CORA Cork Open Research Archive
Cartlann Taighde Oscailte Chorcaí

| | |
|---|---|
| Title | Body, emotions, and hormones: A systematic review of body dissatisfaction, emotion regulation, and puberty in adolescence |
| Authors | Muscolino, Isabella;Dockray, Samantha;Dempsey, Maria;Tomei, Eleonora |
| Publication date | 2026-07-30 |
| Original Citation | Muscolino, I, Dockray, S, Dempsey, M & Tomei, E 2026, 'Body, emotions, and hormones: A systematic review of body dissatisfaction, emotion regulation, and puberty in adolescence', Journal of Adolescence, vol. 98, no. 7, pp. 2207-2244. https://doi.org/10.1002/jad.70238 |
| Type of publication | Review |
| Link to publisher's version | https://www.scopus.com/pages/publications/105045973693 - 10.1002/jad.70238 |
| Rights | © 2026, the Author(s). Journal of Adolescence published by John Wiley & Sons Ltd on behalf of Foundation for Professionals in Services to Adolescents. This is an open access article under the terms of the Creative Commons Attribution#NonCommercial# NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non#commercial and no modifications or adaptations are made. - https://creativecommons.org/licenses/by-nc-nd/4.0/ |
| Download date | 2026-11-17 05:15:23 |
| Item downloaded from | https://hdl.handle.net/10468/19183 |

UCC
University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

Check for updates

*Journal of Adolescence*

WILEY

Foundation for PSA

REVIEW ARTICLE OPEN ACCESS

# Body, Emotions, and Hormones: A Systematic Review of Body Dissatisfaction, Emotion Regulation, and Puberty in Adolescence

Isabella Muscolino | Samantha Dockray | Maria Dempsey | Eleonora Tomei

School of Applied Psychology, University College Cork, Cork, Ireland

**Correspondence:** Isabella Muscolino (isabella.muscolino@ucc.ie)

**Received:** 22 September 2025 | **Revised:** 10 July 2026 | **Accepted:** 16 July 2026

**Keywords:** adolescence | adolescent well-being | body dissatisfaction | body image | emotion regulation | pubertal development

## ABSTRACT

**Objective:** Body dissatisfaction often arises from a discrepancy between perceived and ideal body images, posing a risk for psychological issues like depression and eating pathologies, particularly during adolescence. Puberty's rapid physical changes may exacerbate the feeling of dissatisfaction, additionally pubertal changes also influence cognitive processes, such as emotion regulation. This study aimed to map the relationships of puberty, emotion regulation, and body dissatisfaction to advance a developmentally informed theory of body dissatisfaction and enhance possibilities for future intervention.

**Method:** Searches for English language publications between 2000 and 2025 were conducted in five databases (Ebsco, Jstor, Proquest, Sciencedirect, Scopus). After removal of duplicate records, a total of 3658 studies were identified. Studies were included if they involved participants aged 6–18 and addressed associations of at least two of: emotion regulation, body dissatisfaction, and puberty/pubertal hormones. Following title and abstract screening, 259 studies were full text screened, resulting in 103 studies suitable for data extraction.

**Results:** Findings indicate a relationship between body dissatisfaction, emotion regulation, and puberty. The strength of the correlation varies, partly influenced by pubertal stage. Positive body image predicted positive emotional responses to pubertal onset, while increased negative affect was associated with greater body dissatisfaction. If pubertal development is more advanced at an earlier age, negative effects on psychological well-being persist into adolescence.

**Conclusion:** This review highlights the need for a developmentally informed theoretical framework to understand how puberty can pre-empt or exacerbate body image concerns, particularly in the presence of emotion dysregulation. This systematic review provides preliminary evidence supporting an interplay between puberty, emotion regulation, and body dissatisfaction in adolescence.

## 1 | Introduction

The idea that the changes in the body during puberty can cause psychological and somatic concerns in adolescents is well established in the literature, especially for girls (Attie and Brooks-Gunn 1989; Bucchianeri et al. 2013; de Guzman and Nishina 2014; Dornbusch et al. 1984; Gralen et al. 1990; Keel et al. 1997; Swarr and Richards 1996; Williams and Currie 2000). However, few studies have investigated the effects of puberty on the emergence of body image concerns via development of emotion regulation capacities. Exploring the existing literature on adolescence may help us to trace the pattern of this interplay, contributing to a nuanced understanding of adolescent development and body dissatisfaction.

Pubertal maturation occurs via the action of the hormones, which have a range of effects including on brain maturation, that support the development of adult cognition, decision making, and social behaviors (Blakemore and Choudhury 2006;

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2026 The Author(s). *Journal of Adolescence* published by John Wiley & Sons Ltd on behalf of Foundation for Professionals in Services to Adolescents.

Dockray and Messerli-Burgy 2022); these same regions also contribute to emotion regulation capacities (Sisk and Zehr 2005). Pubertal timing and tempo can influence the timing of these brain maturation processes (Vijayakumar et al. 2021; Worthman et al. 2019), and the influence of puberty on body dissatisfaction and psychological wellbeing has been widely reported (Bucchianeri et al. 2013; Culbert et al. 2017; McNicholas et al. 2012). Earlier timing of puberty has been linked to mood disturbance and poor self-image, and pubertal tempo has been demonstrated to have negative implications for self-perception and alterations in mood or behavior (Culbert et al. 2017; Marceau et al. 2011). As pubertal timing varies, there may be differences between same-age adolescents in their ability to modulate their emotions, for example, in social situations and in risk-taking (Worthman 2011). These inter-individual differences, in combination with intra-individual changes in the pace of pubertal development and emotion regulation, may contribute to a kaleidoscope of processes that shape body comparison and (dis) satisfaction, yet they are rarely considered through an integrative lens. Body dissatisfaction, emotion regulation, puberty and hormones have been explored, but very few studies have focused on the interconnection among these three different aspects of the adolescent experience.

### 1.1 | The Biological, Cognitive and Emotional Dimensions of Body Dissatisfaction

Body dissatisfaction can be described as the result of the discrepancy between the perceived and ideal body image (Dion et al. 2015), and it is associated with depression, low self-esteem and weight and shape concerns. The origin of body dissatisfaction has been traced to pubertal onset, as it is when changes in appearance and other aspects of the body, including changes in perspiration, odors, acne, and hair growth occur (Blakemore and Choudhury 2006; Wertheim and Paxton 2011; Bucchianeri et al. 2013), disrupting the perceptions a person has of their own body (Williams and Currie 2000). However, these body changes are not sufficient to explain the multifaceted psychological construct of body dissatisfaction (Cash 2011). The individual perception of personal body image is partly the result of emotional processes (Cash and Smolak 2011), and the individual's inability to recognize and regulate negative emotions may contribute to appearance comparison and bulimic symptoms, as a dysfunctional strategy to regulate affective states (Sim and Zeman 2005). Despite the connection between eating disorders, body dissatisfaction and emotion regulation (Hughes and Gullone 2011; Lavender and Anderson 2010), and between puberty, pubertal hormones, executive cognitive functions, and body image concerns (Bucchianeri et al. 2013; Guzman and Nishina 2014; Dion et al. 2015; Saunders and Frazier 2017), the interplay of body dissatisfaction, emotion regulation and puberty remains underexplored. This systematic review aims to uncover this connection.

## 2 | Methods

### 2.1 | Search Strategy

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines (Page et al. 2021).

Five academic databases: Ebsco, Jstor, Proquest, Sciencedirect, and Scopus were searched to locate all English language publications between 2000 and 2025. The search terms used were: body dissatisfaction OR body image AND emotion regulation OR affect regulation OR puberty NOT adults NOT women NOT men.

### 2.2 | Inclusion Criteria

Studies were included for review if they met the inclusion criteria: (i) population between 6 and 18 years of age, (ii) the study must include at least two of these concepts or measures: emotion regulation (including positive/negative affect regulation), body dissatisfaction (including eating disorders), puberty and/or pubertal hormones. Gray literature and preprint servers were excluded to prioritize peer-reviewed studies with established methodological rigor and reproducibility.

### 2.3 | Key Concept Definitions

#### *2.3.1 | Emotion Regulation*

Emotion regulation was defined as the cognitive process through which individuals identify, interpret, and modulate their emotional experience and expression. In this review, emotion regulation was operationalized as an intrapersonal process, referring to how young people regulate their own emotions through internal skills and strategies rather than through interactions with others. Only one study included an explicitly interpersonal component via co-rumination with peers. The review treated emotion-focused coping (e.g., emotional eating, coping with negative emotion, regulation of positive/negative affects) as part of the broader construct of emotion regulation when these strategies were clearly targeted at managing emotional states.

#### *2.3.2 | Puberty and Pubertal Changes*

Puberty was addressed in this review as a normative period of biological maturation (increased production of sex hormones, development of secondary sexual characteristics, marked changes in body composition and growth); therefore, it was treated as a multidimensional construct including: stage, timing, tempo, and hormonal or anthropometric indicators of maturational status. Puberty-only measures based solely on chronological age or school grade, without any pubertal indicators, were not considered sufficient to meet this definition.

#### *2.3.3 | Body Dissatisfaction*

Body dissatisfaction was defined as a negative subjective evaluation of one's physical appearance, encompassing concerns about weight, shape, size, and specific body parts. Because body dissatisfaction is closely intertwined with eating-related pathology and eating disorders in adolescence, the review included studies using body-related subscales from validated eating disorder measures (e.g., EDI, EAT-26), which index dissatisfaction and preoccupation with body weight and shape within an eating pathology framework.



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

## 2.4 | Screening and Data Extraction

Study screening applied the inclusion criteria described and used the systematic review software Covidence. The initial search across five databases yielded 5633 records. After removal of 1975 duplicate records, 3658 records remained for title/abstract screening. Title/abstract screening and full-text review of the remaining studies were conducted by two independent reviewers trained in psychology, with a third reviewer resolving cases of disagreement. This resulted in 103 studies eligible for inclusion.

For data extraction, the reviewers used a standardized Excel template to capture study characteristics, quality ratings, measures used, and key findings. Quality was assessed using the National Institutes of Health (NIH) Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (National Heart, Lung, and Blood Institute 2014), a 14-item checklist specifically designed for non-randomized observational research. The reviewers evaluated each study assigning overall ratings of Good, Fair, or Poor. Of the 103 included studies, 101 (98.1%) were rated Good and two (1.9%) were rated Fair (Hermes and Keel 2003; de Guzman and Nishina 2014) using the NIH Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (National Heart, Lung, and Blood Institute 2014); no study received a Poor rating, indicating an overall high methodological quality of the included evidence base. The two studies rated Fair presented minor methodological limitations, specifically related to sample size justification and control of confounding variables, but their findings were retained as they did not introduce systematic bias that would compromise the validity of the conclusions drawn. A quantitative meta-analysis was not conducted because the included studies showed substantial heterogeneity in study design (cross-sectional, longitudinal, experimental, qualitative), operationalisation of emotion regulation, body dissatisfaction, and puberty, and in the types of statistical outcomes reported, which precluded meaningful pooling of effect sizes across studies.

# 3 | Results

The initial search across five databases yielded 5633 records. After the removal of 1975 duplicate records, 3658 studies entered title and abstract screening. Following title and abstract screening, 3399 articles (92.9%) were excluded as they did not meet the inclusion criteria, primarily owing to wrong population age (outside 6–18 years) or the absence of the required constructs (emotion regulation, body dissatisfaction, or puberty). Of the 259 full-text articles sought for retrieval, three could not be retrieved, leaving 256 articles assessed for eligibility. Following full-text screening, 146 studies were excluded for the following reasons: wrong constructs, whereby emotion regulation, body dissatisfaction, or puberty were not analyzed as primary variables but were instead examined separately, entered only as covariates, or included in models focusing on different primary constructs ($n = 105$, 71.9%); ineligible study design, including systematic reviews, book chapters, theses, editorials, case reports, blog posts, preprints, and conference papers ($n = 17$, 11.6%); non-English language publication ($n = 8$, 5.5%); wrong study design, referring to primary studies whose design did not permit an appropriate test of the review question ($n = 5$, 3.4%); wrong population, that is, age outside the 6–18 year criterion ($n = 4$, 2.7%); and duplicate records identified only at the full-text stage ($n = 7$, 4.8%). A total of 110 studies were retained for extraction. During data extraction, seven additional studies were excluded owing to insufficient data for synthesis or the absence of relevant outcomes, leaving a final total of 103 studies (see Figure 1).

Of the 103 studies extracted, the majority employed cross-sectional designs ($n = 67$, 65.0%), followed by longitudinal designs ($n = 22$, 21.4%). A smaller subset utilized intensive longitudinal designs ($n = 6$, 5.8%), including ecological momentary assessment and diary-based protocols. Ecological momentary assessment was classified as a subtype of intensive longitudinal methods. Additional designs included qualitative interviews ($n = 2$, 1.9%), randomized controlled trials ($n = 2$, 1.9%), experimental ($n = 1$, 1.0%), cohort ($n = 1$, 1.0%), gene × environment interaction ($n = 1$, 1.0%), and group comparison ($n = 1$, 1.0%) studies. Sample sizes ranged from 27 to 16,882 participants ($Mdn = 521$, $M = 1{,}433$). Most studies ($n = 38$, 36.9%) included 100 to 499 participants, while seven large-scale studies (6.8%) recruited $\geq 5000$ participants. Although individual participant ages across studies spanned 6–28 years, all studies met the inclusion criterion of having a mean age $\leq 18$ years. Most studies focused on adolescent samples ranging from early through late stages, with many concentrated between 10 and 16 years, corresponding to critical pubertal development periods. Studies primarily recruited community samples; fewer examined clinical populations (e.g., anorexia nervosa) or specific subgroups (e.g., athletes, youth with overweight/obesity). See Table 1 for detailed study characteristics. Figure 2 and Table 2 summarize the conceptual framework and the pathways linking pubertal development, emotion regulation, body dissatisfaction, and eating disorder risk.

## 3.1 | Mechanisms Underlying the Association Between Puberty and Body Dissatisfaction

Of the 103 studies extracted, 40 investigated the effect of puberty on body dissatisfaction and/or eating disorder symptoms (body dissatisfaction and puberty: 32 studies; eating disorder symptoms and puberty: eight studies). Most studies supported an association of pubertal development and increases in weight and shape concern.

### *3.1.1 | Pubertal Development and Body Dissatisfaction*

There was evidence that post-pubescent adolescents are more dissatisfied with their body compared to pre-pubescent adolescents. This was evidenced in cross-sectional studies (Ferrari et al. 2015; Fidelix et al. 2014; Forney et al. 2019; Gay et al. 2018; Harriger et al. 2014; Hermes and Keel 2003; Hughes et al. 2018; Kaczmarek and Trambacz-Oleszak 2016; O'Connor et al. 2020; Peng et al. 2022; Wang et al. 2022), and also in longitudinal studies with same-age peers (Davison et al. 2007; Knowles et al. 2009; Lewis-Smith et al. 2020), and pubertal changes influenced body image, body shame, body dissatisfaction, self-perception, and global self-worth (Dantas et al. 2017;



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

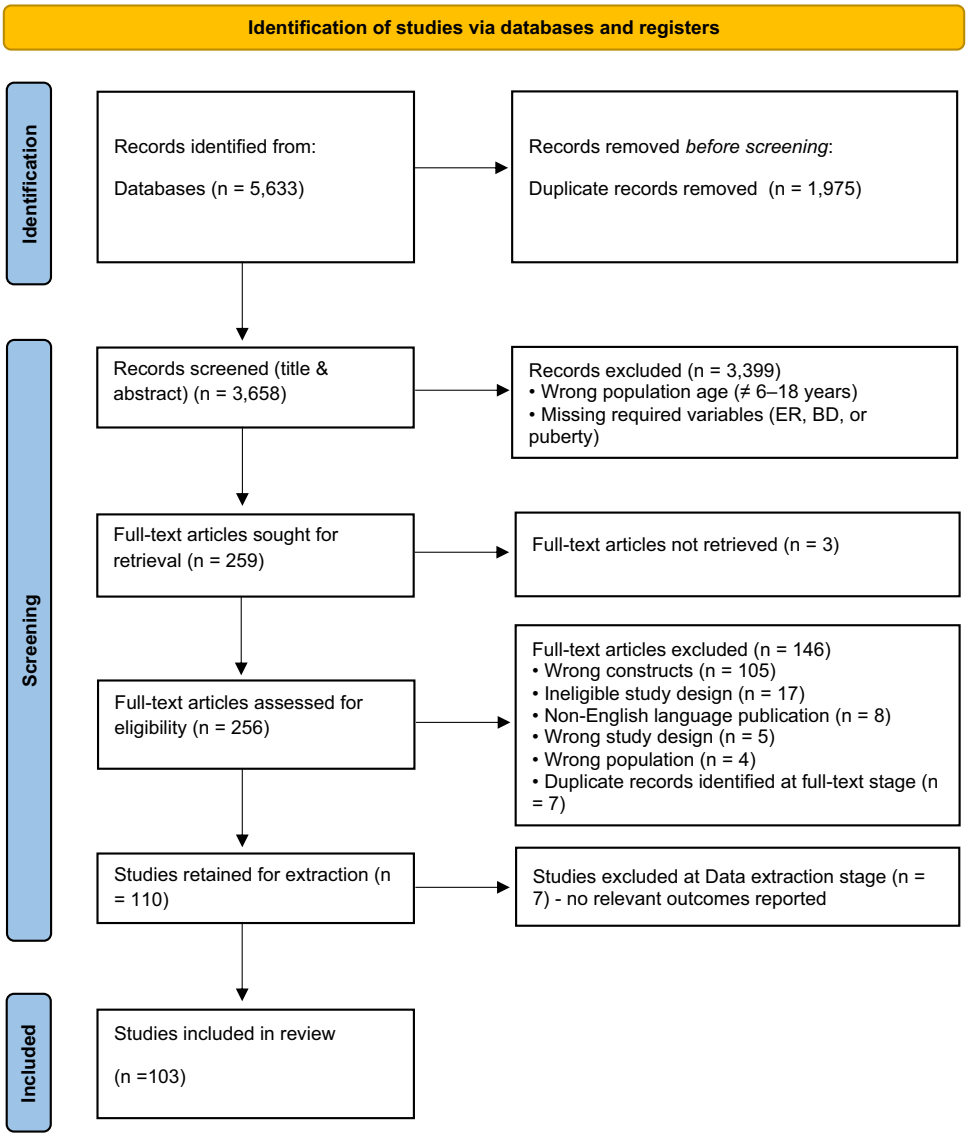


**FIGURE 1** | PRISMA 2020 flow diagram for the study selection process.*Note:* Adapted from Page, M. J., et al. (2021). The PRISMA 2020 statement. BMJ, 372, n71. https://doi.org/10.1136/bmj.n71.

Ferrari et al. 2015; Fidelix et al. 2014; Forney et al. 2019; Gay et al. 2018; Harriger et al. 2014; Hermes and Keel 2003; Hughes et al. 2018; Jiang et al. 2021; Kaczmarek and Trambacz-Oleszak 2016; Knowles et al. 2009; Lewis-Smith et al. 2020; Mahama et al. 2024; O'Connor et al. 2020; Peng et al. 2022; Riboli et al. 2022; Sicilia et al. 2024; Wang et al. 2022). However, the most dissatisfied are those teens who experienced earlier pubertal timing (Berger et al. 2009; Dantas et al. 2017; Davison et al. 2007; Labbrozzi et al. 2013; Lee et al. 2016; Lewis-Smith et al. 2020; Lien et al. 2006; Lien et al. 2010; Ren et al. 2018), because generally they feel bigger than same-age peers, have higher levels of body dissatisfaction and lower body esteem (Berger et al. 2009; Dantas et al. 2017; Davison et al. 2007; Ren et al. 2018). Pubertal tempo also has a role in the experience of body shame and dissatisfaction. Adolescents who experience accelerated maturational development show high values of body dissatisfaction (Dantas et al. 2017), especially girls in combination with early timing (Sicilia et al. 2024). However, for boys the results are contradictory: two different studies showed the negative impact of both slower and accelerated changes (Dantas et al. 2017; Sicilia et al. 2024).

