image, respectively. Nevertheless, the study concluded that most adolescents with moderate body image eventually shifted towards a negative body image by the study's conclusion [35]. Another study in Brazil conducted by Gonzaga et al. [36], examining trends in body image dissatisfaction among 1479 adolescents over ten years, reported a 9.2% increase in negative body image within a decade. This correlates with findings from [35], suggesting a worsening trend in adolescent body image dissatisfaction over time in the absence of early interventions.

Body image is multidimensional, and its antecedents can be complex and interwoven, particularly in adolescents. One major cause of body image dissatisfaction in adolescents is the developmental changes and sexual maturation during puberty [37]. Adolescents undergo rapid changes in appearance and function during puberty, significantly influencing their body perception. In a study conducted in China by

Zhang et al. [38] involving 574 participants aged 8 to 15 years, it was observed that adolescents' reported body image dissatisfaction varied based on their puberty developmental stages, particularly among female participants. According to Zhang et al. [38], female adolescents exhibited higher gender dissatisfaction before breast development Tanner II than after menarche, while sexual organ dissatisfaction was higher before Tanner II and lower after menarche. Conversely, boys displayed consistently higher sexual organ dissatisfaction scores across the three puberty stages [38].

Adolescence is associated with physical and emotional changes and the quest for self-identity and social acceptance, hence the pressure to conform to social standards for beauty could trigger psychological outcomes such as depression and anxiety, eating disorders, social isolation, unhealthy behaviours such as physical inactivity and substance abuse, and low academic performance and productivity [39,40]. In a cross-sectional study conducted by Soares et al. [40] on 2162 adolescents between 18 -19 years of age in Brazil, it was observed that body image dissatisfaction due to overweight was significantly associated with depressive disorder.

This finding is supported by a UK-based prospective study conducted by Bornioli et al. [41] on 2078 females and 1675 males between the ages of 14 – 18 years which revealed that adolescents who had body dissatisfaction at the age of 14 years were clinically diagnosed with mild to severe depressive symptoms by the time they were 18 years of age. This is because dissatisfaction with one's body image during adolescence stimulates negative feelings leading to low self-esteem, anxiety, stress, social isolation, and unhealthy coping mechanisms such as extreme dieting or extreme eating [39]. This also correlates with the findings from a Brazilian study conducted by Leal et al. [42] on 1156 adolescents (13 -19 years) which indicates that binge eating and unhealthy weight control behaviours such as fasting, rigorous diet, use of diuretics and laxatives and self-induced vomiting were prevalent amongst female adolescents with body image dissatisfaction.

6. THE IMPACT OF ACEs ON BODY IMAGE DISSATISFACTION

Many studies have identified adverse childhood experiences (ACEs) as a significant underlying risk factor for body image dissatisfaction [43-45].

The relationship between ACEs and negative body image in adolescents is best understood through an understanding of the 'identity disruption model.' This model, rooted in Erikson's theory [46], examines the interplay between identity formation and psychological well-being [47]. Based on this theory, adolescents grapple with questions of self-identity and future aspirations, but experiencing adverse events during this critical period can lead to identity crises [47,48]. Vankerckhoven et al. [47] suggest that such identity crises may reduce self-concept clarity, leading to heightened focus on physical appearance and subsequent body image dissatisfaction.

Findings by Vartanian and Hayward [49] further support this notion, indicating that ACEs disrupt normal identity development and contribute to the internalisation of societal standards of attractiveness, thereby fostering negative body image. In an examination of 421 adolescents aged 13 to 17 years in Australia, Vartanian et al. [50] using the 'identity disruptive model', found that adolescents from dysfunctional families exhibited lower self-concept clarity, significantly associated with increased internalisation of appearance ideals and social comparison, ultimately leading to body image dissatisfaction.

Studies have also associated specific ACEs, such as emotional abuse and childhood maltreatment, with negative body image [43,44]. A study conducted on 385 high school students in Turkey aged 14 to 18 years revealed that adolescents, especially females, who experienced emotional abuse, including humiliation, verbal assaults, and emotional neglect, were more likely to be dissatisfied with their body image [44]. According to Kircaburun et al. [44], emotionally maltreated adolescents may internalise feelings of inadequacy and develop unattainable standards of perfection, leading to dissatisfaction with their body appearance and function.