Pubertal changes appear to be associated with self-esteem and body-related perception of adolescents; however there are some studies that did not find a connection between these variables (Altıntaş et al. 2014; Cousineau et al. 2010; Gibson et al. 2008; MacPhee and Andrews 2006; Martins et al. 2014; Murdey et al. 2005). Being older continues to be a strong predictor of body dissatisfaction (Martins et al. 2014). Adolescent girls aged 13–14 years were more concerned with their body image than 11–12-year-old girls even if no indication of a relation between puberty and body dissatisfaction was found (Martins et al. 2014).

Pubertal timing appears to be associated with weight management strategies, and adolescents who experienced earlier pubertal timing were more likely to develop restrictive eating behaviors (Berger et al. 2009; Culbert et al. 2009; Gay et al. 2018;



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 1** | Summary of study characteristics.

| Study | Aim | Variables Studied (Measure) | Analysis | Design | Sample size | Age of participants |
|---|---|---|---|---|---|---|
| Abaatyo et al. (2024) | Body image, eating distress, emotional and behavioral difficulties. | Body Image & Eating Distress (Body Image and Eating Distress Scale), Emotional & Behavioral Difficulties (SDQ – extended), Sociodemographics (Age, Gender, Family Structure, SES, BMI, School Level) | Logistic regression assessed links between emotional-behavioral difficulties and high body image/ eating distress. Group differences were explored using descriptive stats, chi-square, and t-tests. Sociodemographic covariates were included. | Cross-sectional | 788 | 13–19 years old |
| Abbott and Barber (2010) | Body image | Demographics, Body Image (EIS), BMI, Pubertal Timing, Depressed Mood & Self-Esteem (Barber's Scales) | Factor analysis (EIS subscales), internal consistency (Cronbach's alpha), predictive validity (regression with self-esteem and depressed mood), group differences (age, BMI, pubertal timing, gender), bivariate correlations (EIS subscales) | Cross-sectional | 1515 | 12–17 years old |
| Allen et al. (2006) | Weight status, weight and shape concerns, self-esteem, body dissatisfaction, and depression. | Weight & Shape Concern (Ch-EDE), Self-Esteem (SPPC), Body Dissatisfaction (CBIS), Depression (CDI), BMI | Mediation analysis tested BMI z-score as predictor with self-esteem, body dissatisfaction, and depression as mediators; main effects of weight status and gender on psychological outcomes | Qualitative - Interviews | 207 | 7–13 years old |
| Altıntaş et al. (2014) | Physical activity level, BMI, puberty and body-related perceptions and self-esteem. | Physical Activity (Weekly Activity Checklist), BMI, Pubertal Status (Self-report), Social Physique Anxiety (SPAS), Body Image Satisfaction (BIS), Self-Esteem (RSES) | Multiple regression analysis evaluated associations among physical activity, BMI, pubertal status, body attractiveness, social physique anxiety, body image satisfaction, and self-esteem. | Cross-sectional | 1012 | 11–18 years old |
| Barberis et al. (2018) | Trait emotional intelligence, need fulfillment and eating disorders. | Needs Fulfillment (BPNS), Trait Emotional Intelligence (TEIQue-SF), ED (EAT-26) | Correlations assessed links among needs fulfillment, trait emotional intelligence, and eating disorder symptoms; SEM examined emotional intelligence as a mediator between needs fulfillment and eating disorders. | Cross-sectional | 59 | (F) 16–22 years old (Mean age = 18.71; SD = 1.98) |

(Continues)



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library, APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 1** | (Continued)

| Study | Aim | Variables Studied (Measure) | Analysis | Design | Sample size | Age of participants |
|---|---|---|---|---|---|---|
| Bearman et al. (2006) | Body dissatisfaction and influence of social, psychological and biological factors, gender differences. | Ideal Body Internalization (TREI), BMI, Social Support (NRI), Dieting (DRES), Negative Affectivity (Negative Affect Scale), Body Dissatisfaction (Satisfaction and Dissatisfaction with Body Parts Scale) | Correlations explored associations between body dissatisfaction and psychosocial variables; HLM tested gender moderation; repeated measures ANOVA analyzed changes in body dissatisfaction. | Longitudinal - Mixed Method | 428 | 12–16 years old |
| Bearman and Stice (2008) | Depression, gender differences. | Stressful Life Events (Major Life Events Scale), Negative Affectivity (Negative Affect Scale), Social Support (NRI), Externalizing Behaviors (CBCL), Body Dissatisfaction (Satisfaction/Dissatisfaction with Body Parts Scale), Dieting (DRES), BMI, Ideal Body Internalization (TREI), Bulimic Symptoms (EDDI), Depression Diagnosis (K-SADS) | HLM identified predictors of depression onset; moderation by sex was analyzed across body dissatisfaction, dieting, BMI, and bulimic symptoms. | Longitudinal - Mixed Method | 428 | 12–16 years old |
| Berger et al. (2009) | Eating disorders and pubertal timing, BMI, irrational beliefs, subjective interpretations of body weight and eating disorders | Demographics, Body Self-Esteem (FBeK), Physical Appearance Comparisons (PACS), Pubertal Timing (Self-report), Self-Esteem (RSES), Ideal Body Stereotype (IBSS), Body Dissatisfaction (BIS), Eating Behavior (EAT-26), Weight Limit & Future BMI (Self-report) | Correlations tested links among body dissatisfaction, self-esteem, eating behavior, BMI, and appearance comparisons; ANOVA assessed pubertal timing effects on body and eating variables | Cross-sectional | 136 | (F) 11–14 years old |
| Bucci and Staff (2020) | Pubertal timing and delinquency. | Delinquency, Parental Supervision, Peer Substance Use, Peer Gender Composition, Dating Behavior & Body Image | Logistic regression and KHB mediation analyzed the relationship between pubertal timing and delinquency, with mediators including parental | Longitudinal | 5799 | 7 years old at T1, 11 years old at T1, and 14 years old at T3 |

(Continues)



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library, APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 1** | (Continued)

| Study | Aim | Variables Studied (Measure) | Analysis | Design | Sample size | Age of participants |
|---|---|---|---|---|---|---|
| | | Perception (MCS Self-report), Pubertal Timing (PDS), Childhood Confounders (MCS age 7) | supervision, peer substance use, gender composition, dating behavior, body image, and childhood confounders. | | | |
| Calzo et al. (2012) | Trajectories of BMI, body dissatisfaction, and weight and shape concerns. | BMI, Concern with Weight & Shape (MRFS), Body Dissatisfaction (MRFS), Relative Pubertal Maturation (Tanner Stage, Age of Menarche) | GEE and GAM tested associations with body dissatisfaction and weight/shape concern, stratified by gender | Longitudinal | 16,882 | 9–18 years old |
| Chaku and Hoyt (2019) | Pubertal processes, executive functioning skills, attention and self-control. | Pubertal Development (Tanner Staging), Attention (CBCL – Attention Subscale), Self-Control (SSRS – Self-Control Subscale) | LGCM estimated pubertal timing and tempo; used as predictors in parallel models with attention and self-control | Intensive Longitudinal | 1099 | 9.5–15.5 years old |
| Chen and Jackson (2009) | Sociocultural, psychological, and biological risk factors and changes in weight esteem. | Weight Esteem (W-E Subscale), Sociocultural Pressure (PSPS), Appearance Teasing (POTS), Appearance Comparison (PACS), Thin Ideal Preference (IBSS-R), Affect (PANAS), BMI | Correlation and regression tested links with weight esteem and body image factors | Longitudinal | 799 | 12–17 years old |
| Chen et al. (2021) | Body dissatisfaction, eating disorder symptoms, regulatory emotional self-efficacy, depression symptoms. | Emotional Self-Efficacy (RESE), Body Dissatisfaction (BSS), Depression Symptoms (CES-D), Eating Disorder Symptoms (EAT-26), Age, Gender | SEM tested direct/indirect effects of body dissatisfaction on eating disorder symptoms via RESE and depression; RESE and CES-D as latent variables; multi-group SEM tested invariance by gender and age | Cross-sectional | 654 | 11–17 years old |
| Chiang et al. (2013) | Emotional disturbance, childhood obesity, educational setting, gender differences. | Emotional Disturbance (SAED), Obesity (BMI Percentile), Relationship Problems, Inappropriate Behavior, Unhappiness/ Depression (SAED Subscales) | Logistic regression analyses examined associations between obesity and emotional disturbance subscales, adjusted for demographic and socioeconomic factors | Longitudinal | 2283 | 6–13 years old |

(Continues)



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library, APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 1** | (Continued)

| Study | Aim | Variables Studied (Measure) | Analysis | Design | Sample size | Age of participants |
|---|---|---|---|---|---|---|
| Cousineau et al. (2010) | Pubertal knowledge, body esteem, self-esteem. | Demographics, Pubertal Status (PDS), Puberty Knowledge (Custom Questionnaire), Body Esteem (BES), Self-Esteem (SPP) | Mixed model analysis and moderator analysis compared intervention and control groups across time points, with pubertal status and gender as moderators | Randomized controlled trial | 190 | Mean age 11.7 years old (SD = 0.06) |
| Cuesta-Zamora et al. (2018) | Trait emotional intelligence, body dissatisfaction, bulimic symptoms, drive for thinness. | Trait Emotional Intelligence (TEIQue-ASF), Body Dissatisfaction, Bulimic Symptoms, Drive for Thinness (EDI-3), BMI | Multiple hierarchical regressions examined associations between trait EI and eating disorder symptoms, controlling for BMI and body dissatisfaction | Cross-sectional | 762 | 10–17 years old |
| Culbert et al. (2009) | Pubertal differences, genetic effects, environmental effects, etiologic effects, disordered eating attitudes, disordered behaviors. | Disordered Eating Attitudes & Behaviors (MEBS), Pubertal Development (PDS), Menarcheal Status, BMI | Twin constraint models compared genetic and environmental effects across pubertal stages; regression analysis controlled for age and BMI | Cross-sectional | 328 | (F) 10–28 years old |
| Culbert et al. (2017) | Genetic effects, disordered eating, adrenarche, androgens, physical changes of puberty. | Disordered Eating Symptoms (MEBS), Pubertal Status (PDS), BMI | Twin constraint models compared genetic and environmental effects across pubertal stages; regression analysis controlled for age and BMI | Cross-sectional | 1212 | (M) 6–28 years old |
| Czepczor-Bernat et al. (2020) | Circle of Discontent, restrained eating, uncontrolled eating. | Negative Affect (PANAS-C), Body Dissatisfaction (Children's Body Image Scale, Figure Rating Scale), Restrictive & Uncontrolled Eating (TFEQ-R13), High-Energy Consumption (Single Item), Obesity Status (BMI), ED Symptoms Screening (EDY-Q) | SEM explored links among body dissatisfaction, negative affect, eating behaviors, and obesity (Circle of Discontent); EDY-Q served as a screener; high-energy consumption was the outcome; affect and eating behaviors acted as mediators. | Cross-sectional | 282 | Mean age 12.23 years (SD = 2.80) |
| Davis and Smith (2018) | Biological factors, personality factors, learning factors, binge eating, purging. | Pubertal Onset (PDS), Negative Urgency (UPPS-P), Negative Affect (PANAS-C), Eating & Thinness | SEM investigated pathways from pubertal onset to disordered eating via negative urgency and negative affect, with mediators including | Longitudinal | 1906 | Mean age 10.86 years old |

(Continues)



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library, APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 1** | (Continued)

| Study | Aim | Variables Studied (Measure) | Analysis | Design | Sample size | Age of participants |
|---|---|---|---|---|---|---|
| | | Expectancies (EEI, TREI), Binge Eating & Purging (Adapted EDE-Q) | eating and thinness expectancies; reciprocal effects tested among binge eating, purging, and expectancies | | | |
| Davison et al. (2007) | Enjoyment of physical activity, psychological response, puberty. | Pubertal Development (Tanner Stage, PDS, Estradiol), Depression (CDI), Global Self-Worth & Athletic Competence (SPP), Body Esteem (BESAA), Maturity Fears (MFS), Physical Activity (CPA, ActiGraph) | SEM analyzed relationships among pubertal development, psychological variables, and physical activity | Longitudinal | 178 | (F) 11 years old |
| Dantas et al. (2017) | Body dissatisfaction, puberty. | Body Image Satisfaction (Silhouette Scale), Maturational Stage (Skeletal Age Equation), BMI | Chi-square and logistic regression evaluated associations between body image satisfaction, maturational stage, and BMI, controlling for age and sex. | Cross-sectional | 207 | 10–12 years old |
| de Guzman and Nishina (2014) | Body dissatisfaction, pubertal development, perceived timing, ethnically diverse sample. | Body Dissatisfaction (Custom Questionnaire), Perceived & Physical Pubertal Timing (Self-report, PDS), Ethnicity & Gender | HLM assessed how pubertal timing, ethnicity, and gender relate to body dissatisfaction. | Longitudinal | 1370 | 6–18 years old |
| Doba et al. (2018) | Self-differentiation, alexithymia, psychological distress, eating disorder symptoms. | Eating Disorder Symptoms (EDI), Psychological Distress (IDPESQ), Differentiation of Self (DSI), Alexithymia (BVAQ) | PLS-PM explored associations among self-differentiation, alexithymia, psychological distress, and eating disorder symptoms. | Cross-sectional | 521 | (F) 12–17 years old |
| Dikmeer et al. (2024) | Mindfulness, emotion regulation, perfectionism, rumination, anorexia nervosa. | ED symptoms (EDE-Q), Mindfulness (FFMQ), Rumination (RRS-SV), Emotion regulation difficulties (DERS), Perfectionism (FMPS), Body dissatisfaction (BISQ), Depression (BDI), Anxiety (SCARED) | ANOVA, ANCOVA, correlations, and regression identified predictors of ED symptoms and mindfulness; DERS and BISQ emerged as significant; anxiety was controlled; rumination was excluded from final models. | Cross-sectional - Cohort comparison | 76 | (F) 12–18 years old (20 acute AN, 16 remission, 40 controls) |

(Continues)



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library, APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 1** | (Continued)

| Study | Aim | Variables Studied (Measure) | Analysis | Design | Sample size | Age of participants |
|---|---|---|---|---|---|---|
| Dworschak et al. (2023) | Positive and negative affect, disordered eating. | Rumination (CRSQ), Dampening of Positive Affect (RPA-C), Disordered Eating Cognitions & Behaviors (EDE-Q Items), Age & Gender (Self-report), COVID-Related Stress (Custom Scale) | Multilevel regression models examined links between emotion regulation (rumination, dampening) and disordered eating, with age, gender, and COVID-related stress as covariates and moderators. | Intensive Longitudinal | 254 | 8–15 years old at T1; 9–17 years old at T2 |
| Egbert et al. (2020) | Positive affect, binge eating. | BMI (CDC Growth Charts), Demographics, Loss of Control Eating (Child EDE), Pubertal Status (Tanner Scale), Positive Affect Intensity & Instability (PANAS), Overeating & LOCE Severity (EMA) | GEE models assessed concurrent, lagged, and daily associations between positive affect and LOCE/overeating; pubertal status was tested as a moderator; BMI $\geq$ 85th percentile served as inclusion criterion; demographics were described. | Intensive Longitudinal | 38 | 14–18 years old |
| Erdem et al. (2023) | Social anxiety, emotional eating. | Social Anxiety (SASC-R), Emotional Eating (EES-C), Demographics & Lifestyle (Custom Questionnaire), BMI (WHO Growth Charts) | Descriptive stats, Mann–Whitney U, Kruskal–Wallis, and regression analyzed links between social anxiety and emotional eating; SASC-R predicted EES-C; group differences were examined by gender, internet use, gaming, and body image. | Cross-sectional | 1027 | 8–14 years old |
| Farrow and Fox (2011) | Bullying, emotional adjustment, restrained eating, body dissatisfaction. | Bullying Experiences (Self-report), Emotional Symptoms (SDQ), Restrained Eating (DEBQ), Body Dissatisfaction (Figure Rating Scale, EDI), BMI | Correlations, t-tests, and mediation explored relationships among bullying, emotional symptoms, restrained eating, and body dissatisfaction. | Cross-sectional | 376 | 11–14 years old |
| Fernandes et al. (2018) | Mindfulness, body dissatisfaction, body shame, psychological adjustment. | Dispositional Mindfulness (CAMM), Body Dissatisfaction (CBI), Body Shame (ESS), Internalizing & Externalizing Problems (SDQ), Mental & Social QoL (DISABKIDS-37), Gender | PROCESS Models 14 & 4 evaluated indirect effects of mindfulness on internalizing problems and QoL via body shame and dissatisfaction; gender moderation was examined but not retained. | Cross-sectional | 105 | 7–18 years old |

(Continues)



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library, APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 1** | (Continued)

| Study | Aim | Variables Studied (Measure) | Analysis | Design | Sample size | Age of participants |
|---|---|---|---|---|---|---|
| Ferrari et al. (2015) | Body image dissatisfaction, BMI, maturational stages, anthropometric indicators. | Body Image Dissatisfaction (BSS), BMI, Body Fat % (Skinfolds), Sexual Maturity (Tanner Stages) | Fisher's exact, chi-square, and multinomial logistic regression analyzed associations among body image dissatisfaction, BMI, BF%, and sexual maturity. | Cross-sectional | 1499 | (M) 7–17 years old |
| Fidelix et al. (2014) | Body image dissatisfaction. | Body Image Dissatisfaction (BSS), Sexual Maturation (Tanner Stages), Sociodemographic Factors | Chi-square test, Fisher's exact test, and Poisson regression examined associations with body image dissatisfaction | Cross-sectional | 278 | 10–17 years old |
| Forney et al. (2019) | Progesterone, perceived social pressures, thin ideal, body image concerns. | Appearance–Popularity Beliefs (PAS), Weight-Related Teasing (PTS), Progesterone (Salivary Assay), Body Image Concerns (MEBS, EDE-Q Composite), BMI Percentile (CDC), Menarcheal Status & Pubertal Development (PDS), Age | Used as predictors in multilevel moderation models; interactions between social variables (appearance–popularity beliefs, teasing) and progesterone tested to predict body image concerns | Cross-sectional | 813 | 8–16 years old |
| Gall et al. (2016) | Body dissatisfaction, loss of control eating, obesity, impaired emotional well-being. | Body Dissatisfaction & LOC Eating (EDE-Q), Self-Rated Health (Single Item), Emotional Well-being (K-10) | Moderated mediation analysis examined relationships among obesity, emotional well-being, and disordered eating behaviors | Cross-sectional | 1670 | 12–18 years old |
| Gay et al. (2011) | Social physique anxiety. | Social Physique Anxiety (SPAS), BMI, Maturity Offset (Anthropometric Formula), Age at Menarche (Self-report) | Logistic regression examined associations between SPA and age, BMI, sport context, maturity offset, and age at menarche | Cross-sectional | 404 | (F) 11–16 years old |
| Gay et al. (2018) | Physical maturation, weight management behaviors. | Growth Timing (Maturity Offset), Age at Menarche (Self-report), BMI Percentile (CDC), Weight Management & Perceived Weight Status (YRBS), Demographics, Anthropometrics (Height, Weight, Sitting Height), Body Composition (%BF via BIA) | Logistic regression and chi-square assessed links between BMI percentile, growth timing, age at menarche, and weight-related behaviors; descriptive stats and t-tests compared anthropometric measures. | Cross-sectional | 826 | 9–18 years old |

(Continues)



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library, APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 1** | (Continued)

| Study | Aim | Variables Studied (Measure) | Analysis | Design | Sample size | Age of participants |
|---|---|---|---|---|---|---|
| Ghammem et al. (2024) | Weight status perception, socio-demographic characteristics, mental health disorders. | Weight Perception & Misperception (Figure Rating Scale, BMI), Depression (BDI-II), Anxiety (SCARED-C), Self-Esteem (RSE), Alexithymia (TAS-20), Measured BMI (IOTF) | Chi-square and multinomial logistic regression evaluated associations between weight misperception and mental health/ sociodemographic factors; BMI classified actual weight and misperception categories. | Cross-sectional | 1399 | 14–21 years old |
| Gibson et al. (2008) | Adiposity, psychosocial functioning, overweight/ obesity. | BMI, Depression (CDI), Self-Esteem (SPPC), Body Dissatisfaction (CBIS), Eating Disorder Symptoms (ChEDE), Peer Relationships (BQ), Quality of Life (PedsQL), Behavioral & Emotional Problems (CBCL) | Multilevel analysis, correlations, and PCA explored relationships among depression, self-esteem, body dissatisfaction, ED symptoms, peer relationships, QoL, and behavioral/emotional problems. | Cross-sectional | 262 | 8–13 years old |
| Goddings et al. (2012) | Hormone levels, physical development, social emotions. | Pubertal Stage (Tanner), Menarcheal Status, Hormone Levels (Salivary Assays), Brain Activity (fMRI), Age | Multiple regression analyzed associations between pubertal development, hormone levels, and brain activity during social emotion processing. | Cross-sectional | 42 | (F) 11–13 years old |
| Goldschmidt et al. (2018) | Body image, interpersonal functioning, loss of control eating. | LOC Eating & Dieting (EAT-26), Body Dissatisfaction (Figure Rating Scale), Interpersonal Functioning (SSRS), Negative Emotionality (NEO-FFI), BMI, SES, Ethnicity, Age | Two mediation models evaluated indirect effects of body dissatisfaction (via dieting) and interpersonal functioning (via negative emotionality) on LOC eating at age 18; bootstrapped regressions (PROCESS, 10,000 resamples) controlled for BMI, SES, ethnicity, and age. | Longitudinal | 588 | (F) 14–18 years old |
| Grilo (2004) | Eating disorder, negative affect. | Dietary Restraint, Body Image Dissatisfaction, Suicidal Tendency, Personality Disturbance & Childhood Abuse (MACI Scales), Negative Affect (BDI), Self-Esteem (RSE) | Cluster analysis and independent sample t-tests examined associations between dietary restraint, negative affect, and psychological traits | Cross sectional – Cluster analyses | 137 | (F) 13–18 years old |

(Continues)



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 1** | (Continued)

| Study | Aim | Variables Studied (Measure) | Analysis | Design | Sample size | Age of participants |
|---|---|---|---|---|---|---|
| Harriger et al. (2014) | Body surveillance, body shame, pubertal development. | Eating Pathology (EAT-26, ChEAT), Self-Esteem (RSE), Body Surveillance & Shame (OBC–Youth), Pubertal Development (PDS), Training Hours (Self-report) | Path analysis and regression analysis examined relationships among eating pathology, body surveillance, body shame, self-esteem, pubertal development, and training hours | Cross-sectional | 100 | (F) 10–15 years old |
| Henderson et al. (2021) | Emotion regulation, anorexia nervosa | Emotion Regulation (CSBQ), Broad Anorexia Nervosa (MCS Composite), BMI (IOTF), Mental Health Difficulties (SDQ), Cognitive Development, Maternal Attachment (Custom Items), Prenatal & Perinatal Factors, SES (MCS-derived) | Growth curve models estimated emotion regulation intercept and slope; logistic regression (univariable/multivariable) evaluated associations with broad anorexia nervosa, adjusting for sociodemographic, cognitive, emotional, and perinatal confounders; sensitivity analyses included mixed models and multiple imputation. | Cohort study | 15,896 | 14 years old |
| Hermes and Keel (2003) | Puberty, ethnicity, thin ideal. | Body Dissatisfaction, Drive for Thinness & Bulimia (EDI Subscales), Thin Ideal Awareness & Internalization (SATAQ Subscales) | MANOVA explored associations with pubertal development and ethnicity. | Cross-sectional | 67 | (F) 9–11 years old |
| Hughes and Gullone (2011) | Emotion regulation, body image concerns, psychological symptoms. | Body Image Concerns (SIBID, BITI), Emotion Regulation (BICSI, REQ), Eating Disorder Symptoms (EDI-3), Depressive Symptoms (CDI), Anxiety Symptoms (RCMAS) | Hierarchical regression analyzed relationships among body image concerns, emotion regulation, and psychological symptoms. | Cross-sectional | 533 | 11–20 years old (Mean age = 15.6; SD = 2.5) |
| Hughes et al. (2018) | DHEA, adrenarche, body dissatisfaction, BMI, socioeconomic status. | Body Dissatisfaction (KEDS Silhouettes), Adrenal Hormones (DHEA, DHEA-S, Testosterone – Salivary Assays), BMI z-score (WHO), Age, SES (SEIFA Index) | GEE models assessed associations between hormone levels, BMI z-score, age, SES, and body dissatisfaction; separate models were run by sex; hormone levels treated as continuous and categorical predictors. | Cross-sectional | 1137 | 8–9 years old |

(Continues)



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library, APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 1** | (Continued)

| Study | Aim | Variables Studied (Measure) | Analysis | Design | Sample size | Age of participants |
|---|---|---|---|---|---|---|
| Jiang et al. (2021) | Pubertal development, depression. | Pubertal Stage (PDS), Depressive Symptoms (BDI), Negative Physical Self (NPSS), Interpersonal Stress (AISS), Academic Self-Concept | ANOVA, correlations, and SEM mediation models evaluated effects of pubertal stage (dummy coded) on NPSS, AISS, and academic self-concept; gender moderation tested for academic self-concept; low-loading subscales excluded. | Cross-sectional | 502 | 10–14 years old |
| Kaczmarek and Trambacz-Oleszak (2016) | Body image perceptions, menstrual cycle, weight status, socioeconomic status. | Actual Body Image (Figure Rating Scale), Ideal Body Image (FRS), Ideal-Self Discrepancy (FRS), Body Dissatisfaction (FRS) | One-way ANOVA and logistic regression investigated associations with weight status, age at menarche, and menstrual cycle phase. | Cross-sectional | 339 | (F) 12–18 years old |
| Klein (2008) | Body image satisfaction, ethnicity, peer popularity, positive affect. | Body Image Satisfaction (MBSRQ), Positive Affect (RADS, BASC, RSE), Peer Popularity (RCP, SEQ), Ethnicity | Hierarchical regression analyzed associations among body image satisfaction, positive affect, peer popularity, and ethnicity. | Cross-sectional | 339 | (M) 11–14 years old |
| Klump et al. (2003) | Heritability of eating pathology, pubertal status. | Eating Pathology (M-EDI), Pubertal Development (PDS) | One-way ANOVA and twin modeling explored links between pubertal status and eating pathology. | Cross-sectional | 1250 | (F) 10–15 years old |
| Klump et al. (2010) | Estradiol level, genetic influences, disordered eating, puberty. | Disordered Eating Attitudes & Behaviors (MEBS), Estradiol (Salivary Assay), Genetic Influences (Twin Design), Pubertal Status (PDS), BMI | Twin correlations compared MZ and DZ pairs across estradiol levels; moderation of genetic effects assessed via stratified correlations; MEBS subscales adjusted for age, BMI, and pubertal status; MZ versus DZ differences and effect sizes tested; tertile-based analysis conducted for high estradiol group. | Cross-sectional | 198 | (F) 10–18 years old |
| Knejzlíková et al. (2021) | Physiological responses, emotional responses, anorexia nervosa, emotional processing. | ED Symptoms (EDI: Drive for Thinness, Bulimia, Body Dissatisfaction), Emotional & Interoceptive Awareness (LEAS-C, BPQ), Emotional Experiences & | Group comparisons (AN vs. HC) used t-tests and correlations with SCR changes; PCA included psychological and physiological variables; mixed-design ANOVAs (2×4) analyzed group × condition | Experimental design | 60 | (F) Study group (Mean age = 14.9 1.31); Control group (Mean age = 15.7 1.09) |

(Continues)



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 1** | (Continued)

| Study | Aim | Variables Studied (Measure) | Analysis | Design | Sample size | Age of participants |
|---|---|---|---|---|---|---|
| | | Regulation (SEBQ, ERQ), Mirror Exposure Response (SAM), Physiological Arousal (SCL, SCR), BMI | effects; post hoc tested diagnosis × interoceptive awareness interactions. | | | |
| Knowles et al. (2009) | Pubertal maturation, physical self-perceptions, physical activity. | Physical Self-Perceptions (PSPP), Physical Activity (Self-report), Pubertal Development (PDS) | Longitudinal and hierarchical modeling assessed links among maturation, physical activity, and physical self-perception. | Longitudinal | 150 | (F) T1 (Mean age = 11.83; SD = 0.39), T2 (Mean age = 12.79; SD = 0.31) |
| Kolodziejczyk et al. (2015) | BMI, quality of life | BMI, HRQOL (PedsQL), Depression (CES-D), Body Dissatisfaction (EDI), Self-Esteem (RSE), Acculturation (SASH-Y), Environment (NEWS) | Linear regression evaluated associations with HRQOL, BMI, depression, body image, self-esteem, acculturation, and environment. | Two intervention trials — 12 months apart | 205 | 11–16 years old |
| Labbrozzi et al. (2013) | Physical self-perception, physical activity. | BMI, Pubertal Status (Tanner Scale), Physical Self-Perception (PSDQ), Physical Activity Enjoyment (PACES), Motivation (SIMS) | MANOVA and MANCOVA explored associations with physical self-perception, motivation, BMI, and pubertal status. | Cross-sectional | 134 | (F) 11–13 years old |
| Lavell et al. (2018) | Peer appearance-related victimization, body dysmorphic disorder symptoms. | Appearance Anxiety (AAI), Peer Appearance Victimization (POTS), Mindfulness (FFMQ), Emotion Regulation Difficulties (DERS) | Multiple regression investigated links among BDD symptoms, peer victimization, emotion regulation, and mindfulness. | Longitudinal | 367 | 10–14 years old at T1, 12–15 years old at T2 |
| Lee et al. (2016) | Body image, self-esteem, depression, precocious puberty. | Body Image (Modified Body Image Scale), Self-Esteem (RSES), Depression (CDI-K) | T-tests and Pearson correlations assessed associations among body image, self-esteem, and depression. | Cross-sectional | 336 | (F) 6–10 years old |
| Lewis-Smith et al. (2020) | BMI, body dissatisfaction, depressive symptoms, pubertal development, gender differences, emotional dysregulation. | BMI, Body dissatisfaction (BIPAS-C), Depressive symptoms (SMFQ), Pubertal development (Tanner stage, height z-score), Disordered eating (YRBSSQ), Covariates (maternal education, social | SEM path models evaluated direct and indirect effects of BMI, pubertal development, and depression on disordered eating via body dissatisfaction; analyses stratified by gender; FIML handled | Longitudinal cohort-based study | 8195 | 7 years old at T1, 11 years old at T2, 13 years old at T3 and 14 years old at T4 |

(Continues)



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library, APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 1** | (Continued)

| Study | Aim | Variables Studied (Measure) | Analysis | Design | Sample size | Age of participants |
|---|---|---|---|---|---|---|
| | | class, age at childbirth, maternal ED/depression history) | missing data; bootstrap estimated indirect effects. | | | |
| Lien et al. (2006) | Age of menarche, mental distress, BMI, weight perception. | Age of Menarche, Mental Distress (HSCL-10), Immigrant Status (self-report), Weight Discrepancy (Self-report), BMI, Socioeconomic and Behavioral Covariates | Linear and logistic regression analyzed associations among age of menarche, mental distress, BMI, and weight discrepancy; three-stage models controlled for socioeconomic and behavioral factors; interactions tested via two-way ANOVA; ethnic comparisons used survival analysis, ANOVA, and chi-square. | Cross-sectional | 3630 | (F) 15–16 years old |
| Lien et al. (2010) | Mental health differences, early and late maturing girls. | Mental Distress (HSCL-10), Age of Menarche, BMI, Weight & Body Satisfaction (Custom Items), Number of Sexual Partners (Custom Item), Sociodemographic Covariates | Logistic regression assessed links between age of menarche and mental distress at 15 and 18; stepwise adjustments included socio-demographic, behavioral, and body-related variables; chi-square tested group differences; longitudinal analysis examined persistence over time. | Longitudinal | 1860 | (F) 15 years old |
| Lo Coco et al. (2020) | Emotion regulation, smartphone, body esteem. | Problematic Smartphone Use (SPAI-I), Emotion Regulation Difficulties (DERS-SF), Body Esteem (Appearance, Weight, Attribution – BES), BMI, Age | Hierarchical regression evaluated SPAI-I and DERS-SF as predictors of body esteem; SPAI × DERS interaction tested for moderation, with significant effects for attribution in girls; age and BMI controlled. | Cross-sectional | 647 | Mean age = 14.15; SD = 1.43 |
| MacPhee and Andrews (2006) | Depression in early adolescence. | Depression (CES-D), Peer Relationships, Parental Nurturance & Rejection (Parenting Questionnaire), Self-Esteem & Body Image (SDQ), Pubertal Status (PDS), SES (Derived), Conduct Problems & Hyperactivity (Self-report) | Multiple and stepwise regression, along with intercorrelations, explored associations among depression, relationships, self-esteem, body image, pubertal status, SES, and behavioral issues. | Cross-sectional | 2014 | 12–13 years old |

(Continues)



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library, APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 1** | (Continued)

| Study | Aim | Variables Studied (Measure) | Analysis | Design | Sample size | Age of participants |
|---|---|---|---|---|---|---|
| Mahama et al. (2024) | Puberty experiences, body image appraisals, gender differences, country differences. | Pubertal Status (PDS), Body Image Appraisal (Self-Awareness Questionnaire), Pubertal Experiences (Open-ended), Sociodemographics (Age, Gender, SES, Religion, School Context) | Correlation, ANOVA, and moderation analyses examined links between pubertal status and body image appraisal; thematic analysis identified pubertal experience themes; inter-coder reliability assessed via Krippendorff's alpha. | Cross-sectional - Mixed-method | 86 | 13–14 years old |
| Martins et al. (2014) | Body shape concerns. | Body Shape Concerns (BSQ), Eating Attitudes (EAT-26), Age, SES (ABEP), Body Fat (%BF via Skinfolds), Sexual Maturation (Tanner Scale) | Poisson regression analysis examined associations among body shape concerns and sociodemographic, biological, and behavioral factors | Cross-sectional | 526 | (F) 11–14 years old |
| McCabe et al. (2001) | Negative and positive affect, weight preoccupation, muscle tone. | Body Image & Importance, Body Change Strategies, Food Supplement Use (BIBCI), Pubertal Development (PDS), Depression & Anxiety (DASS), Positive Affect (PANAS), BMI | SEM analyzed relationships among body image, affect, and body change strategies | Cross-sectional | 1185 | 11–16 years old at T1, 13–17 years old at T2 |
| McCabe et al. (2002) | Pubertal development, perceived media pressure, body dissatisfaction, weight preoccupation, muscle tone. | Body Change Strategies (BIBCI), Pubertal Development (PDS), Media Influence (SCIBI), Peer Popularity (SDQ) | Multiple regression analyzed predictors of body change strategies | Cross-sectional | 1185 | 12–15 years old |
| McCabe and Ricciardelli (2006) | Extreme weight loss, exercise dependence, drive for thinness, bulimia. | Exercise Dependence (EDS), Food Supplement Use (FSS), Drive for Thinness & Bulimia (EDI-2), Pubertal Timing (PDS), Depression (DASS), Positive Affect (PANAS), Body Dissatisfaction & Importance (BIBCI), BMI | Repeated measures ANOVA and multiple regression examined predictors of extreme weight change behaviors | Intensive Longitudinal | 847 | 12–16 years old |
| McCabe and Ricciardelli (2009) | Extreme weight loss, overweight. | Body Image & Importance (BIBCI), Pubertal Timing | MANOVA, hierarchical regression, and SEM examined predictors of | Intensive Longitudinal | 847 | 12–16 years old |

(Continues)



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library, APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 1** | (Continued)

| Study | Aim | Variables Studied (Measure) | Analysis | Design | Sample size | Age of participants |
|---|---|---|---|---|---|---|
| | | (Self-report), Negative Affect (PANAS), Food Supplement Use (FSS), Bulimic Symptoms (EDI-2), Exercise Dependence (EDS) | bulimic symptoms, supplement use, and exercise dependence | | | |
| McNicholas et al. (2012) | Pubertal status, pubertal timing, eating disorders. | Eating Attitudes (EAT-26), Eating Psychopathology (EDI-III), Pubertal Status (PDS), Perceived Pubertal Timing (Study-specific) | ANCOVA and ANOVA examined interaction effects of gender and pubertal status/timing on eating attitudes and psychopathology | Cross-sectional | 3031 | (F) Mean age = 14.75 (SD = 1.68) (M) Mean age =14.73 (SD = 1.58) |
| Mendle et al. (2020) | Rumination, negative urgency, puberty. | Pubertal Status & Timing (PDS), Rumination & Co-rumination (CRSQ, CRQ), Negative Urgency (UPPS-P), Rejection Sensitivity (CRSQ), Depressive Symptoms (CES-DC), Demographics | SEM tested whether transdiagnostic processes (rumination, urgency, co-rumination, rejection sensitivity) mediated the link between pubertal status/timing and depressive symptoms; indicators also analyzed in separate pathway models; age controlled. | Cross-sectional | 228 | 9–14 years old |
| Mercader-Yus et al. (2018) | Pubertal changes, precocious puberty, anxiety, self-esteem, body image, psychosocial factors. | Anxiety (STAIC), Self-Esteem (SDQ), Body Image (SDQ) | Mann–Whitney U tests compared anxiety, self-esteem, and body image between girls with and without precocious puberty. | Cross-sectional | 31 | (F) 8–12 years old |
| Mikhail et al. (2021) | Neighborhood disadvantage, disordered eating symptoms, pubertal development. | Disordered Eating (MTP-ED – Parent-report), Neighborhood Disadvantage (ADI), Pubertal Development (PDS – Parent-report), BMI, SES (Parental Education & Income) | MLMs assessed phenotypic links between ADI and disordered eating across puberty; univariate twin models tested G×E interactions with ADI and PDS moderating A, C, and E effects. | Population based - Cross-sectional | 2922 | (M) 8–17 years old |
| Mikhail et al. (2023) | Neighborhood disadvantage, disordered eating symptoms, pubertal development. | Disordered Eating (MTP-ED), Neighborhood Disadvantage (ADI), Family SES (Latent: Income & Education), Pubertal Development – Adrenarche | MLMs and ACE twin models evaluated phenotypic and G×E associations between disordered eating and pubertal development, moderated by SES and neighborhood disadvantage; BMI | Genotype X Environment interaction | 3484 | (F) 8–17 years old |

(Continues)