Similarly, a separate study involving 443 adolescents aged 14 to 15 years in Turkey reported that emotional maltreatment contributes to negative self-perception, feelings of worthlessness, and, ultimately, the development of negative body image [43].

A different study involving 5,147 fifth graders in the United States by Michael et al. [51] found that adolescents with nurturing fathers experienced lower levels of body image dissatisfaction, particularly among boys. In contrast, research

conducted on 260 adolescents aged 13 to 17 in Spain by Laporta-Herrero et al. [52] revealed that those who lacked trust in their parents and had poor communication with them tended to internalise societal beauty standards, leading to body image dissatisfaction. This suggests that children who do not suffer from physical or emotional neglect from parents have significantly higher chances of developing positive body image compared to children who have experienced at least one ACE in their lifetime.

While these studies have explored the family dysfunction domain of ACEs, it is worth noting that social interactions outside the family context also significantly impact a child's cognitive development. The sociocultural theory proposed by Piaget and Vygotsky suggests that social interactions with parents, caregivers, peers, and teachers impact cognitive function [53]. This implies that the psychological impact of ACEs and their impact on body image development are influenced by social context and cultural norms. This theory explains how other factors can aggravate the effect of ACEs on body image development [54]. The media, for instance, is a social factor that significantly contributes to negative body image by portraying unrealistic standards for beauty in magazines, advertisements, and social media platforms like TikTok, Facebook, and Instagram [55,56]. Pressures from peers also result in social comparison and self-consciousness among children and adolescents; this affects how they appreciate their body appearance and functionality [26,57]. Children and adolescents who have experienced ACEs are already self-conscious of their appearance, and exposure to pressures from peers and media reinforces this self-consciousness, leading to body image dissatisfaction [58].

The effect of sociocultural factors on body image dissatisfaction in adolescents differs across genders. In the study conducted by Mahon and Seekis [59] on male and female adolescents (15-16 years), it was observed that boys had significantly higher positive perceptions regarding their bodies and social media use. They tended to employ more active coping styles, such as avoiding harmful content and selecting positive content. In contrast, girls were found to be more susceptible to body dissatisfaction due to social media. They engaged more in self-presentation behaviours and felt more pressure from social media to conform to certain body ideals, leading to negative body image perceptions.

7. COPING STRATEGIES AND RESILIENCE BUILDING

ACEs and body image dissatisfaction could result in depression, suicidal ideation, eating disorders, substance abuse, and poor academic performance in children and adolescents [45]. While some children carry the burdens of body image dissatisfaction into adulthood, studies have shown that some children outgrow negative body image upon entering adulthood [31]. A longitudinal study by Gattario and Frisén [31] tracked the journey of 15 women and 16 men from experiencing negative body image in early adolescence to developing positive body images as adults (26-27 years old). The study found that participants overcame negative body image by forming new friendships and romantic relationships with individuals who valued and supported them, engaging in empowering activities such as sports, physical exercise, and personal growth endeavours, avoiding exposure to unrealistic and unhealthy body-related media, blogs, and television programs, practising self-care and self-appreciation, and embracing body diversity.

The strategy via which adolescents overcome body image dissatisfaction can be understood using the resilience theory. Resilience is adapting and recovering from adversity, conflict, trauma, and adverse events. Resilience describes the individual trait of persisting and coping with traumatic experiences. Resilience acts as a protective buffer against the negative impact of ACEs [60]. The resilience theory proposes that adolescents must learn to repurpose setbacks and opportunities as a ladder for growth and learning [61]. Resilient adolescents are better equipped to handle stressors and maintain mental well-being. They learn to adapt, seek support, and find healthy ways to process stress [62]. During adaptation, adolescents develop coping skills that help them navigate challenges like body image dissatisfaction. Some adolescents build resilience by developing positive coping strategies to foster a positive body image, such as peer support, engagement in physical activities, media literacy, and parental nurturing [31,51,52]. However, it is worth noting that some adolescents build resilience by adopting unhealthy coping strategies such as substance use, avoidance, and aggression, this would eventually result in social isolation, incarceration, suicide ideation, and mental health issues [63-65].