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library, APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 1** | (Continued)

| Study | Aim | Variables Studied (Measure) | Analysis | Design | Sample size | Age of participants |
|---|---|---|---|---|---|---|
| | | (PDS – Parent-report), BMI (CDC), Zygosity (Questionnaire + DNA) | included in sensitivity checks; zygosity used for classification. | | | |
| Mitchell et al. (2012) | Internalization of body image, pubertal status, self-esteem, physical self-concept, physical appearance comparisons, cardiorespiratory fitness. | Internalization (SATAQ-3), Body Satisfaction (BPSS-R), BMI (FITNESSGRAM®), Pubertal Status (PDS), Cardiorespiratory Fitness (PACER), Self-Esteem (SDQII-GSE), Physical Self-Concept (PSDQ), Appearance Comparison (PACS) | Hierarchical regression analyzed direct and moderating effects of internalization, body satisfaction, BMI, pubertal status, fitness, self-esteem, physical self-concept, and appearance comparison on body dissatisfaction. | Cross-sectional | 685 | (F) 11–14 years old |
| Morrissey et al. (2020) | Thin-ideal internalization, interoceptive deficits, perceived pressure for thinness, eating disorder symptoms. | Body Dissatisfaction (Body Parts Scale), Dieting (DRES), Thin-Ideal Internalization (SATAQ-3–IG), Interoceptive Deficits (EDI-IA), Bulimic Symptoms (EDI-B), Depressive Symptoms (CDI/BDI-II), BMI, Age | Moderated mediation models assessed direct and indirect effects of body dissatisfaction on bulimic symptoms via dieting; moderation by thin-ideal internalization, interoceptive deficits, and age group; PROCESS with bootstrapped CIs; BMI and depression controlled. | Cross-sectional | 353 | (F) 11–22 years old (M = 16.14, SD = 2.93) |
| Murdey et al. (2004) | Pubertal status, gender differences, body composition, sleep, sedentary behavior. | Sedentary Behavior & Sleep Time (MTS Diary), Body Composition (BMI, %BF via Skinfolds), Body Image (C-PSPP), Pubertal Status (Custom Items) | ANOVA and ANCOVA compared sedentary behavior across pubertal stages and age groups; partial correlations (controlling for sleep) assessed links between pubertal status, body composition, body image, and sedentary behavior. | Cross-sectional | 119 | 10–15 years old |
| Murdey et al. (2005) | Pubertal status, body composition, body image, sedentary behavior. | Sedentary Behavior & Sleep Time (MTS Diary), Body Composition (BMI, %BF via Skinfolds), Body Image (C-PSPP), Pubertal Status (Custom Items) | ANCOVA compared sedentary behavior changes across pubertal change groups (controlling for baseline and sleep); Spearman and biserial correlations examined links between pubertal status, body composition, and body image; hierarchical regression tested %BF as predictor. | Intensive Longitudinal | 84 | 10–14 years old |

(Continues)



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library, APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 1** | (Continued)

| Study | Aim | Variables Studied (Measure) | Analysis | Design | Sample size | Age of participants |
|---|---|---|---|---|---|---|
| Muris et al. (2005) | Body change strategies, eating problems | Body Change Strategies (BCI), Eating Problems (EDI-2), Biological Factors (Pubertal Status, BMI – Self-report), Psychological Factors (Self-Esteem, Anxiety, Depression – Self-report), Sociocultural Factors (Media, Peer, Parental Influences) | Multiple regression analysis explored associations between body change strategies/eating problems and biological, psychological, and sociocultural factors. | Cross-sectional | 307 | 12–16 years old |
| Newman et al. (2006) | Psychosocial risks, BMI, body image. | BMI, Body Image (BSQ-16B, EAT-26), Weight Control Behaviors (Add Health items), Psychological Adjustment (YSR), Self-Esteem (RSE), Peer Acceptance (Peer Acceptance Scale), Ethnic Identity (MEIM) | Correlations assessed links among BMI, body image, weight control behaviors, psychological adjustment, self-esteem, peer acceptance, and ethnic identity. | Longitudinal | 135 | 12–14 years old at T1, 14–16 years old at T2 |
| O'Connor et al. (2020) | Genetic influences, environmental influences, body weight concerns, body shape concerns, disordered eating, pubertal development. | Disordered Eating, Body Dissatisfaction, Weight Preoccupation, Binge Eating (MEBS), Weight/Shape Concerns (YEDE-Q), Pubertal Development (PDS), BMI, Zygosity (Questionnaire + DNA) | Twin moderation models evaluated A, C, and E influences on disordered eating and body concerns across pubertal development; moderation by PDS tested using linear and quadratic terms; age and BMI regressed out. | Population based - Cross-sectional | 926 | (F) 8–16 years old |
| Pedro et al. (2016) | BMI, disordered eating, body dissatisfaction, puberty. | Body Image Satisfaction (FID – Stunkard's Silhouettes), Eating Attitudes (EAT-26), Perceptions of Female Body Silhouettes (Descriptive Attributes), BMI, Pubertal Status (Tanner Scale) | ANOVA, Bonferroni test, Wilcoxon-Mann-Whitney test, Pearson's chi-squared test examined differences in BMI, eating attitudes, and body image across sex and pubertal stages | Cross-sectional | 385 | 11–15 years old |

(Continues)



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library, APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 1** | (Continued)

| Study | Aim | Variables Studied (Measure) | Analysis | Design | Sample size | Age of participants |
|---|---|---|---|---|---|---|
| Peng et al. (2022) | Body image dissatisfaction, aggressive behavior, pubertal stages. | Aggressive Behavior (BWAQ), Body Image Dissatisfaction (BSQ), Pubertal Development Stage (Tanner – Clinical) | Descriptive stats, t-tests, ANOVA, correlations, regression, and SEM examined direct and indirect links between body image dissatisfaction and aggression across pubertal stages; pubertal stage served as grouping variable. | Cross-sectional | 518 | 8–15 years old |
| Petruzzelli et al. (2022) | Psychiatric disorders, body emotional investment, emotion regulation, internalizing symptoms. | Internalizing Symptoms (SAFA), Emotion Dysregulation (DERS), Body Emotional Investment (BIS) | Mann–Whitney U tests compared GD and cisgender groups on SAFA, DERS, and BIS; Spearman correlations assessed DERS–BIS associations; logistic regression evaluated BIS and DERS as predictors of SAFA outcomes. | Group Comparison - Questionnaires | 60 | 12–18 years old |
| Rabbani et al. (2012) | Emotional problems, behavioral problems, pubertal stage, ethnicity. | Emotional, Conduct, Hyperactivity, Peer Problems & Prosocial Behavior (SDQ), Pubertal Status (Tanner Stages) | Chi-square and logistic regression analyzed links between pubertal development and emotional/behavioral problems, adjusting for sociodemographic factors. | Cross-sectional | 4576 | (F) 10–20 years old |
| Radziwiłłowicz et al. (2016) | Depression, acceptance of pubertal body changes, gender differences. | Depression Symptoms (BDI), Acceptance of Biological Changes (Original Feelings Towards the Body questionnaire), Pubertal Status (Tanner Scale), Socio-demographic Data | Pearson's correlations, ANOVA, and multiple regression explored relationships between depression, pubertal status, and acceptance of biological changes | Cross-sectional | 172 | 12–18 years old |
| Ren et al. (2018) | Emotional problems, behavioral problems, actual weight status, body image, puberty. | Emotional & Behavioral Problems (SDQ), Actual Weight Status (BMI), Self-Perceived Weight & Body Satisfaction (Custom Items), Pubertal Development (PDS – Chinese Version), Socioeconomic & Demographic Factors | Multivariate logistic regression assessed associations between emotional/behavioral problems and actual/perceived weight and body satisfaction; pubertal development and sociodemographics included as covariates. | Cross-sectional | 3841 | 11–16 years old |

(Continues)



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 1** | (Continued)

| Study | Aim | Variables Studied (Measure) | Analysis | Design | Sample size | Age of participants |
|---|---|---|---|---|---|---|
| Riboli et al. (2022) | Post-menarche body changes, pubertal development, body ideals. | Body Image (Qualitative Semi-structured Interviews), Pubertal Development (PDS), BMI, Menarche Status | IPA of interviews explored body image experiences post-menarche; descriptive stats summarized demographic and PDS data. | Qualitative - semi-structured interviews | 27 | (F) 11–14 years old |
| Shriver et al. (2020) | Childhood emotion regulation, weight status, negative body image, emotional eating. | Emotional Eating (TFEQ), Emotion Regulation (ERC), Weight Status (BMI Percentiles – CDC), Negative Body Image (BIEQ), SES (Hollingshead Index) | Multiple regression models evaluated emotion regulation, weight status, and negative body image as predictors of emotional eating; interaction effects tested; SES controlled. | Longitudinal - multi-method | 138 | 7 years old at T1, 15 years old at T2, and 17 years old at T3 |
| Sim and Zeman (2005) | Negative affect, emotion awareness, bulimic symptoms. | Body Dissatisfaction & Bulimic Symptoms (EDI), Negative Affect (DES-IV), Emotion Awareness (EESC), Coping with Negative Emotion (CEMS), BMI | Correlations, hierarchical regression, and Sobel tests assessed whether emotion regulation (negative affect, poor awareness, nonconstructive coping) mediated the link between body dissatisfaction and bulimic symptoms. | Cross-sectional | 234 | (F) 9–15 years old |
| Sim and Zeman (2006) | Emotional regulation, body dissatisfaction, eating disorders. | Body Dissatisfaction (EDI-BD), Disordered Eating (EAT-26), Negative Affect (DES-IV), Emotional Awareness (EESC), Coping with Negative Emotion (CEMS), BMI | Correlations, ANOVA, t-tests, and regression identified predictors of body dissatisfaction and disordered eating; emotion regulation profiles compared between high and low disordered eating groups. | Cross-sectional | 234 | (F) 9–15 years old |
| Sicilia et al. (2023) | Social physique anxiety, exercise motivation, earlier pubertal development. | Pubertal Development (PDS), Social Physique Anxiety (SPAS-7), Self-Determined Motivation (BREQ-3 – RAI), Exercise Behavior (Frequency, Stages of Change) | SEM with 3-point growth models analyzed pubertal timing and tempo in relation to SPA, motivation, and exercise; SPA and RAI served as mediators; age and BMI controlled. | Cross-sectional | 328 | (F) 9–12 years old |
| Sicilia et al. (2024) | Pubertal timing, pubertal tempo, body shame. | Pubertal Development – Timing & Tempo (PDS), Body Shame (Objectified Body Consciousness Scale), BMI, Sociodemographics (Age, Ethnicity, Height, Weight) | Growth curve models assessed links between pubertal timing/tempo and body shame over time; models stratified by gender; BMI controlled; sociodemographics used for sample description. | Longitudinal | 755 | 10–14 years at T1; 12–16 years at T3 |

(Continues)



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library, APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 1** | (Continued)

| Study | Aim | Variables Studied (Measure) | Analysis | Design | Sample size | Age of participants |
|---|---|---|---|---|---|---|
| Skrove et al. (2016) | Social competence, family cohesion, loneliness, emotional symptoms, perceived pubertal timing, BMI. | Emotional Symptoms (SCL-5), Pubertal Timing (PDS), BMI, Social Competence & Family Cohesion (READ), Loneliness (Single Item) | Linear regression evaluated associations between emotional symptoms, pubertal timing, and body mass; resilience factors tested as moderators. | Cross-sectional | 7639 | 13–18 years old |
| Tang et al. (2003) | Emotional responses to menarche. | Emotional Responses to Menarche (EEMS), Menstrual Attitudes (MAQ), Self-Esteem (GSE), Body Image (BIS), Gender-Role Attitudes (SRES), Preparedness for Menarche (Custom Items) | Correlations and hierarchical regression explored associations among emotional responses to menarche, menstrual attitudes, self-esteem, body image, gender-role attitudes, and preparedness. | Cross-sectional | 1573 | (F) 11–15 years old at T1 |
| Stice and Whitenton (2002) | Early menarche, BMI, perceived pressure to be thin, weight-related teasing, thin-ideal internalization, depression, social support, body dissatisfaction, menarche | Body Dissatisfaction (Body Parts Scale), BMI, Perceived Pressure to Be Thin (Sociocultural Pressure Scale), Weight-Related Teasing (Custom Items), Thin-Ideal Internalization (TREI), Social Support (NRI), Depressive Symptoms (K-SADS), Early Menarche (Self-report) | Multiple regression models examined relationships between body dissatisfaction and risk factors, controlling for initial body dissatisfaction | Longitudinal | 496 | 12–13 years old |
| Suka et al. (2005) | Dieting behavior, pubertal changes, maternal overweight. | Body Image, Body Satisfaction, Dieting Behavior (Custom Items), BMI, Pubertal Changes (Checklist), Maternal BMI | Path analysis explored directional links among BMI, body image, satisfaction, and dieting; chi-square tested group differences by BMI quartiles, pubertal status, and maternal BMI; Mantel-Haenszel and Cochran-Armitage tests assessed stratified and trend associations. | Cross-sectional | 5244 | (F) 11–16 years old |
| Van den Akker et al. (2021) | Personality, pubertal hormones, self-reported pubertal development. | Big Five Traits (BFI – Child), Pubertal Hormones (Hair Assays: DHEA, Testosterone, | Regression and LOSEM models tested links between Big Five traits and pubertal development (self- | Cross-sectional | 2640 | 8–18 years old |

(Continues)



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 1** | (Continued)

| Study | Aim | Variables Studied (Measure) | Analysis | Design | Sample size | Age of participants |
|---|---|---|---|---|---|---|
| | | Progesterone), Pubertal Development & Timing (PDS, Residualized PDS), Age, Gender | reported and hormonal); interaction effects with age and sex were analyzed; combined models evaluated unique contributions of timing and hormone levels. | | | |
| Verschueren et al. (2020) | BMI, eating disorder symptomatology, identity confusion, internalizing symptoms, effortful control, socio-cultural differences | BMI (Flemish Charts), Drive for Thinness, Body Dissatisfaction & Bulimic Symptoms (EDI-3), Identity Confusion (EPSI), Internalizing Symptoms (HADS), Effortful Control (ATQ) | LGC and LCGA modeled ED symptom and BMI trajectories; multi-group LGC compared changes in identity, internalizing symptoms, and effortful control across ED classes. | Longitudinal | 1115 | 12–18 years old at T1, 13–19 years old at T2, 14–20 years old at T3 |
| Vijayakumar et al. (2023) | Pubertal timing, corticolimbic connectivity, mental health problems. | Pubertal Timing (PDS), Corticolimbic Connectivity (rsfMRI), Mental Health Problems (CBCL), Family Environment (CRPBI, FES) | Mixed models and Bayesian mediation assessed links between pubertal timing and corticolimbic connectivity; indirect effects on mental health were examined, with moderation by family environment. | Longitudinal | 10,228 | 9–11 years old at T1 and 10.5–13.5 years old years old at T2 |
| Wang et al. (2022) | Body image dissatisfaction, body anthropometrical measurements, pubertal stages. | Body Image Dissatisfaction (BSQ-14), Anthropometrics (Height, Weight, SH, CC, WC, HC, SST, TST, AST, WHtR, HHR, WHR, CSHR, WSHR, SHHR, HSHR, BMI), Pubertal Stage (Tanner) | Correlations and regression evaluated associations between anthropometric indices and BID; analyses stratified by sex and pubertal stage. | Cross-sectional | 609 | 8–15 years old |
| Watzlawik (2008) | Pubertal development, body dissatisfaction. | Pubertal Development (PDS), Body Satisfaction (Single Item), Desired Body Changes (Custom Items) | Logistic regression analyzed links between pubertal development, body satisfaction, and desired body changes. | Longitudinal - Mixed Method | 214 | 10–12 years old |
| Xie et al. (2003) | Body weight perception, puberty, depression, anxiety, social support, peer isolation. | Actual Weight Status (Height & Weight), Self-Perceived Weight, Depressive & Anxiety Symptoms, Peer Isolation, Family Disharmony, Trouble | GLM compared psychological differences across weight perception groups, adjusting for age, parental education, and urban residence. | Longitudinal | 2179 | 11–15 years old |

(Continues)



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library, APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 1** | (Continued)

| Study | Aim | Variables Studied (Measure) | Analysis | Design | Sample size | Age of participants |
|---|---|---|---|---|---|---|
| | | with Teachers, School Connectedness, Social Support (Custom Items) | | | | |
| Zhang et al. (2020) | Pubertal development, body image dissatisfaction. | Body Image Dissatisfaction (TBIAQ), Pubertal Stage (Tanner, Testicular Volume, Menarche/Spermatorrhea), BMI, Age, Gender | T-tests, ANOVA, and regression (BMI-adjusted) assessed body-image dissatisfaction by sex and pubertal stage; analyses stratified by age and sex. | Cross-sectional | 574 | 8–18 years old |

Lewis-Smith et al. 2020; McCabe and Ricciardelli 2001; McCabe and Ricciardelli 2009). Maturity offset, for both boys and girls, is associated with the perception of being overweight (Gay et al. 2011; Gay et al. 2018), but the risk of engaging in weight-managing behaviors decreases every year after the maturity peak is reached.

Some studies found that early maturing girls are more likely to experience high levels of negative affect, body dissatisfaction, and eating disorder symptoms (Grilo 2004; Lewis-Smith et al. 2020; McCabe and Ricciardelli 2009; Sicilia et al. 2023). It seems to be a genetic influence that exerts effects during puberty: some studies describe an increased genetic influence on disordered eating symptoms during adrenarcheal development (Culbert et al. 2017; Mikhail et al. 2021, 2023). Findings of Klump et al. 2003 show that 17-year-old twins engage more often in eating disorder behaviors, followed by pubertal and then pre-pubertal twins. This pattern indicates that genetic influences on disordered eating symptoms are negligible before puberty but increase substantially during and after pubertal development, suggesting that pubertal maturation activates genetic risk for eating pathology (Klump et al. 2003). Mikhail et al. 2021, Mikhail et al. 2023 also found that at lower levels of environmental disadvantage, genetic influences on disordered eating are greater in post-pubertal than pre-pubertal girls and boys, aligning with the findings of Klump et al. 2003, 2010).

### *3.1.2 | Gender Differences*

The research on body dissatisfaction and related disorders has historically focused on girls, as social contextual factors that contribute to body image concerns may be felt more intensely by girls (Hargreaves and Tiggemann 2003; Stice and Bearman 2001; Thompson and Stice 2001). The changes in body size and shape, brought by puberty, may not align with the body ideal messaging conveyed by society. Of the 40 studies exploring puberty, body image, and related concerns, 17 focused exclusively on girls, while another 20 included boys, and an additional 3 focused on boys only, allowing a review of possible sex-specific effects. Historically, early maturation was considered beneficial for boys (Blyth 1981; Simmons et al. 1979; Crockett and Petersen 1987), however it is as much of a risk in boys as in girls, for example for the establishment of conduct disorders, such as aggression, delinquency (Bucci and Staff 2020; Vijayakumar et al. 2023), and high risk-taking behavior (Hoyt et al. 2020).

Pubertal timing is an important risk factor for both boys and girls, yet there are differences in the way boys and girls respond to pubertal development with consequent body dissatisfaction (Gay et al. 2018; Hughes et al. 2018; Lewis-Smith et al. 2020; Mahama et al. 2024; Muris et al. 2005; Sicilia et al. 2023; Jiang et al. 2021; Zhang et al. 2020). Early maturing girls are more frequently dissatisfied with their bodies than early maturing boys (Abbott and Barber 2010; Calzo et al. 2012; Lien et al. 2010; McCabe and Ricciardelli 2009; McNicholas et al. 2012; Zhang et al. 2020). However, while the mean level of body dissatisfaction for boys decreases with age, for girls it increases (Bearman et al. 2006; Cuesta-Zamora et al. 2018; Lee et al. 2016; McCabe et al. 2002; McNicholas et al. 2012). A longitudinal study conducted by Bucci and Staff (2020) found that girls have



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

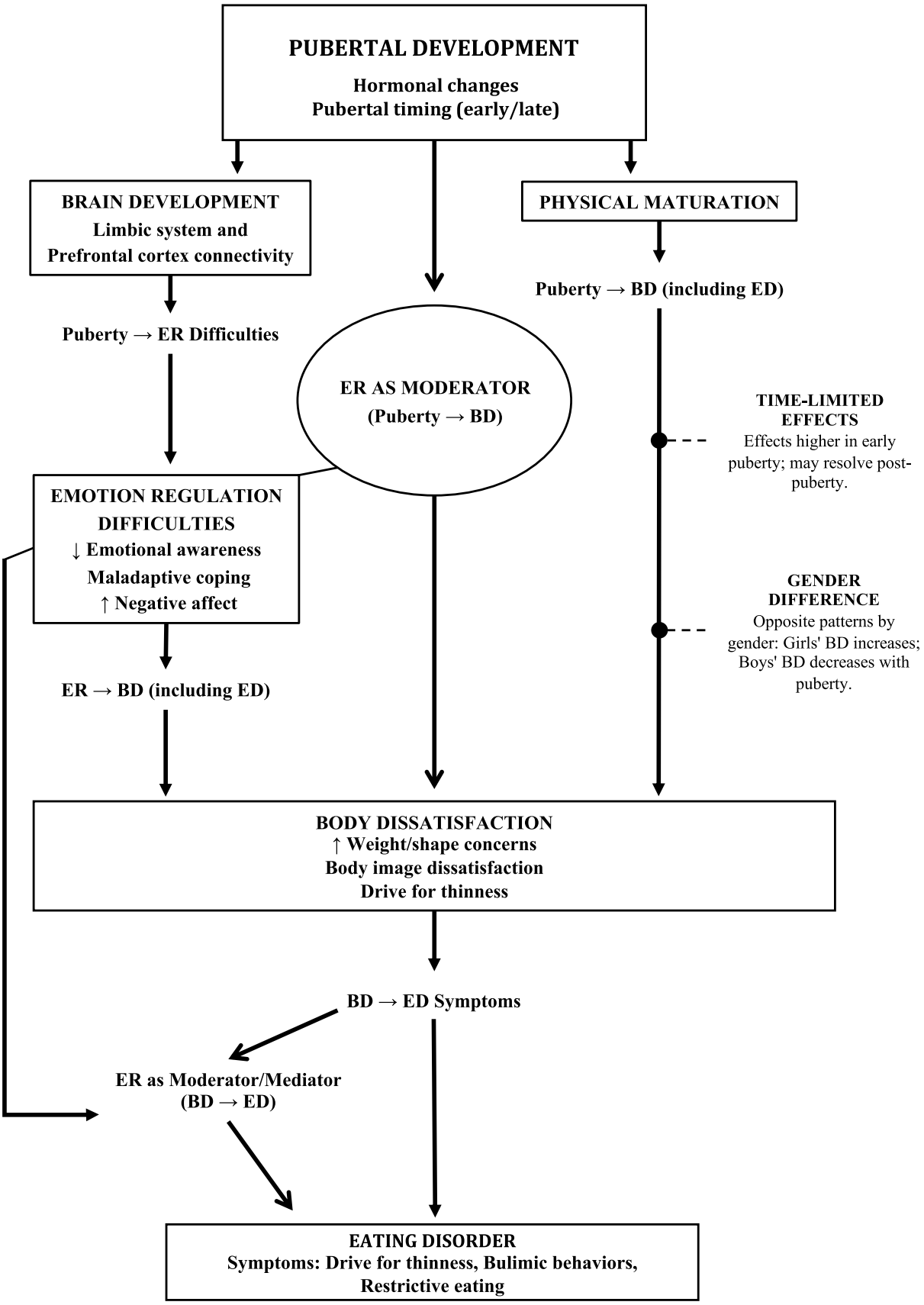


**FIGURE 2** | Conceptual framework: Pathways linking pubertal development, emotion regulation, and body dissatisfaction to eating disorder risk.*Note:* See Table 2 for additional details.



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

**TABLE 2** | Evidence summary for six psychological pathways: Sample sizes, percentages of significant findings, and evidence strength ($N = 103$ studies).

| Pathway | n | % Significant | Evidence Level | Key Findings |
|---|---|---|---|---|
| Pubertal Development → BD (including ED) | 40 | 65% (26/40)<br>80% (32/40 including partials) | Moderate-Strong | Early timing = ↑BD in girls; mixed in boys.<br>• Opposite gender trajectories (girls ↑BD, boys ↓BD) in 17 papers (74%).<br>• Time-limited effects in 7/40 studies (17.5%), with peak risk in early–mid puberty that weakens post-puberty. |
| Pubertal Development → ER Difficulties | 7 | 60%–70% (conditional on: small number of papers, gender, puberty indicator type, etc.) | Limited-Moderate | Effects conditional on gender/hormone type; neuroimaging evidence |
| ER → BD (including ED) | 35 | 83% (29/35)<br>97% (34/35 including partials) | Strong | Negative affect, poor awareness, maladaptive coping predict BD |
| ER as Moderator (Puberty → BD) | 21 | 48%–71%<br>(10/21 explicit<br>15/21 including suggestive) | Moderate | ER buffers or exacerbates puberty effects on BD |
| BD → ED Symptoms | 30 | 83% (25/30 conservative) 93%–100% (28–30/30 including partials) | Strong | Body dissatisfaction is robust predictor of eating pathology |
| ER as Moderator/ Mediator (BD → ED) | 20 | 50%–75%<br>(10–15/20) | Moderate | ER strategies (avoidance, suppression) moderate BD → ED link |

*Note:* This table quantifies the conceptual pathways illustrated in Figure 2. The n column indicates the number of studies explicitly measuring each pathway; percentages reflect the proportion showing statistically significant effects, with conservative estimates (direct findings only) and broader estimates (including partial and suggestive evidence). Strong evidence: ≥ 80% of studies found significant effects. Moderate evidence: 60%–79% of studies found significant effects. Limited evidence: 40%–59% of studies found significant effects. Weak evidence: < 40% of studies found significant effects.



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library, APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

higher levels of negative body image satisfaction compared to boys; the perception of their body becomes increasingly negative from age 11 to 14 for girls and the rate of this change is more rapid and marked compared to boys, whose perception remains stable (Bucci and Staff 2020).

Adolescent girls are more dissatisfied with their bodies, and in the long term, they show a lower level of accepting physical changes (Bucci and Staff 2020; Wang et al. 2022) and they are more likely to engage in weight-control behaviors (e.g., dieting) as a strategy to decrease weight (Bearman et al. 2006; McCabe et al. 2002; McNicholas et al. 2012; Radziwiłłowicz et al. 2016). Some studies report an influence of hormones to explain the different perception of body image between boys and girls. For example, Klump et al. (2010) in their study on twins reported that estradiol levels moderate the association of genetic influences and disordered eating attitudes (Klump et al. 2010) and girls that had higher estradiol levels were more likely to manifest body dissatisfaction, weight preoccupation and disordered eating behaviors (Klump et al. 2010). Progesterone has also been associated with body dissatisfaction. Forney et al. (2019) found that girls with the highest progesterone levels who also reported the greatest social pressure toward thin-ideal internalization showed the highest body dissatisfaction; however, no direct association between progesterone levels alone and body dissatisfaction was observed, suggesting that progesterone's effect operates primarily through its interaction with socio-cultural pressures rather than as an independent predictor. In research by Hughes et al. (2018), girls selected self and ideal body figures that were smaller than those selected by boys, who overall had lower levels of pubertal hormones. Girls also reported greater body dissatisfaction than boys and pre-pubescent peers. Higher pubertal hormone levels were associated with stronger body image concerns in both sexes. Girls who had significantly higher levels of dehydroepiandrosterone (DHEA) and testosterone compared to same-age peers scored higher in body dissatisfaction measurements (Hughes et al. 2018); both boys and girls with higher levels of testosterone compared to peers had significantly greater body dissatisfaction while for males only higher DHEA sulfate (DHEA-S) was weakly associated with greater body dissatisfaction (Hughes et al. 2018).

Cultural effects can also explain the discrepancy between boys' and girls' perception and acceptance of pubertal changes (Mahama et al. 2024). Puberty is significantly associated with body image and psychological well-being, with notable differences between genders and cultural contexts (Mahama et al. 2024; see "Cultural and Contextual Considerations" in the Discussion for further elaboration).

### 3.2 | Mechanisms Underlying the Association Between Puberty and Emotion Regulation

Of the 103 papers extracted, six studies investigated the relationship between pubertal development and emotion regulation capabilities, but by widening the focus on negative and positive affect regulation related to stress and depression, one additional study was included.

A study conducted by Goddings et al. (2012) supports the hypothesis that a difference exists between younger and older girls in emotional responses to social and basic emotion-processing stimuli presented during experimental tasks, and this could be a consequence of a biological maturational effect: more advanced age is associated with lower dorsomedial prefrontal cortex activity during social emotion processing (Goddings et al. 2012). Girls in late puberty display a wider combination of emotions in social scenarios than girls in early puberty. These differences were not significant if pubertal stage was considered (measured with Tanner stage and age of menarche), they were significantly negatively correlated only with age (Goddings et al. 2012). Strong significant associations were found by Goddings et al. (2012) specifically between hormone levels (testosterone, oestradiol and DHEA) and the activation of the left anterior temporal cortex (ATC) during social/basic emotion processing, therefore pubertal hormones appears to have an influence on the neurocognitive changes typical of adolescence more so than the changes wrought by pubertal development (Goddings et al. 2012). However, a study by Van den Akker et al. (2021) found a direct link: more advanced pubertal development was related to lower levels of neuroticism, but only for boys, while Rabbani et al. (2012) obtained similar results for girls. They discovered that a significant difference exists in emotional and behavioral problems if measured in different stages of Tanner's pubertal scale. In particular, the development of menstruation showed stronger association with higher emotional problems. This correlation was strong, while secondary sexual characteristics development (breast and pubic hair), in contrast, showed fewer or no correlations with emotional difficulties (Rabbani et al. 2012). Van den Akker et al. (2021) found a correlation between hormone levels and emotional dysregulation (neuroticism), but still only for boys and, overall, all these associations were small in magnitude. The associations between progesterone/neuroticism and testosterone/neuroticism were stronger in early adolescence, decreasing slowly to zero by age 14 (progesterone) and 16 (testosterone) (Van den Akker et al. 2021). Instead, the correlation between DHEA/neuroticism was near zero until age 14, with an increasing effect from then onwards Van den Akker et al. 2021).

A recent study by Vijayakumar et al. (2023) showed that more advanced pubertal stages are related to decreased corticolimbic connectivity, particularly between limbic regions (amygdala and hippocampus) and higher order neuronal networks involved in emotion regulation: that is, cingulo-opercular-network and frontoparietal. Earlier pubertal timing is associated with decreased functional connectivity between limbic structures and pre-frontal-cortex (Vijayakumar et al. 2023), and this leads to poorer emotion regulation. Also, Chaku and Hoyt (2019) found that early pubertal timing was significantly associated with worse self-control skills in girls, but not for boys. However, in this study sample the average pubertal onset was 12.5 for boys and 10.5 for girls; therefore, the chronological age may have played a role in the display of more refined self-regulation strategies for boys. The influence of age, as a proxy for psychosocial maturation, has been reported by others (Chiang et al. 2013; Sim and Zeman 2005) who found that pubertal development was not significantly related to emotion regulation skills.

In this review, we also included studies that explored the relationship between the capacity to regulate positive-negative



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

affect, and mental distress (anxiety and depression), as they may be indicative of emotion regulation capacities, and putting these competences in relation to maturational development, in addition to body dissatisfaction, eating behaviors and other relevant variables (Allen et al. 2006; Bearman and Stice 2008; Davison et al. 2007; Lee et al. 2016; Lien et al. 2006; Lien et al. 2010; McCabe et al. 2001; Mendle et al. 2020; Mercader-Yus et al. 2018; Skrove et al. 2016; So-Kum Tang et al. 2003). In general, later stages of puberty are associated with higher mental distress (Mendle et al. 2020) and the greater negative psychological consequences are related to early pubertal timing (Lee et al. 2016). There is an inverse linear relationship between puberty onset and mental distress: early onset of puberty is related to higher anxiety level and depression (Lee et al. 2016; Lien et al. 2006; Lien et al. 2010; Mendle et al. 2020; Mercader-Yus et al. 2018; Skrove et al. 2016; Vijayakumar et al. 2023). This association has been explored in girls (Davison et al. 2007; Lien et al. 2006; Lien et al. 2010; Mendle et al. 2020; Mercader-Yus et al. 2018), but it is still underexplored for boys. McCabe et al. (2001) discovered a significant effect of puberty on positive affect for males, while no significant association was found for the female participants, and this is in line with other studies: the emotional response of girls to the onset of puberty is generally correlated with negative affect (Lien et al. 2006; So-Kum Tang et al. 2003). In a study conducted by Lien et al. (2006), girls who were reporting early menarche obtained the highest score in mental distress scales, while those experiencing menarche at 14 years and above obtained the lowest scores (Lien et al. 2006). In another longitudinal study Lien et al. (2010) found that while age at menarche was significantly associated with mental distress at age 15, this association was no longer statistically significant at age 18 in the same cohort. However, this area of research remains mostly unexplored and contradictory (Allen et al. 2006; Chen and Jackson 2009; Sim and Zeman 2005).

### 3.3 | Mechanisms Underlying the Association Between Emotion Regulation and Body Dissatisfaction

Of the 103 papers extracted, eight studies directly investigated the relationship between body dissatisfaction and emotion regulation. Eating disorders were included in this review as they have a high correlation not only with body dissatisfaction and emotion regulation, but also with the regulation of negative affect. This reveals that the relationship between body dissatisfaction, emotion regulation, negative affect, and eating disorders is more thoroughly explored in the literature (20 studies) than the direct relationship between body dissatisfaction and emotion regulation.

Some papers in the review investigated a direct association between an elevation in negative affect and an increase in body dissatisfaction (Bearman et al. 2006; Chen and Jackson 2009; Czepczor-Bernat et al. 2020; Davis and Smith 2018; Dworschak et al. 2023; Farrow and Fox 2011; Klein 2008; Sim and Zeman 2006), while others investigated how low emotion regulation is positively correlated with body dissatisfaction (Abaatyo et al. 2024; Chen et al. 2021; Cuesta-Zamora et al. 2018; Fernandes et al. 2018; Lo Coco et al. 2020; Petruzzelli et al. 2022; Ren et al. 2018; Sim and Zeman 2005). A study by Lavell et al. (2018) found a negative association between emotion regulation skills and body dysmorphic disorder symptoms, which can be considered one of the most extreme forms of body dissatisfaction. In a study conducted by Sim and Zeman (2005) the results showed that girls who were dissatisfied with their bodies were also at risk for difficulties identifying their emotional states, and poor coping with negative emotion (Sim and Zeman 2005). In other studies, carried out by Cuesta-Zamora et al. (2018), Fernandes et al. (2018), and Lo Coco et al. (2020), emotion regulation difficulties emerged as a predictor of body dissatisfaction, negative appearance esteem and body shame; and this relationship continues across adolescence (Cuesta-Zamora et al. 2018).

Evidence is also available of the relationship between body dissatisfaction and depression, of which body dissatisfaction seems a strong predictor (Abaatyo et al. 2024; Allen et al. 2006; Bearman and Stice 2008; Lee et al. 2016; Newman et al. 2006; Radziwiłłowicz et al. 2016; Stice and Whitenton 2002; Xie et al. 2003). The severity of the depressive symptoms depends on different factors, for example: precocious puberty (Lee et al. 2016), capacity to accept physical changes (Hughes and Gullone 2011; Radziwiłłowicz et al. 2016), higher investment in the esthetic body (Abbott and Barber 2010) and body mass index (BMI) (Lewis-Smith et al. 2020; Stice and Whitenton 2002; Xie et al. 2003). Few studies found that obese and overweight adolescents experience higher levels of body dissatisfaction, anxiety, depressive symptoms, and have difficulties in regulating their emotions (Ghammem et al. 2024; Gibson et al. 2008; Ren et al. 2018; Stice and Whitenton 2002; Xie et al. 2003). More than the actual weight status, it is the self-perceived weight and the self-perceived body image that acts as a predictor of adolescent emotional and behavioral problems (Ghammem et al. 2024; Ren et al. 2018). Therefore, body image may have a mediating effect on the relationship between actual body weight and depressive psychological symptoms (Xie et al. 2003), and the relationships between body image concerns, eating disorders, and depressive symptoms may be moderated by the emotion regulation abilities; specifically, Hughes and Gullone (2011) found that the association between body image concerns and bulimic symptoms was stronger among adolescents who relied more on avoidance and internal emotion regulation dysfunctional strategies, and weaker among those who used positive rational acceptance and internal functional regulation strategies more frequently (Hughes and Gullone 2011).

#### *3.3.1 | Emotion Regulation and Eating Behaviors*

Body dissatisfaction and eating disorder symptoms frequently co-occur. From the papers examined, emotion regulation difficulties were negatively correlated with eating disorder symptoms (Barberis et al. 2018; Chen et al. 2021; Cuesta-Zamora et al. 2018; Dikmeer et al. 2023; Doba et al. 2018; Dworschak et al. 2023; Egbert et al. 2020; Erdem et al. 2023; Farrow and Fox 2011; Gall et al. 2016; Goldschmidt et al. 2018; Henderson et al. 2021; Hughes and Gullone 2011; Knejzlíková et al. 2021; Shriver et al. 2020; Sim and Zeman 2005; Verschueren et al. 2020), so difficulties in regulating negative emotions have been associated with eating disorder symptoms; however, the



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

cross-sectional nature of most studies precludes conclusions about temporal or causal ordering (Barberis et al. 2018; Chen and Jackson 2009; Cuesta-Zamora et al. 2018; Czepczor-Bernat et al. 2020; Doba et al. 2018; Dworschak et al. 2023; Goldschmidt et al. 2018; McCabe and Ricciardelli 2009; Shriver et al. 2020; Sim and Zeman 2005; Sim and Zeman 2006).

Body dissatisfaction was the most frequently reported predictor of eating disorder symptoms based on the number of studies reporting a significant association, but according to Hughes and Gullone (2011) emotion regulation may be a protective factor, and emotional regulation traits account for a statistically significant change in the variance in bulimic symptoms (Cuesta-Zamora et al. 2018; Hughes and Gullone 2011). Emotion regulation can be considered a moderator in the relationship between body image concerns and bulimic/depressive symptomatology (Hughes and Gullone 2011).

A study carried out by Shriver et al. (2020) partially confirmed this hypothesis, uncovering an association between emotion regulation and emotional eating. Poorer childhood emotion regulation predicted higher emotional eating in late adolescence, and this association was stronger among adolescents with more negative body image and among those with normal weight status (Shriver et al. 2020). An interesting result was revealed after follow-up analyses: normal weight adolescents, but not overweight adolescents, were less likely to engage in emotional eating as emotion regulation increased. This is a confirmation of what was sustained by Hughes and Gullone (2011) that emotion regulation can be considered a protective factor against eating disorders.