8. PREVENTION AND INTERVENTION APPROACHES

The systematic reviews conducted by Guest et al. [66] and Mahon and Seekis [59] suggest that interventions targeting positive body image primarily focus on psychoeducation to reduce cognitive dissonance, engagement in physical activity, and digital-based behavioural therapy, which could help prevent or manage body image dissatisfaction in adolescents. It is worth noting that the effectiveness of these interventions could vary based on gender. According to Mahon and Hevey [67], while male adolescents via body acceptance messages as a motivating space that encourages them to adhere to body ideals perceived as attainable through deliberate effort, girls are sceptical towards messages on body acceptance messages, especially when the message is from individuals who, in their view, do not struggle with body image concerns. The susceptibility of female students to negative body image perception explains why the preponderance of the existing intervention studies on promoting positive body image in children and adolescents are focused on the female gender.

9. PSYCHOEDUCATION ADDRESSING COGNITIVE DISSONANCE ON BODY IMAGE

Psychoeducation refers to intervention strategies that encompass information sharing, problem-solving, social support, discussion of concerns, and training on healthy coping skills concerning psychological issues [68].

According to Bashir and Ivanova [69], a psychoeducation program promoting positive body image in adolescents could involve educating them about the uniqueness of different body shapes and sizes and the unrealistic beauty standards portrayed by society and social media. Cognitive dissonance, within the context of this review, refers to the mental discomfort and anxiety adolescents experience due to conflicting perceptions of their body appearance and functionality [70].

Psychoeducation interventions for cognitive dissonance are often targeted at motivating individuals to reduce dissonance and achieve beliefs that are consistent with reality (consonance) [71]. This intervention works via two major strategies: changing behaviours or

avoiding situations that generate or exacerbate dissonance [72].

Implementing psychoeducation to reduce cognitive dissonance in adolescents can involve organizing book workshops, individual counselling, and collaborations with educational systems and communities [73-75].

An intervention study titled 'Free to be program' organized for 117 adolescents (mean age = 12 years) in Canada by Regehr et al. [75] as part of their health class school program, revealed that participating in a 55 mins interactive session on body-related topics such as understanding body appearance myth, discerning unhealthy media messages on appearance and body appreciation for 6 weeks caused a significant decrease in body image dissatisfaction, and boosted self-esteem and self-acceptance.

A similar intervention named 'Dove Confident Me' conducted in the UK by Diedrichs et al. [76] also integrated psychoeducation on body image into the classrooms of 11-13-year-olds (n = 848) for five sessions and their outcomes were compared to control adolescent who received no psychoeducation. It was observed that the adolescents exposed to psychoeducation in their classrooms developed and sustained improved body esteem up to 6 months after the intervention [76]. The authors also reported that the participants experienced a significant reduction in body-related teasing up to 12 months after the intervention.

Other studies, such as those conducted in the UK Jarman et al. [73] and India Paraskeva et al. [74], focused on psychoeducation targeting cognitive dissonance in adolescent girls aged 11-18, using young adults as trainers rather than professionals or teachers. Jarman et al. [73] conducted a 'body project' in the United Kingdom in which 99 female adolescents between the ages of 14 – 18 years of age were divided into groups where they actively challenged societal appearance ideals through peer group discussions, role plays, and journalling activities using young undergraduate psychology students (19 – 24 years) as peer-leaders rather than professionals and teachers. Following this intervention, the adolescent girls acquired a sense of belonging as they realised that dissonance in body image was a common challenge among group members. Working as a group, the participants recognised that societal standards for body shape and appearance were

unrealistic and expressed their commitment to attain and maintain a positive body image.

A similar intervention study, 'free being me' was conducted in India by Paraskeva et al. [74], using members of girls' scouts and guides to educate 117 adolescent girls between 11-14 years of age on understanding image myth, media literacy and body activism and advocacy. The intervention covered a wide range of topics, such as: challenging societal and cultural standards for appearance, recognising the financial and health implications of believing and adhering to these unrealistic standards, identifying the techniques used to manipulate images on social media, critiquing images portraying unrealistic appearance expectations, positive body affirmations, promoting body image confidence and embracing appearance diversity. The participants also engaged in personal body activism projects by educating community members on body image myths and how to combat societal pressures regarding body image. It was reported that the intervention caused a significant boost in the body esteem of the adolescent girls and that the participants were comfortable and accepting of the intervention and enjoyed the interactive activities.