### 3.4 | Mechanisms Underlying the Association Between Body Dissatisfaction, Emotion Regulation and Puberty

We hypothesized that there is a relationship that interconnects body dissatisfaction, emotion regulation and puberty, and we have found indications of this relationship in the studies reviewed. Based on the data from the studies included, body dissatisfaction is interrelated with both pubertal changes and emotion regulation strategies. Some studies showed that adolescents with poorer emotion regulation and/or more negative affect tend to report lower body satisfaction and a higher likelihood of eating disorder symptoms. The strength of these associations appears to vary across developmental stages. (Barberis et al. 2018; Chen and Jackson 2009; Cuesta-Zamora et al. 2018; Doba et al. 2018; Gall et al. 2016; Farrow and Fox 2011; Hughes and Gullone 2011; Lien et al. 2006; Jiang et al. 2021; Sim and Zeman 2005; Sim and Zeman 2006).

Earlier timing of puberty has a significant impact on psychological well-being (weight and shape concerns, depression, negative affect, emotional dysregulation and eating disorder symptoms), and its consequences tend to persist into later adolescence (Davison et al. 2007; Doba et al. 2018; Lee et al. 2016; Lien et al. 2006; Jiang et al. 2021; Mercader-Yus et al. 2018; Ren et al. 2018). McCabe and Ricciardelli (2009) found that body dissatisfaction and pubertal timing predict negative affect; body dissatisfaction and negative affect are the most important predictors of bulimic symptoms for normal weight girls (McCabe and Ricciardelli 2009), while positive affect plays a protective role (Klein 2008; McCabe and Ricciardelli 2006; McCabe et al. 2001). In another study carried out by Ren et al. (2018), pubertal development stage had a significant effect on actual weight, body image and, indirectly, on emotional symptoms. Specifically, adolescents with early puberty were most likely to perceive themselves as being overweight, and girls who perceived themselves to be overweight reported more emotional symptoms than girls who perceived themselves as normal weight (Ren et al. 2018). Results were slightly different for boys, because not only those who perceived themselves as overweight, but those who perceived themselves as underweight as well, reported the highest levels of emotional and behavioral problems, including emotional symptoms and conduct problems (Ren et al. 2018).

As puberty progresses, body-related concerns may arise (Bearman et al. 2006; Chen and Jackson 2009), and positive body image predicts positive emotional responses to signs of pubertal development and fewer signs of depression (Radziwiłłowicz et al. 2016; So-Kum Tang et al. 2003), while elevation in negative affect predicts increased body dissatisfaction (Bearman et al. 2006; Chen and Jackson 2009). In a study by Sim and Zeman (2005), where 64% of girls reported being post-menarcheal, participants who were dissatisfied with their bodies had difficulties identifying their emotional states as well as poor coping strategies for negative emotions (Sim and Zeman 2005).

Doba et al. (2018) found that alexithymia and psychological distress mediate the relationship between self-differentiation and eating disorder symptoms, more strongly in middle than in early adolescence, as a consequence of the brain maturation (Doba et al. 2018). However, the connection among emotional difficulties, body dissatisfaction and eating disorder symptoms emerges in early adolescence as shown in a study conducted by Cuesta-Zamora et al. (2018). Emotional intelligence was a strong predictor of bulimic symptoms in the preadolescence group, even more than body dissatisfaction, and surprisingly for adolescent girls the only significant predictor of eating disorder symptoms was emotional intelligence, not even body concerns (Cuesta-Zamora et al. 2018).

## 4 | Discussion

This review contributes evidence to support the development of a theoretical framework that can be used to understand first, how puberty can determine the establishment of body image concerns for both boys and girls; second, how these concerns are related to emotion regulation capabilities; and third, how body dissatisfaction and positive or negative affect towards self and the body impact individual health and behavior, including engagement in eating disorder behaviors. Integrating evidence from 103 studies, three consistent trends are observed. First, early pubertal timing and pubertal hormones are associated with a developmental period characterized by increased vulnerability where adolescents experience heightened emotional dysregulation before the expected maturation of more developed emotion regulation capacities. Second, pubertal hormones and physical



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

changes are associated with body dissatisfaction, and this is reflected in distinct gender-differentiated mechanisms: while girls' dissatisfaction lasts longer, following internalization of a "thin ideal," boys' dissatisfaction tends to be transient and focused on muscularity, resolving as they reach peak physical maturity. Third, emotion regulation appears to function as a critical protective mechanism; adolescents with higher emotional intelligence may cope better with the psychological impact of pubertal changes, whereas those with less developed capacities to regulate and identify emotions are more prone to body dissatisfaction and related disorders (specifically eating disorders). However, only limited research has examined all three variables together. The majority of studies included in this review measured body dissatisfaction, emotion regulation, and puberty in pairs, but only a small proportion (21 studies) examined all as an integrated triad, leaving the specific mechanisms linking them under-explored.

### 4.1 | Pubertal Hormones, Brain Development and Emotion Regulation

The adolescent brain matures during puberty, and via this maturation adolescents acquire new abilities to identify and to regulate emotions; however, earlier pubertal timing seems to be associated with poorer emotion regulation (Chaku and Hoyt 2019; Mendle et al. 2020; Vijayakumar et al. 2023). Therefore, pubertal changes seem to have a greater negative psychological impact on emotion regulation abilities when puberty is more advanced at an earlier age (Vijayakumar et al. 2023). Pubertal changes are triggered by the action of hormones, and hormones exert effect on brain development and those areas that control executive functions and emotion regulation capacities (Sisk and Zehr 2005). Goddings et al. (2012) found strong significant associations between hormone levels (testosterone, oestradiol and DHEA) and the activation of the left anterior temporal cortex (ATC) during social/basic emotion processing, however, these differences were not significant if related to pubertal stages, they were significantly negatively correlated only with age (Goddings et al. 2012). Van den Akker et al. (2021) found that the correlation between hormone levels and emotional dysregulation (neuroticism) was stronger in early adolescence, while Rabbani et al. (2012) found a strong association between menarche and higher emotional problems, while secondary sexual characteristics development showed fewer or no correlation with emotional difficulties (Rabbani et al. 2012). There is not yet a definitive answer, but all these results may partially confirm what was hypothesized by Goddings et al. (2012): that hormone levels have a stronger influence on emotion regulation, more so than the evident bodily changes caused by pubertal development. Hormone levels may play a stronger role in influencing the neurocognitive areas that control emotion regulation capabilities (particularly connectivity between limbic structures—amygdala and hippocampus—and higher-order cognitive control networks including the cingulo-opercular and frontoparietal networks; Chaku and Hoyt 2019; Vijayakumar et al. 2023), and changes in hormones during puberty have a greater negative psychological impact when pubertal development is more advanced at an earlier age. A possible explanation is that an accelerated biological development requires a parallel accelerated maturation of emotion regulation systems in response to external stressors (Vijayakumar et al. 2023), but this is not possible for those adolescents who experience earlier pubertal timing. Longitudinal data (Lien et al. 2010) showed that early menarche is strongly associated with mental distress at age 15, but this association disappears by age 18 (Lien et al. 2010), suggesting that after the development peak is reached, and with it a more refined emotion regulation, the negative psychological impact of early pubertal development resolves as cognitive-emotional regulation systems mature. Brain cognitive control systems mature gradually during adolescence, progressively improving self-regulation capacities (Doba et al. 2018). The capacity to identify and regulate emotions develops differently across early versus middle adolescence, suggesting that early pubertal onset occurs before these cognitive control systems are sufficiently developed (Doba et al. 2018).

### 4.2 | Pubertal Hormones, Physical Changes and Body Dissatisfaction

Beyond their effects on brain development, pubertal hormones also influence the body, affecting the onset of body image dissatisfaction (and related disorders). Some studies found that hormones can influence the perception of body image. Girls who reported higher estradiol levels were more likely to manifest body dissatisfaction, weight preoccupation and disordered eating behaviors (Klump et al. 2010). Progesterone has also been associated with body dissatisfaction (Forney et al. 2019). A direct association between progesterone and body image concerns was not observed, but girls with highest progesterone levels showed greatest social pressures on internalization of the thin ideal (Forney et al. 2019). One hypothesis is that progesterone may influence girls' drives towards the norms perceived as important for social acceptance, and for the same reason they feel more pressures on internalization of the thin ideal (Forney et al. 2019), which in turns make them more vulnerable to body dissatisfaction.

Pubertal body changes can trigger body image concerns (Lewis-Smith et al. 2020; Riboli et al. 2022) without the direct action of hormones. A more sexually mature body may pose a higher psychological stress for adolescents, specifically girls, at least compared to pre-pubescent girls (Lewis-Smith et al. 2020; Riboli et al. 2022; Zhang et al. 2020). This may be the result of the perceived discrepancy between their changing bodies and the body ideal imposed by society (Dantas et al. 2017; McCabe et al. 2002). Older post-pubescent girls may be less satisfied with their body shape due to the cultural pressure to decrease their weight and reduce their overall silhouette (Dantas et al. 2017; Lewis-Smith et al. 2020; McCabe et al. 2002; Xie et al. 2003). Boys, on the contrary, are more likely to describe themselves as underweight (Xie et al. 2003) and show the tendency to exercise more to increase weight and muscle tone (Gay et al. 2018; Xie et al. 2003), especially during earlier adolescence. It is possible that in this way boys are trying to meet the culturally imposed body ideal for males (McCabe et al. 2002) and post-pubescent boys are nearer to this goal; after the maturational peak is reached, their concerns abate (Bucci and Staff 2020; Zhang et al. 2020; Wang et al. 2022).



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

### 4.3 | The Protective Role of Emotion Regulation

Given that pubertal hormones determine poorer emotion regulation, whilst pubertal hormones and physical changes increase body dissatisfaction—which can lead to the development of eating disorders— this review points in the direction that enhanced emotion regulation may be a protective factor. According to Hughes and Gullone (2011) emotional intelligence traits account for a statistically significant change in the variance in bulimic symptoms (Cuesta-Zamora et al. 2018; Hughes and Gullone 2011). Individuals with lower emotional intelligence are more vulnerable to negative emotions; they find more difficulties in regulating and differentiating them from physical states, so they adopt compensating behaviors, such as disordered eating behaviors (Barberis et al. 2018; Dworschak et al. 2023). Another hypothesis is that difficulties identifying the bodily manifestations of emotions may have a negative effect on body satisfaction experience, and this can explain why low emotion regulation is positively correlated with body dissatisfaction (Abaatyo et al. 2024; Chen et al. 2021; Cuesta-Zamora et al. 2018; Fernandes et al. 2018; Lo Coco et al. 2020; Petruzzelli et al. 2022; Ren et al. 2018; Sim and Zeman 2005). Notably, emotional abilities influence eating disorder symptoms at different developmental stages (Cuesta-Zamora et al. 2018; Doba et al. 2018), suggesting that the pathway from pubertal changes to eating pathology may operate partly through emotion regulation capacities.

This review elucidated how emotions (including positive and negative affect), body image, pubertal changes and hormones are interrelated, an aspect that has yet to be explored, particularly not through systematic examination of their interconnections. The interplay between these three mechanisms—hormonal effects on neurodevelopment, physical changes triggering appearance concerns, and emotion regulation capacities moderating outcomes—creates both vulnerability and opportunity during pubertal transitions.

### 4.4 | Implications for Population Health and Contribution

This systematic review reveals the significant relationship between emotion regulation capabilities and pubertal body satisfaction. Emotion regulation is a skill that children acquire from parents and, as observed from this review, low emotion regulation may lead to lower acceptance of the signs of puberty and lower body satisfaction. However, emotional regulation is a skill that can be developed in all types of educational settings. Therefore, the knowledge acquired through this review can be used to inform intervention programs in schools for students; additionally, parents and school staff could also benefit from such interventions. For example, emotional literacy workshops and body image support groups could be implemented, or school-based health promotion programs could be expanded to include emotion regulation training alongside traditional health education.

The findings suggest that poorer emotion regulation can lead to negative feelings toward the body. Consequently, these types of interventions could help children and adolescents to approach puberty well prepared and supported. In addition, public health agencies could use this information to design screening programs that identify adolescents who may benefit from additional support during pubertal transitions. These programs may help to prevent the mental and physical distress children and adolescents may experience as they progress through pubertal development, supporting them in developing a better understanding of the bodily and emotional components of this transition. Moreover, and most importantly, such initiatives could potentially reduce the incidence of eating disorders and other mental health issues associated with body dissatisfaction, thereby improving overall population health outcomes.

### 4.5 | Cultural and Contextual Considerations

While a comprehensive cross-cultural analysis was beyond the scope of this review, we recognize the value of acknowledging cultural moderation. The majority of research included in this review has been conducted in Western contexts (approx. 77% of included studies), but studies from diverse cultural settings suggest that the role of pubertal changes, the "thin ideal," and body norms are not universal. For instance, Mahama et al. (2024) found country differences in pubertal status and body-image appraisals between Ghanaian and Kenyan adolescents, with a gender × puberty interaction observed in the Kenyan subsample only, highlighting how cultural context shapes acceptances of pubertal maturation. Similarly, in the United States, Hermes and Keel (2003) found that the internalization of the thin ideal was higher in non-Caucasian girls and in case of more advanced pubertal development; however, ethnicity did not moderate the puberty–internalization link, and de Guzman and Nishina (2014) observed ethnic differences in girls' levels and trajectories of body dissatisfaction (e.g., Asian American girls showing higher and increasing dissatisfaction). In East Asian contexts, So-Kum Tang et al. (2003) found that Chinese adolescent girls' emotional responses to menarche were closely tied to culturally specific menstrual attitudes and preparedness, reflecting the contextual meanings attributed to this transition, while other studies from Uganda (Abaatyo et al. 2024), China (Jiang et al. 2021), South Africa (Pedro et al. 2016) and South Korea (Lee et al. 2016) suggest the same: that while body dissatisfaction is a global phenomenon, the specific emotional pathways may differ based on cultural background. These findings imply that a universally applicable model of adolescent development must account for how local cultural norms dictate the "meaning" of pubertal changes and how this reflects on the emotional experience and stress that adolescents report while facing these changes.

### 4.6 | Limitations

The predominance of cross-sectional studies in the examined literature ($n = 67$, 65.0% of included studies) may be considered a limitation. Although cross-sectional studies are important for understanding proximal correlates, they cannot establish temporal precedence or causal directionality among pubertal development, emotion regulation, and body dissatisfaction. Future prospective research should focus on longitudinal studies ($n = 22$ longitudinal, $n = 6$ intensive longitudinal), which comprised only 27.2%, $n = 28$, of the reviewed evidence



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

to achieve a better comprehension of how body dissatisfaction, emotion regulation and puberty are related, how this relationship evolves with time and if it is maintained into adulthood.

Substantial heterogeneity in the operationalization of key constructs limited our ability to conduct quantitative meta-analysis. Studies varied widely in how emotion regulation was measured (e.g., direct emotion regulation strategies such as suppression and reappraisal vs. proxy measures such as negative affect, mental distress, or psychological symptoms), how body dissatisfaction was assessed (e.g., weight/shape concerns, body image satisfaction, drive for thinness), and how pubertal development was operationalized (e.g., self-reported Tanner stages, age at menarche, hormonal assays, pubertal timing categories). This measurement heterogeneity precluded meaningful pooling of effect sizes and may have contributed to inconsistent findings across studies. The absence of a meta-analysis represents a further constraint on the conclusions that can be drawn, as it precludes the quantification of effect sizes and the statistical comparison of findings across studies; future reviews in this area should prioritize conditions that allow for quantitative synthesis.

Restricting inclusion to peer-reviewed publications may have introduced publication bias, as studies reporting null findings are less likely to be published. Formal publication bias assessment was not conducted because no quantitative meta-analysis was performed. Although a formal assessment of publication bias (e.g., funnel plot analysis or Egger's test) was not conducted, this decision was consistent with the absence of a quantitative meta-analysis, which is the standard context in which such tools are applied; readers should nonetheless interpret the pattern of findings with this caveat in mind.

Another limitation is the decision not to include gray literature and to include papers on eating disorders, mental distress and regulation of positive and negative affect. For future systematic reviews, more restrictive inclusion criteria focusing exclusively on direct measures of emotion regulation and body dissatisfaction—rather than related constructs such as negative affect, mental distress, or eating disorder symptoms—would strengthen construct validity, although this would substantially reduce the available evidence base. Most of the studies examined used quantitative measures, but the sample sizes were very different, ranging from 27 to 16,882 participants (median = 521), and this may have skewed some results or contributed to heterogeneity in effect size estimates.

The literature showed substantial gender imbalance in study design. Of the 103 included studies, female-only samples ($n = 34$, 33.0%) outnumbered male-only samples ($n = 5$, 4.9%) by nearly 7:1, with the remaining studies being mixed-gender ($n = 64$, 62.1%). This gender gap highlights the need for male-focused or gender-comparative research, especially given evidence of opposite gender trajectories in the puberty/body dissatisfaction pathway (girls' body dissatisfaction increases while boys' body dissatisfaction decreases with puberty).

Finally, although this review included studies from Asia, Africa, and South America, approximately only 23% of included studies were conducted in non-Western contexts, limiting generalizability. Future research should investigate whether pubertal changes, body image satisfaction and emotion regulation mechanisms operate differently across diverse cultural contexts where appearance ideals, pubertal timing norms, and emotional expression vary.

## 5 | Conclusions

This systematic review underscores the critical need for a developmentally informed approach to understanding body image concerns during puberty. Our findings highlight the potential of interventions targeting emotion regulation skills to improve adolescent mental health outcomes. This knowledge can also be used to structure future research projects, especially on pubertal development and emotion regulation capabilities, since we identified a paucity of studies in this area. Future studies should consider longitudinal designs to better understand the temporal relationships between body dissatisfaction, emotion regulation, and pubertal development, and how these factors interact to influence population health outcomes. We hope that this systematic review will stimulate further research to finally shed light on an under-investigated key stage of human development.

### Author Contributions

Isabella Muscolino conceived the study and drafted the manuscript. Isabella Muscolino, Samantha Dockray, and Eleonora Tomei conducted the literature search, screening, and data extraction. Samantha Dockray and Maria Dempsey supervised the work and critically revised the manuscript. All authors approved the final version of the manuscript.

### Funding

The authors have nothing to report.

### Ethics Statement

Not required for this systematic review. All included studies reported obtaining approval from an institutional ethics committee and informed consent from participants, in line with recognized standards such as the Declaration of Helsinki.

### Conflicts of Interest

The authors declare no conflicts of interest.

### References

Abaatyo, J., G. Twakiire, A. Favina, G. Munaru, and G. Z. Rukundo. 2024. "Body Image, Eating Distress and Emotional-Behavioral Difficulties Among Adolescents in Mbarara, Southwestern Uganda." *BMC Public Health* 24: 1493. https://doi.org/10.1186/s12889-024-18973-1.

Abbott, B. D., and B. L. Barber. 2010. "Embodied Image: Gender Differences in Functional and Aesthetic Body Image Among Australian Adolescents." *Body Image* 7, no. 1: 22–31. https://doi.org/10.1016/j.bodyim.2009.10.004.

Allen, K. L., S. M. Byrne, E. M. Blair, and E. A. Davis. 2006. "Why Do Some Overweight Children Experience Psychological Problems? The Role of Weight and Shape Concern." *International Journal of Pediatric Obesity* 1, no. 4: 239–247. https://doi.org/10.1080/17477160600913552.

Altıntaş, A., F. H. Aşçı, A. Kin-İşler, et al. 2014. "The Role of Physical Activity, Body Mass Index and Maturity Status in Body-Related Perceptions and Self-Esteem of Adolescents." *Annals of Human Biology* 41, no. 5: 395–402. https://doi.org/10.3109/03014460.2013.857721.