10. PHYSICAL ACTIVITY INTERVENTION

Studies have suggested that engaging in physical activity can positively impact body image in adolescents.

A cross-sectional study by Fernández-Bustos et al. [77] involving 652 Spanish children aged 12-17 found that adolescents who participated in physical activities had a more positive perception of their appearance and self-concept. However, a limited number of intervention studies focused on reducing negative body image in adolescents through physical activity.

Nonetheless, a systematic review by Vaquero-Solís et al. [78] suggests that integrating physical activity into the classroom for children and adolescents aged 6-17 could help reduce sedentary behaviours and build competence, autonomy, intrinsic motivation, self-esteem, and positive body image.

Based on the findings of a systematic review by Klos et al. [79], group-based physical activity programs that emphasise task-oriented activities are perceived as more enjoyable by adolescents and may yield better results. This insight could

inform the design of physical activity programs to promote positive adolescent body image.

11. DIGITAL-BASED BEHAVIORAL THERAPY INTERVENTION

In today's digital age, mobile interventions are crucial in promoting health and well-being, including positive body image among adolescents.

Rodgers et al. [80] designed an app called 'BodiMojo,' which delivered messages on self-compassion, mindfulness, and self-kindness to participants twice daily, tracked their mood and emotional regulation, and included a gratitude journaling component.

The study involved 274 late adolescents (14-18 years) who were instructed to use the app at least once daily for six weeks. According to Rodgers et al. [80], adolescents who used the app experienced changes in their perception of their body appearance and showed more self-compassion than the control group.

Additionally, while the digital intervention studied by Aboody et al. [81] targeted adult populations, its principles could be applied to address adolescent body image distortions. The intervention involved behavioural therapy mobile software called the 'GGBI app,' which consisted of daily game-like training exercises targeting cognitive dissonance. Compared to the control group, participants who used the app showed reduced symptoms of body image dissatisfaction, increased positive body image, and greater resilience to familiar body image triggers.

Virtual reality-based (VR) interventions are gradually becoming a prominent digital intervention for improving the well-being of children and adolescents. The systematic review conducted by Xu et al. [82] nature-based, mindfulness-based, and educational-based VR interventions increase overall well-being, reduce stress, enhance positive mood, and improve anxiety and depressive disorders in adolescents. While digital intervention studies for ACEs and body image dissatisfaction have not explored VR interventions, the studies conducted by Farič et al. [83] and Scherpbier et al. [84] suggest that VR could stimulate adolescents to engage in physical activities and foster child-parent relationships. This implies that VR could be a promising tool to promote positive body image in children and adolescents.

The vEngage project, a study conducted by Farič et al. [83] in the UK, aimed to promote physical activities in early adolescents (13 -17 years) using a VR exergame. The exergame featured realistic body movements, graphics, and in-game rewards, and players could only progress by accurately mimicking the body movements in the game. Despite being in its pilot phase, the game was well-received by adolescents and parents. The potential benefits of the intervention, such as promoting weight loss and fostering positive body image, are yet to be fully explored, but the high acceptance rate suggests promising outcomes.

A qualitative study conducted by Scherpbier et al. [84], integrated VR into therapy parent-child interaction therapy for six months in children with disruptive behaviour problems (2-7 years). The parents involved in the intervention reported diminished disruptive behaviour in their child and developed positive parenting skills. However, the study was limited as the therapists perceived that the intervention did not thoroughly capture the challenges faced by these parents and the treatment needs of their children. While the study by Scherpbier et al. [84] has no direct relationship with body image formation and has its limitation. The intervention is a promising tool for preventing and managing ACEs in children and can be used as a tool to manage ACEs-induced body image dissatisfaction in children and adolescents.

12. LIMITATIONS OF REVIEWED STUDIES

Although this narrative review comprehensively explored the issue of body image dissatisfaction in children and adolescents and the role of ACEs in negative body development. The mechanism through which the different categories impact body image dissatisfaction in this population could not be extensively captured due to the methodological limitations of the literature utilised in this review. A large proportion of the studies reviewed in this study are cross-sectional studies, which limited the ability of this study to establish the causality between ACEs and body image dissatisfaction adequately. Also, except for studies conducted by Emirtekin et al. [43], Kircaburun et al. [44], and Vartanian and Hayward [49], which assessed the relationship between ACEs and body image dissatisfaction, the preponderance of the studies included in this review examined the two phenomena independent of each other. The studies that examined the role of ACEs in body image

dissatisfaction were, however, limited because they were focused on family dysfunction, child maltreatment, and emotional abuse. Other categories of ACEs, such as physical and emotional neglect and sexual abuse, were neglected. Similarly, these studies failed to assess the effect of more than one ACE on body image development in children and adolescents. The studies did not account for the cultural differences in the perception of body image and the experience of ACEs; this limits the generalizability of the findings.

Unfortunately, despite the high prevalence of ACEs in non-western countries, as identified in the systematic review conducted by Carlson et al. [12], studies from these regions still need to address ACEs and their impact on body image dissatisfaction. This explains why the intervention studies reviewed were conducted in the United Kingdom, Spain, and India. Based on the systematic review conducted by Guest et al. [66], the preponderance of the intervention studies targeted at promoting positive body image in children and adolescents was conducted in the United States, The United Kingdom, and Canada. Due to this limitation, this review could not capture the cultural variations in adolescent body image dissatisfaction and the interventions suitable for different cultures.

13. CONCLUSION AND STUDY IMPLICATIONS

This narrative review explored the adverse effects of ACEs on child development, potentially leading to mental health issues such as body image dissatisfaction. Recent intervention studies by Fernández-Bustos et al. [77], Aboody et al. [81], Diedrichs et al. [76], and Harmon-Jones et al. [71] indicate that psychoeducation addressing cognitive dissonance on body image, physical activity, and digital behavioral therapy can effectively promote a positive body image in children and adolescents. These interventions could be even more effective if they included strategies to address ACEs. One practical method for integrating this approach is through parental and community involvement in programs aimed at fostering positive body image in children and adolescents.

Crucially, parental involvement in these interventions fosters supportive environments that nurture positive body image and resilience in adolescents. As highlighted by Perez-Fuentes et

al. [85], positive parenting styles that prioritize child-parent interactions significantly influence a child's self-esteem. Therefore, digital behavioral therapies and psychoeducation programs could incorporate features that educate parents about ACEs and the effects of parental neglect on a child's mental health and body image development. For instance, the 'BodiMojo' app, developed by Rodgers et al. [80], could be enhanced to include a feature where parents can send compassionate and affirming messages to their children three times a day. This could be further augmented by integrating Scherpbier et al. [84] VR-based intervention to enhance parent-child interactions with the 'BodiMojo' app, thereby promoting positive body image and mitigating parent-induced ACEs.

However, it is of utmost importance to note that addressing ACEs and their impact on body image dissatisfaction necessitates comprehensive and multidisciplinary strategies. This is not a task that can be tackled with a single approach, but rather requires a concerted effort from all stakeholders involved in child development and mental health.

Research Gap and Future Perspectives:

While a substantial body of research exists examining the relationship between Adverse Childhood Experiences (ACEs) and body image dissatisfaction in adolescence, several gaps in knowledge persist, which may need further exploration.

1. **Mechanisms of ACEs on Body Image:** While existing research has provided valuable insights into the association between ACEs and body image distortion, further understanding of the underlying mechanisms through which ACEs influence body image perception remains necessary. Future studies should shed light on this relationship's possible psychological, neurobiological, and social pathways to provide a more comprehensive understanding.
2. **Longitudinal Studies:** Many existing studies have been cross-sectional, providing snapshots of body image simultaneously. Longitudinal studies tracking individuals from adolescence into adulthood are essential to fully capture the dynamics of the development of body image distortions. These longitudinal studies would allow researchers to examine how body image

perceptions evolve over time and whether the effects of ACEs persist into adulthood.

3. Gender Disparity: A notable gap in the literature is the limited focus on male adolescents in research on body image. Most studies have predominantly focused on female adolescents, potentially overlooking essential gender differences in body image development and the impact of ACEs. Future research should include more male adolescents in study populations and explore gender-specific factors influencing body image and responses to interventions.

DATA AVAILABILITY STATEMENT

All data supporting this research are included in the references section of this publication and are available online.

CONSENT AND ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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