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

Attie, I., and J. Brooks-Gunn. 1989. "Development of Eating Problems in Adolescent Girls: A Longitudinal Study." *Developmental Psychology* 25, no. 1: 70–79. https://doi.org/10.1037/0012-1649.25.1.70.

Barberis, N., S. Costa, F. Cuzzocrea, and M. C. Quattropani. 2018. "Trait EI in the Relationship Between Needs Fulfilment and Symptoms and Attitudes Associated With EDS." *Mental Health & Prevention* 10: 50–55. https://doi.org/10.1016/j.mhp.2018.01.003.

Bearman, S. K., and E. Stice. 2008. "Testing a Gender Additive Model: The Role of Body Image in Adolescent Depression." *Journal of Abnormal Child Psychology* 36, no. 8: 1251–1263. https://doi.org/10.1007/s10802-008-9248-2.

Bearman, S. K., K. Presnell, E. Martinez, and E. Stice. 2006. "The Skinny on Body Dissatisfaction: A Longitudinal Study of Adolescent Girls and Boys." *Journal of Youth and Adolescence* 35, no. 2: 217–229. https://doi.org/10.1007/s10964-005-9010-9.

Berger, U., K. Weitkamp, and B. Strauss. 2009. "Weight Limits, Estimations of Future BMI, Subjective Pubertal Timing and Physical Appearance Comparisons Among Adolescent Girls as Precursors of Disturbed Eating Behaviour in a Community Sample." *European Eating Disorders Review* 17, no. 2: 128–136. https://doi.org/10.1002/erv.898.

Blakemore, S. J., and S. Choudhury. 2006. "Brain Development During Puberty: State of the Science." *Developmental Science* 9, no. 1: 11–14. https://doi.org/10.1111/j.1467-7687.2005.00456.x.

Blyth, D. A. 1981. "The Effects of Physical Development on Self-Image and Satisfaction with Body-Image for Early Adolescent Males." *Research in Community & Mental Health*.

Bucchianeri, M. M., A. J. Arikian, P. J. Hannan, M. E. Eisenberg, and D. Neumark-Sztainer. 2013. "Body Dissatisfaction From Adolescence to Young Adulthood: Findings From a 10-Year Longitudinal Study." *Body image* 10, no. 1: 1–7. https://doi.org/10.1016/j.bodyim.2012.09.001.

Bucci, R., and J. Staff. 2020. "Pubertal Timing and Adolescent Delinquency." *Criminology* 58, no. 3: 537–567. https://doi.org/10.1111/1745-9125.12246.

Calzo, J. P., K. R. Sonneville, J. Haines, E. A. Blood, A. E. Field, and S. B. Austin. 2012. "The Development of Associations Among Body Mass Index, Body Dissatisfaction, and Weight and Shape Concern in Adolescent Boys and Girls." *Journal of Adolescent Health* 51, no. 5: 517–523. https://doi.org/10.1016/j.jadohealth.2012.02.021.

Cash, T. F. 2011. "Cognitive-Behavioral Perspectives on Body Image." In *Body Image: A Handbook of Science, Practice, and Prevention*, edited by In. T. F. Cash and L. Smolak, (2nd ed., 39–47. Guilford Press).

Cash, T. F., and L. Smolak. 2011. "Understanding Body Images: Historical and Contemporary Perspectives." In *Body Image: A Handbook of Science, Practice, and Prevention*, edited by T. F. Cash and L. Smolak, (2nd ed., 3–12. Guilford Press).

Chaku, N., and L. T. Hoyt. 2019. "Developmental Trajectories of Executive Functioning and Puberty in Boys and Girls." *Journal of Youth and Adolescence* 48: 1365–1378. https://doi.org/10.1007/s10964-019-01021-2.

Chen, G., J. He, B. Zhang, and X. Fan. 2021. "Revisiting the Relationship Between Body Dissatisfaction and Eating Disorder Symptoms in Chinese Adolescents: The Mediating Roles of Regulatory Emotional Self-Efficacy and Depression Symptoms." *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity* 26: 239–247. https://doi.org/10.1007/s40519-020-00848-0.

Chen, H., and T. Jackson. 2009. "Predictors of Changes in Weight Esteem Among Mainland Chinese Adolescents: A Longitudinal Analysis." *Developmental Psychology* 45, no. 6: 1618–1629. https://doi.org/10.1037/a0016820.

Chiang, P. H., L. Y. Huang, Y. T. Lo, M. S. Lee, and M. L. Wahlqvist. 2013. "Bidirectionality and Gender Differences in Emotional Disturbance Associations With Obesity Among Taiwanese Schoolchildren." *Research in Developmental Disabilities* 34, no. 10: 3504–3516. https://doi.org/10.1016/j.ridd.2013.06.023.

Cousineau, T. M., D. L. Franko, M. Trant, et al. 2010. "Teaching Adolescents About Changing Bodies: Randomized Controlled Trial of an Internet Puberty Education and Body Dissatisfaction Prevention Program." *Body Image* 7, no. 4: 296–300. https://doi.org/10.1016/j.bodyim.2010.06.003.

Crockett, L., and A. Petersen. 1987. "Pubertal Status and Psychological Development: Findings From Early Adolescence Studies." In *Biological-Psychosocial Interactions in Early Adolescence*, edited by In. R. M. Lerner and T. T. Foch, 173–188. Erlbaum.

Cuesta-Zamora, C., I. González-Martí, and L. M. García-López. 2018. "The Role of Trait Emotional Intelligence in Body Dissatisfaction and Eating Disorder Symptoms in Preadolescents and Adolescents." *Personality and Individual Differences* 126: 1–6. https://doi.org/10.1016/j.paid.2017.12.021.

Culbert, K. M., S. A. Burt, and K. L. Klump. 2017. "Expanding the Developmental Boundaries of Etiologic Effects: The Role of Adrenarche in Genetic Influences on Disordered Eating in Males." *Journal of Abnormal Psychology* 126, no. 5: 593–606. https://doi.org/10.1037/abn0000226.

Culbert, K. M., S. A. Burt, M. McGue, W. G. Iacono, and K. L. Klump. 2009. "Puberty and the Genetic Diathesis of Disordered Eating Attitudes and Behaviors." *Journal of Abnormal Psychology* 118, no. 4: 788–796. https://doi.org/10.1037/a0017207.

Czepczor-Bernat, K., A. Brytek-Matera, and P. Matusik. 2020. "The Homeostatic Theory of Obesity: An Empirical Verification of the Circle of Discontent With an Assessment of Its Relationship to Restrained and Uncontrolled Eating Among Children and Adolescents." *International Journal of Environmental Research and Public Health* 17, no. 17: 6028. https://doi.org/10.3390/ijerph17176028.

Dantas, R. P. N. C., T. B. S. Simões, P. G. D. M. Santos, P. M. S. Dantas, and B. G. D. A. T. Cabral. 2017. "Satisfaction of Body Image in Adolescents With Different Maturity Stages." *Journal of Human Growth and Development* 27, no. 3: 300–306. https://doi.org/10.7322/jhgd.127574.

Davis, H. A., and G. T. Smith. 2018. "An Integrative Model of Risk for High School Disordered Eating." *Journal of Abnormal Psychology* 127, no. 6: 559–570. https://doi.org/10.1037/abn0000365.

Davison, K. K., J. L. Werder, S. G. Trost, B. L. Baker, and L. L. Birch. 2007. "Why Are Early Maturing Girls Less Active? Links Between Pubertal Development, Psychological Well-Being, and Physical Activity Among Girls at Ages 11 and 13." *Social Science & Medicine (1982)* 64, no. 12: 2391–2404. https://doi.org/10.1016/j.socscimed.2007.02.033.

de Guzman, N. S., and A. Nishina. 2014. "A Longitudinal Study of Body Dissatisfaction and Pubertal Timing in an Ethnically Diverse Adolescent Sample." *Body Image* 11, no. 1: 68–71. https://doi.org/10.1016/j.bodyim.2013.11.001.

Dikmeer, N., B. Ersöz Alan, and D. Foto Özdemir. 2024. "The Role of Mindfulness on the Psychological Aspects of Anorexia Nervosa." *Clinical Child Psychology and Psychiatry* 29, no. 1: 15–29. https://doi.org/10.1177/13591045231190675.

Dion, J., M. E. Blackburn, J. Auclair, et al. 2015. "Development and Aetiology of Body Dissatisfaction in Adolescent Boys and Girls." *International Journal of Adolescence and Youth* 20, no. 2: 151–166. https://doi.org/10.1080/02673843.2014.985320.

Doba, K., G. Berna, E. Constant, and J. L. Nandrino. 2018. "Self-Differentiation and Eating Disorders in Early and Middle Adolescence: A Cross-Sectional Path Analysis." *Eating Behaviors* 29: 75–82. https://doi.org/10.1016/j.eatbeh.2018.03.003.

Dockray, S., and N. Messerli-Burgy. 2022. "Puberty and Mental Health: A Developmental Perspective." *Current Opinion in Psychology* 44: 101293.

Dornbusch, S. M., J. M. Carlsmith, S. J. Bushwall, et al. 1984. "Single Parents, Extended Families, and the Control of Adolescents." *Child Development* 55, no. 5: 1352–1364. https://doi.org/10.2307/1129723.



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

Dworschak, C., R. G. Polack, J. Winschel, J. Joormann, and H. Kober. 2023. "Emotion Regulation and Disordered Eating Behaviour in Youths: Two Daily-Diary Studies." *European Eating Disorders Review* 31, no. 5: 655–669. https://doi.org/10.1002/erv.2993.

Egbert, A. H., A. Haedt-Matt, K. E. Smith, K. Culbert, S. Engel, and A. B. Goldschmidt. 2020. "Momentary Associations Between Positive Affect Dimensions and Dysregulated Eating During Puberty in a Diverse Sample of Youth With Overweight/Obesity." *International Journal of Eating Disorders* 53, no. 10: 1667–1677. https://doi.org/10.1002/eat.23342.

Erdem, E., Y. S. Efe, and H. Özbey. 2023. "A Predictor of Emotional Eating in Adolescents: Social Anxiety." *Archives of Psychiatric Nursing* 43: 71–75. https://doi.org/10.1016/j.apnu.2022.12.016.

Farrow, C. V., and C. L. Fox. 2011. "Gender Differences in the Relationships Between Bullying at School and Unhealthy Eating and Shape-Related Attitudes and Behaviours." *British Journal of Educational Psychology* 81, no. 3: 409–420. https://doi.org/10.1348/000709910X525804.

Fernandes, D. V., M. J. Gouveia, M. C. Canavarro, and H. Moreira. 2018. "Mindfulness and Psychological Adjustment in Paediatric Obesity: The Mediating Role of Body Image." *Psychology, Community & Health* 7, no. 1: 122–137. https://doi.org/10.5964/pch.v7i1.242.

Ferrari, E. P., G. Minatto, J. Berria, et al. 2015. "Body Image Dissatisfaction and Anthropometric Indicators in Male Children and Adolescents." *European Journal of Clinical Nutrition* 69, no. 10: 1140–1144. https://doi.org/10.1038/ejcn.2014.252.

Fidelix, Y. L., E. L. Petroski, and A. Pelegrini. 2014. "Females and Post-Pubescent Adolescents: Groups With High Exposure to the Development of Body Image Dissatisfaction in São Bonifácio, Santa Catarina State, Brazil." *Acta Scientiarum. Health Science* 36, no. 2: 165–170. https://doi.org/10.4025/actascihealthsci.v36i2.19290.

Forney, K. J., P. K. Keel, S. O'Connor, C. Sisk, S. A. Burt, and K. L. Klump. 2019. "Interaction of Hormonal and Social Environments in Understanding Body Image Concerns in Adolescent Girls." *Journal of Psychiatric Research* 109: 178–184. https://doi.org/10.1016/j.jpsychires.2018.12.008.

Gall, K., K. Van Zutven, J. Lindstrom, et al. 2016. "Obesity and Emotional Well-Being in Adolescents: Roles of Body Dissatisfaction, Loss of Control Eating, and Self-Rated Health." *Obesity* 24, no. 4: 837–842. https://doi.org/10.1002/oby.21428.

Gay, J. L., E. V. Monsma, and K. D. Hein. 2018. "Weight Management Behaviors Among Mexican American Youth: Cross-Sectional Variation by Timing of Growth and Maturation." *American Journal of Health Promotion* 32, no. 2: 392–399. https://doi.org/10.1177/0890117116689160.

Gay, J. L., E. V. Monsma, and T. M. Torres-McGehee. 2011. "Developmental and Contextual Risks of Social Physique Anxiety Among Female Athletes." *Research Quarterly for Exercise and Sport* 82, no. 2: 168–177. https://doi.org/10.1080/02701367.2011.10599744.

Ghammem, R., H. Ghali, L. Pavicic, et al. 2024. "Weight Perception and Mental Health Disorders Among Adolescents of Central-Eastern Tunisia: A Cross-Sectional Study." *PLoS One* 19, no. 10: e0308384. https://doi.org/10.1371/journal.pone.0308384.

Gibson, L. Y., S. M. Byrne, E. Blair, E. A. Davis, P. Jacoby, and S. R. Zubrick. 2008. "Clustering of Psychosocial Symptoms in Overweight Children." *Australian and New Zealand Journal of Psychiatry* 42, no. 2: 118–125. https://doi.org/10.1080/00048670701787560.

Goddings, A. L., S. Burnett Heyes, G. Bird, R. M. Viner, and S. J. Blakemore. 2012. "The Relationship Between Puberty and Social Emotion Processing." *Developmental Science* 15, no. 6: 801–811. https://doi.org/10.1111/j.1467-7687.2012.01174.x.

Goldschmidt, A. B., J. M. Lavender, A. E. Hipwell, S. D. Stepp, and K. Keenan. 2018. "Examining Two Prevailing Models of Loss of Control Eating Among Community-Based Girls." *Obesity* 26, no. 2: 420–425. https://doi.org/10.1002/oby.22101.

Gralen, S. J., M. P. Levine, L. Smolak, and S. K. Murnen. 1990. "Dieting and Disordered Eating During Early and Middle Adolescence: Do the Influences Remain the Same?" *International Journal of Eating Disorders* 9, no. 5: 501–512. https://doi.org/10.1002/1098-108X(199009)9:5<501::AID-EAT2260090505>3.0.CO;2-0.

Grilo, C. M. 2004. "Subtyping Female Adolescent Psychiatric Inpatients With Features of Eating Disorders Along Dietary Restraint and Negative Affect Dimensions." *Behaviour Research and Therapy* 42, no. 1: 67–78. https://doi.org/10.1016/s0005-7967(03)00073-1.

Hargreaves, D., and M. Tiggemann. 2003. "The Effect of 'Thin Ideal' Television Commercials on Body Dissatisfaction and Schema Activation During Early Adolescence." *Journal of Youth and Adolescence* 32, no. 5: 367–373. https://doi.org/10.1023/A:1024974015581.

Harriger, J. A., D. C. Witherington, and A. D. Bryan. 2014. "Eating Pathology in Female Gymnasts: Potential Risk and Protective Factors." *Body Image* 11, no. 4: 501–508. https://doi.org/10.1016/j.bodyim.2014.07.007.

Henderson, M., H. Bould, E. Flouri, et al. 2021. "Association of Emotion Regulation Trajectories in Childhood With Anorexia Nervosa and Atypical Anorexia Nervosa in Early Adolescence." *JAMA Psychiatry* 78, no. 11: 1249–1257. https://doi.org/10.1001/jamapsychiatry.2021.1599.

Hermes, S. F., and P. K. Keel. 2003. "The Influence of Puberty and Ethnicity on Awareness and Internalization of the Thin Ideal." *International Journal of Eating Disorders* 33, no. 4: 465–467. https://doi.org/10.1002/eat.10169.

Hoyt, L. T., L. Niu, M. C. Pachucki, and N. Chaku. 2020. "Timing of Puberty in Boys and Girls: Implications for Population Health." *SSM - Population Health* 10: 100549. https://doi.org/10.1016/j.ssmph.2020.100549.

Hughes, E. K., and E. Gullone. 2011. "Emotion Regulation Moderates Relationships Between Body Image Concerns and Psychological Symptomatology." *Body Image* 8, no. 3: 224–231. https://doi.org/10.1016/j.bodyim.2011.04.001.

Hughes, E. K., L. K. Mundy, H. Romaniuk, et al. 2018. "Body Image Dissatisfaction and the Adrenarchal Transition." *Journal of Adolescent Health* 63, no. 5: 621–627. https://doi.org/10.1016/j.jadohealth.2018.05.025.

Jiang, L., D. Yang, Y. Li, and J. Yuan. 2021. "The Influence of Pubertal Development on Adolescent Depression: The Mediating Effects of Negative Physical Self and Interpersonal Stress." *Frontiers in Psychiatry* 12: 786386. https://doi.org/10.3389/fpsyt.2021.786386.

Kaczmarek, M., and S. Trambacz-Oleszak. 2016. "The Association Between Menstrual Cycle Characteristics and Perceived Body Image: A Cross-Sectional Survey of Polish Female Adolescents." *Journal of Biosocial Science* 48, no. 3: 374–390. https://doi.org/10.1017/S0021932015000292.

Keel, P. K., J. A. Fulkerson, and G. R. Leon. 1997. "Disordered Eating Precursors in Pre-And Early Adolescent Girls and Boys." *Journal of Youth and Adolescence* 26, no. 2: 203–216. https://doi.org/10.1023/A:1024504615742.

Klein, J. S. 2008. *Body Image in Boys: The Role of Race, Positive Affect and Peer Popularity in Eighth Grade Boys [Doctoral Dissertation]*. Columbia University.

Klump, K. L., M. McGue, and W. G. Iacono. 2003. "Differential Heritability of Eating Attitudes and Behaviors in Prepubertal Versus Pubertal Twins." *International Journal of Eating Disorders* 33, no. 3: 287–292. https://doi.org/10.1002/eat.10151.

Klump, K. L., P. K. Keel, C. Sisk, and S. A. Burt. 2010. "Preliminary Evidence That Estradiol Moderates Genetic Influences on Disordered Eating Attitudes and Behaviors During Puberty." *Psychological Medicine* 40, no. 10: 1745–1753. https://doi.org/10.1017/S0033291709992236.



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

Knejzlíková, T., M. Světlák, T. Malatincová, et al. 2021. "Electrodermal Response to Mirror Exposure in Relation to Subjective Emotional Responses, Emotional Competences and Affectivity in Adolescent Girls With Restrictive Anorexia and Healthy Controls." *Frontiers in Psychology* 12: 673597. https://doi.org/10.3389/fpsyg.2021.673597.

Knowles, A. M., A. G. Niven, S. G. Fawkner, and J. M. Henretty. 2009. "A Longitudinal Examination of the Influence of Maturation on Physical Self-Perceptions and the Relationship With Physical Activity in Early Adolescent Girls." *Journal of Adolescence* 32, no. 3: 555–566. https://doi.org/10.1016/j.adolescence.2008.06.001.

Kolodziejczyk, J. K., K. Gutzmer, S. M. Wright, et al. 2015. "Influence of Specific Individual and Environmental Variables on the Relationship Between Body Mass Index and Health-Related Quality of Life in Overweight and Obese Adolescents." *Quality of Life Research* 24, no. 1: 251–261. https://doi.org/10.1007/s11136-014-0745-1.

Labbrozzi, D., C. Robazza, M. Bertollo, I. Bucci, and L. Bortoli. 2013. "Pubertal Development, Physical Self-Perception, and Motivation Toward Physical Activity in Girls." *Journal of Adolescence* 36, no. 4: 759–765. https://doi.org/10.1016/j.adolescence.2013.06.002.

Lavell, C. H., H. J. Webb, M. J. Zimmer-Gembeck, and L. J. Farrell. 2018. "A Prospective Study of Adolescents' Body Dysmorphic Symptoms: Peer Victimization and the Direct and Protective Roles of Emotion Regulation and Mindfulness." *Body Image* 24: 17–25. https://doi.org/10.1016/j.bodyim.2017.11.006.

Lavender, J. M., and D. A. Anderson. 2010. "Contribution of Emotion Regulation Difficulties to Disordered Eating and Body Dissatisfaction in College Men." *International Journal of Eating Disorders* 43, no. 4: 352–357. https://doi.org/10.1002/eat.20705.

Lee, J., H. Y. Ahn, and H. Choi. 2016. "Psychosocial Characteristics of Precocious Puberty in Korean Girls." *International Journal of Bio-Science and Bio-Technology* 8, no. 4: 1–10. https://doi.org/10.14257/ijbsbt.2016.8.4.01.

Lewis-Smith, H., I. Bray, D. Salmon, and A. Slater. 2020. "Prospective Pathways to Depressive Symptoms and Disordered Eating in Adolescence: A 7-Year Longitudinal Cohort Study." *Journal of Youth and Adolescence* 49: 2060–2074. https://doi.org/10.1007/s10964-020-01291-1.

Lien, L., F. Dalgard, S. Heyerdahl, M. Thoresen, and E. Bjertness. 2006. "The Relationship Between Age of Menarche and Mental Distress in Norwegian Adolescent Girls and Girls From Different Immigrant Groups in Norway: Results From an Urban City Cross-Sectional Survey." *Social Science & Medicine (1982)* 63, no. 2: 285–295. https://doi.org/10.1016/j.socscimed.2006.01.003.

Lien, L., O. R. Haavet, and F. Dalgard. 2010. "Do Mental Health and Behavioural Problems of Early Menarche Persist Into Late Adolescence? A Three Year Follow-Up Study Among Adolescent Girls in Oslo, Norway." *Social Science & Medicine (1982)* 71, no. 3: 529–533. https://doi.org/10.1016/j.socscimed.2010.05.003.

Lo Coco, G., L. Salerno, C. Giordano, M. Di Blasi, and R. F. Rodgers. 2020. "Understanding the Smartphone Generation: Is Problematic Smartphone Use Associated With Low Body Esteem Among Adolescent Girls and Boys?" *Current Psychology* 41, no. 12: 8455–8466. https://doi.org/10.1007/s12144-020-00847-5.

MacPhee, A. R., and J. J. Andrews. 2006. "Risk Factors for Depression in Early Adolescence." *Adolescence* 41, no. 163: 435–466.

Mahama, S., K. Weichold, N. Fehmer, E. N. Mvungu, and M. N. Natsuaki. 2024. "Pubertal Status and Body Image: An Inquiry Into Experiences of Adolescents in Ghana and Kenya." *Journal of Research on Adolescence* 34, no. 2: 257–271. https://doi.org/10.1111/jora.12953.

Marceau, K., N. Ram, R. M. Houts, K. J. Grimm, and E. J. Susman. 2011. "Individual Differences in Boys' and Girls' Timing and Tempo of Puberty: Modeling Development With Nonlinear Growth Models." *Developmental Psychology* 47, no. 5: 1389–1409. https://doi.org/10.1037/a0023838.

Martins, C. R., E. Carraça, P. J. Teixeira, A. M. Silva, and E. L. Petroski. 2014. "Prevalence of Body Shape Concerns and Associated Factors Among Brazilian Early Adolescents." *Human Movement* 15, no. 1: 12–20. https://doi.org/10.2478/humo-2013-0047.

McCabe, M. P., and L. A. Ricciardelli. 2001. "Parent, Peer and Media Influences on Body Image and Strategies to Both Increase and Decrease Body Size Among Adolescent Boys and Girls." *Adolescence* 36, no. 142: 225–240.

McCabe, M. P., and L. A. Ricciardelli. 2006. "A Prospective Study of Extreme Weight Change Behaviors Among Adolescent Boys and Girls." *Journal of Youth and Adolescence* 35, no. 3: 402–411. https://doi.org/10.1007/s10964-006-9062-5.

McCabe, M. P., and L. A. Ricciardelli. 2009. "Extreme Weight Change Behaviours: Are Overweight and Normal Weight Adolescents Different, and Does This Vary Over Time?" *European Eating Disorders Review* 17, no. 4: 301–314. https://doi.org/10.1002/erv.929.

McCabe, M. P., L. A. Ricciardelli, and J. Finemore. 2002. "The Role of Puberty, Media and Popularity With Peers on Strategies to Increase Weight, Decrease Weight and Increase Muscle Tone Among Adolescent Boys and Girls." *Journal of Psychosomatic Research* 52, no. 3: 145–153. https://doi.org/10.1016/S0022-3999(01)00272-0.

McCabe, M. P., L. A. Ricciardelli, and S. Banfield. 2001. "Body Image, Strategies to Change Muscles and Weight, and Puberty." *Eating Behaviors* 2, no. 2: 129–149. https://doi.org/10.1016/S1471-0153(01)00025-3.

McNicholas, F., B. Dooley, N. McNamara, and R. Lennon. 2012. "The Impact of Self-Reported Pubertal Status and Pubertal Timing on Disordered Eating in Irish Adolescents." *European Eating Disorders Review* 20, no. 5: 355–362. https://doi.org/10.1002/erv.2171.

Mendle, J., C. R. Beam, K. M. P. McKone, and M. K. Koch. 2020. "Puberty and Transdiagnostic Risks for Mental Health." *Journal of Research on Adolescence* 30, no. 3: 687–705. https://doi.org/10.1111/jora.12552.

Mercader-Yus, E., M. C. Neipp-López, P. Gómez-Méndez, et al. 2018. "Ansiedad, autoestima e imagen corporal en niñas con diagnóstico de pubertad precoz." *Revista Colombiana de Psiquiatría* 47, no. 4: 229–236. https://doi.org/10.1016/j.rcpeng.2017.05.015.

Mikhail, M. E., S. L. Carroll, D. A. Clark, et al. 2023. "Disadvantage and Disordered Eating in Boys: Examining Phenotypic and Genotype-Environment Associations Across Development." *Journal of Psychopathology and Clinical Science* 132, no. 1: 51–62. https://doi.org/10.1037/abn0000791.

Mikhail, M. E., S. L. Carroll, D. A. Clark, S. O'Connor, S. A. Burt, and K. L. Klump. 2021. "Context Matters: Neighborhood Disadvantage Is Associated With Increased Disordered Eating and Earlier Activation of Genetic Influences in Girls." *Journal of Abnormal Psychology* 130, no. 8: 875–885. https://doi.org/10.1037/abn0000719.

Mitchell, S. H., T. A. Petrie, C. A. Greenleaf, and S. B. Martin. 2012. "Moderators of the Internalization–Body Dissatisfaction Relationship in Middle School Girls." *Body Image* 9, no. 4: 431–440. https://doi.org/10.1016/j.bodyim.2012.07.001.

Morrissey, R. A., D. M. Gondoli, and A. F. Corning. 2020. "Reexamining the Restraint Pathway as a Conditional Process Among Adolescent Girls: When Does Dieting Link Body Dissatisfaction to Bulimia?" *Development and Psychopathology* 32, no. 3: 1031–1043. https://doi.org/10.1017/s0954579419001287.

Murdey, I. D., N. Cameron, S. J. H. Biddle, S. J. Marshall, and T. Gorely. 2004. "Pubertal Development and Sedentary Behaviour During Adolescence." *Annals of Human Biology* 31, no. 1: 75–86. https://doi.org/10.1080/03014460310001636589.

Murdey, I. D., N. Cameron, S. J. H. Biddle, S. J. Marshall, and T. Gorely. 2005. "Short-Term Changes in Sedentary Behaviour During Adolescence: Project STIL (Sedentary Teenagers and Inactive Lifestyles)."



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

*Annals of Human Biology* 32, no. 3: 283–296. https://doi.org/10.1080/03014460500068295.

Muris, P., C. Meesters, W. van de Blom, and B. Mayer. 2005. "Biological, Psychological, and Sociocultural Correlates of Body Change Strategies and Eating Problems in Adolescent Boys and Girls." *Eating Behaviors* 6, no. 1: 11–22. https://doi.org/10.1016/j.eatbeh.2004.03.002.

National Heart, Lung, and Blood Institute. 2014. Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies. https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools.

Newman, D. L., L. M. Sontag, and R. Salvato. 2006. "Psychosocial Aspects of Body Mass and Body Image Among Rural American Indian Adolescents." *Journal of Youth and Adolescence* 35, no. 2: 265–275. https://doi.org/10.1007/s10964-005-9011-8.

O'Connor, S. M., K. M. Culbert, L. A. Mayhall, S. A. Burt, and K. L. Klump. 2020. "Differences in Genetic and Environmental Influences on Body Weight and Shape Concerns Across Pubertal Development in Females." *Journal of Psychiatric Research* 121: 39–46. https://doi.org/10.1016/j.jpsychires.2019.11.001.

Page, M. J., J. E. McKenzie, P. M. Bossuyt, et al. 2021. "The PRISMA 2020 Statement: An Updated Guideline for Reporting Systematic Reviews." *BMJ* 372: n71. https://doi.org/10.1136/bmj.n71.

Pedro, T. M., L. K. Micklesfield, K. Kahn, S. M. Tollman, J. M. Pettifor, and S. A. Norris. 2016. "Body Image Satisfaction, Eating Attitudes and Perceptions of Female Body Silhouettes in Rural South African Adolescents." *PLoS One* 11, no. 5: e0154784. https://doi.org/10.1371/journal.pone.0154784.

Peng, X., R. Cao, Y. Wang, et al. 2022. "Body Image Dissatisfaction and Aggressive Behavior Among Chinese Children at Different Pubdertal Stages: A Path Analysis." *Psychology Research and Behavior Management* 15: 2573–2586. https://doi.org/10.2147/PRBM.S382999.

Petruzzelli, M. G., L. Margari, F. Furente, et al. 2022. "Body Emotional Investment and Emotion Dysregulation in a Sample of Adolescents With Gender Dysphoria Seeking Sex Reassignment." *Journal of Clinical Medicine* 11, no. 12: 3314. https://doi.org/10.3390/jcm11123314.

Rabbani, A., J. Mahmoudi-Gharaei, M. R. Mohammadi, et al. 2012. "Mental Health Problems of Iranian Female Adolescents and Its Association With Pubertal Development: A Nationwide Study." *Acta Medica Iranica* 50, no. 3: 169–176.

Radziwiłłowicz, W., P. Hrycyk, and B. Dutczak. 2016. "The Impact of Accepting Biological Changes During Adolescence on the Severity of Depression Symptoms." *Polish Psychological Bulletin* 47, no. 4: 394–401. https://doi.org/10.1515/ppb-2016-0046.

Ren, L., Y. Xu, X. Guo, et al. 2018. "Body Image as Risk Factor for Emotional and Behavioral Problems Among Chinese Adolescents." *BMC Public Health* 18: 1179. https://doi.org/10.1186/s12889-018-6079-0.

Riboli, G., R. Borlimi, and G. Caselli. 2022. "A Qualitative Approach–Delineates Changes on Pubertal Body Image After Menarche." *International Journal of Adolescence and Youth* 27, no. 1: 111–124. https://doi.org/10.1080/02673843.2022.2032219.

Saunders, J. F., and L. D. Frazier. 2017. "Body Dissatisfaction in Early Adolescence: The Coactive Roles of Cognitive and Sociocultural Factors." *Journal of Youth and Adolescence* 46, no. 6: 1246–1261. https://doi.org/10.1007/s10964-016-0559-2.

Shriver, L. H., J. M. Dollar, S. D. Calkins, S. P. Keane, L. Shanahan, and L. Wideman. 2020. "Emotional Eating in Adolescence: Effects of Emotion Regulation, Weight Status and Negative Body Image." *Nutrients* 13, no. 1: 79. https://doi.org/10.3390/nu13010079.

Sicilia, Á., M. Alcaraz-Ibáñez, A. Paterna, L. O. Gallardo, and J. Martín-Albo. 2023. "Effects of Pubertal Timing and Pubertal Tempo on Social Physique Anxiety, Self-Determined Motivation, and Exercise in Early Adolescent Girls." *Journal of Adolescent Health* 73, no. 1: 37–43. https://doi.org/10.1016/j.jadohealth.2023.01.025.

Sicilia, Á., M. D. Griffiths, and J. Martín-Albo. 2024. "A Longitudinal Study of Pubertal Timing and Tempo on Body Shame Among Young Adolescent Girls and Boys." *Sex Roles* 90, no. 12: 1923–1936.

Sim, L., and J. Zeman. 2005. "Emotion Regulation Factors as Mediators Between Body Dissatisfaction and Bulimic Symptoms in Early Adolescent Girls." *Journal of Early Adolescence* 25, no. 4: 478–496. https://doi.org/10.1177/0272431605279838.

Sim, L., and J. Zeman. 2006. "The Contribution of Emotion Regulation to Body Dissatisfaction and Disordered Eating in Early Adolescent Girls." *Journal of Youth and Adolescence* 35, no. 2: 207–216. https://doi.org/10.1007/s10964-005-9003-8.

Simmons, R. G., D. A. Blyth, E. F. V. Van Cleave, and D. M. Bush. 1979. "Entry into Early Adolescence: The Impact of School Structure, Puberty, and Early Dating on Self-Esteem." *American Sociological Review* 44, no. 6: 948–967. https://doi.org/10.2307/2094719.

Sisk, C. L., and J. L. Zehr. 2005. "Pubertal Hormones Organize the Adolescent Brain and Behavior." *Frontiers in Neuroendocrinology* 26, no. 3–4: 163–174. https://doi.org/10.1016/j.yfrne.2005.10.003.

Skrove, M., S. Lydersen, and M. S. Indredavik. 2016. "Resilience Factors May Moderate the Associations Between Pubertal Timing, Body Mass and Emotional Symptoms in Adolescence." *Acta Paediatrica* 105, no. 1: 96–104. https://doi.org/10.1111/apa.13171.

Stice, E., and K. Whitenton. 2002. "Risk Factors for Body Dissatisfaction in Adolescent Girls: A Longitudinal Investigation." *Developmental Psychology* 38, no. 5: 669–678. https://doi.org/10.1037/0012-1649.38.5.669.

Stice, E., and S. K. Bearman. 2001. "Body-Image and Eating Disturbances Prospectively Predict Increases in Depressive Symptoms in Adolescent Girls: A Growth Curve Analysis." *Developmental Psychology* 37, no. 5: 597–607. https://doi.org/10.1037/0012-1649.37.5.597.

Suka, M., H. Sugimori, K. Yoshida, et al. 2005. "Body Image and Body Satisfaction Play Important Roles in the Path to Dieting Behavior in Japanese Preadolescents: The Toyama Birth Cohort Study." *Environmental Health and Preventive Medicine* 10, no. 6: 324–330. https://doi.org/10.1007/bf02898192.

Swarr, A. E., and M. H. Richards. 1996. "Longitudinal Effects of Adolescent Girls' Pubertal Development, Perceptions of Pubertal Timing, and Parental Relations on Eating Problems." *Developmental Psychology* 32, no. 4: 636–646. https://doi.org/10.1037/0012-1649.32.4.636.

Tang, C. S. K., D. Y. L. Yeung, and A. M. Lee. 2003. "Psychosocial Correlates of Emotional Responses to Menarche Among Chinese Adolescent Girls." *Journal of Adolescent Health* 33, no. 3: 193–201. https://doi.org/10.1016/S1054-139X(03)00049-1.

Thompson, J. K., and E. Stice. 2001. "Thin-Ideal Internalization: Mounting Evidence for a New Risk Factor for Body-Image Disturbance and Eating Pathology." *Current directions in psychological science* 10, no. 5: 181–183.

Van den Akker, A. L., D. A. Briley, A. D. Grotzinger, J. L. Tackett, E. M. Tucker-Drob, and K. P. Harden. 2021. "Adolescent Big Five Personality and Pubertal Development: Pubertal Hormone Concentrations and Self-Reported Pubertal Status." *Developmental Psychology* 57, no. 1: 60–72. https://doi.org/10.1037/dev0001135.

Verschueren, M., L. Claes, N. Palmeroni, et al. 2020. "Eating Disorder Symptomatology in Adolescent Boys and Girls: Identifying Distinct Developmental Trajectory Classes." *Journal of Youth and Adolescence* 49: 410–426. https://doi.org/10.1007/s10964-019-01174-0.

Vijayakumar, N., S. Whittle, and T. J. Silk. 2023. "Corticolimbic Connectivity Mediates the Relationship Between Pubertal Timing and Mental Health Problems." *Psychological Medicine* 53: 7655–7665. https://doi.org/10.1017/s0033291723001472.

Vijayakumar, N., T. W. Cheng, J. H. Pfeifer, and J. C. Flournoy. 2021. "A Longitudinal Analysis of Puberty-Related Cortical Development." *Developmental Cognitive Neuroscience* 52: 101020. https://doi.org/10.1016/j.neuroimage.2020.117684.



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

Wang, Y., R. Cao, X. Peng, L. Zhang, Z. Zhang, and L. Fu. 2022. "Association Between Body Image Dissatisfaction and Body Anthropometric Indices Among Chinese Children and Adolescents at Different Developmental Stages." *Frontiers in Public Health* 10: 926079. https://doi.org/10.3389/fpubh.2022.926079.

Watzlawik, M. 2008. "Pubertal Development, Body Satisfaction, and Desired Body Changes: Gender Differences in Early Adolescence." *International Journal of Developmental Science: Biopsychosocial Mechanisms of Change, Human Development, and Psychopathology - Perspectives From Psychology, Neuroscience, and Genetics* 2: 341–352. https://doi.org/10.3233/DEV-2008-2401.

Wertheim, E. H., and S. J. Paxton. 2011. "Body Image Development in Adolescent Girls." In *Body Image: A Handbook of Science, Practice, and Prevention*, edited by T. F. Cash and L. Smolak, 76–84. Guilford Press.

Williams, J. M., and C. Currie. 2000. "Self-Esteem and Physical Development in Early Adolescence: Pubertal Timing and Body Image." *Journal of Early Adolescence* 20, no. 2: 129–149. https://doi.org/10.1177/0272431600020002002.

Worthman, C. M. 2011. "Hormones and Behavior." In *Encyclopedia of Adolescence*, edited by In. B. B. Brown and M. J. Prinstein, 177–192. Academic Press.

Worthman, C. M., S. Dockray, and K. Marceau. 2019. "Puberty and the Evolution of Developmental Science." *Journal of Research on Adolescence* 29, no. 1: 9–31. https://doi.org/10.1111/jora.12411.

Xie, B., C. Liu, C. P. Chou, et al. 2003. "Weight Perception and Psychological Factors in Chinese Adolescents." *Journal of Adolescent Health* 33, no. 3: 202–210. https://doi.org/10.1016/S1054-139X(03)00099-5.

Zhang, Y., T. Li, R. Yao, et al. 2020. "Comparison of Body-Image Dissatisfaction Among Chinese Children and Adolescents at Different Pubertal Development Stages." *Psychology Research and Behavior Management* 13: 555–562. https://doi.org/10.2147/PRBM.S242645.



10959254, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/jad.70238 by Library APCs - University College Cork , Wiley Online Library on [04/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License