

Body image and dietary habits in adolescents: a systematic review

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Context: Adolescence is a critical developmental stage in which increasing concerns about body image (BI) coincide with the consolidation of dietary habits (DHs). Multiple studies have sought robust associations between BI and DHs to prevent unhealthy behaviors. **Objective:** The aim of this systematic review was to examine the available literature on the association between BI perception (BIP) and/or satisfaction (BIS) and DHs in adolescents. **Data Sources:** A search was carried out of 5 electronic databases (PubMed, SciELO, Cochrane, Embase, and PsycInfo) using a combination of keywords (and synonyms) related to adolescence, BI, and diet. **Data Extraction:** Data screening, extraction, and quality assessment were performed independently by 2 investigators using the PRISMA and AXIS guidelines. **Data Analysis:** Of 2496 articles screened, 30 articles, published in English or Spanish, that evaluated the relationship between BI and DHs in adolescents aged between 10 years and 18 years, were included. A relationship between accurate BI perception in adolescents and healthy DHs was reported in 5 articles (16.2%). A relationship between overestimation of body weight in adolescents and healthy DHs was reported in 4 articles (13.3%). A relationship between underestimation of body weight and unhealthy DHs was reported in 8 articles (26.7%). In addition, 4 articles (13.3%) reported a relationship between BIS and healthy DHs. The desire to gain weight was associated with unhealthy DHs in 3 (10%) of the articles, while the desire to lose weight was related to healthy DHs in 3 (10%) of the articles and to unhealthy DHs in 3 (10%) other articles. There were also gender differences in the relationship between BIP or BIS and DHs. **Conclusion:** Adolescents who underestimate their body weight tend to report less healthy DHs than body weight overestimators. Adolescents unsatisfied with their BI and with a drive for thinness frequently engage in DHs linked to losing weight.

Systematic Review Registration: PROSPERO registration no. CRD42020184625.

Key words: body image perception, body image satisfaction, eating habits, teenagers.

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INTRODUCTION

Adolescence is a transitional stage in development toward adult life that features many significant physical, psychological, and behavioral changes.^{1,2} This period is characterized by increasing concerns about body image (BI), due to external pressures from peers and family, and such concerns are reinforced by mass media and social stereotypes about ideal body shape.^{3–10} Adolescence is thus the time when a link may develop between BI and eating habits.^{11,12}

BI is a psychological term related to self-image that predominantly refers to the visual representation of one's own body shape and size, regardless of their actual body shape and size, that also includes subjective perceptions, feelings, and thoughts, about that representation. BI is thus a multidimensional construct that refers to one's perceptions of and attitudes toward one's own physical characteristics. BI can affect behaviors, and a favorable BI is crucial to emotional well-being.^{6,10,13–15} BI affects the nature and frequency of appearance-referential thoughts, and the extent of cognitive and behavioral investment in one's appearance; it is linked to self-esteem, interpersonal confidence, eating and exercise behaviors, and other factors that can affect well-being.¹⁶ Therefore, BI involves multiple components: the perceptual component (BI perception [BIP]), the attitudinal component (BI satisfaction [BIS]), the cognition component, and the behavioral component.^{6,10,14,16–19} BIP is defined as the accuracy with which someone perceives their appearance and can estimate their bodily dimensions.^{6,7,18} BIS represents the discrepancy between an individual's perceptual and ideal BI.^{6,7,20}

Previous research shows that between 45% and 60% of children and adolescents have an inaccurate BIP.²¹ Moreover, a recent systematic review revealed that between 44% and 61% of children and adolescents with excess weight were dissatisfied with their own bodies.⁷

Several terms related to BI are commonly used interchangeably, such as BI distortion, BIP, BI disturbance, negative BI, and BIS; however, there are some differences in meaning between them. Although BI distortion and BIP are interrelated, BI distortion also includes a cognitive and affective component. Similarly, BI disturbance, negative BI, and BI dissatisfaction are associated; however, the former also manifests on a behavioral level, while negative BI is more connected to a negative view of one's appearance.⁶ The lack of consensus on how to interpret BI presents a major challenge in the assessment and understanding of how BI shapes diet in adolescents.^{17,22} Dietary habits (DHs) refer to the individual decisions regarding what, when,

how much, and how often different food groups are consumed. These preferences may be influenced by culture, education, socioeconomic background, lifestyle factors, and health status.^{23–25} DHs have been shown to have a significant impact on health. For instance, a healthy diet rich in fruits, vegetables, legumes, or nuts, but which limits saturated fats, dairy products, and ultraprocessed foods, such as the Mediterranean diet, among others, has been proved to prevent non-communicable diseases.²⁵ Several reviews have investigated links between BI and eating disorders and the risk of obesity, but to our knowledge no previous review has focused exclusively on the relationship between BI and DHs in adolescents.^{7,22,26} Therefore, the aim of the present systematic review was to examine the potential association of BIP and/or BIS with DHs in adolescents.

METHODS

Protocol and registration

The protocol for this systematic review was registered with the International Prospective Register of Systematic Reviews, PROSPERO network [CRD42020184625] (<https://www.crd.york.ac.uk/prospero/>) and was enacted according to the recommendations of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).²⁷ The PRISMA 2020 checklist is presented in [Table S1 in the Supporting Information online](#).

Search strategy

Five electronic databases were used for the search: PubMed, SciELO, Cochrane, Embase, and PsycInfo. The article searches were carried out on February 8, 2022, with no publication date limitation. Searches were performed using a combination of keywords (and synonyms) on adolescents, BI, and diet in the title or abstract or by Medical Subject Heading (MeSH), with the Boolean operators AND and OR. The complete search strategy in each electronic database is described in [Table S2 in the Supporting Information online](#). The research question for this review was defined using Population, Intervention, Comparison, Outcome and Study (PICOS) criteria ([Table 1](#)). The final question was, "Is there an association between BIP and/or BIS and DHs in adolescents?"

Eligibility criteria

To be included in the review, articles had to meet the following criteria: (1) report original research carried

Table 1 PICOS criteria for inclusion of studies

| Parameter | Criterion |
|------------------|---|
| Population (P) | Adolescents (with no known health condition) |
| Intervention (I) | Body image perception and/or satisfaction |
| Comparison (C) | Not applicable |
| Outcome (O) | Dietary habits (including dietary patterns or dietary indicators) |
| Study design (S) | Cross-sectional, case-control, or cohort studies |

out on adolescents between the ages of 10 years and 18 years with no known health condition other than overweight or obesity; (2) be published in English, French, or Spanish; (3) have a cross-sectional, case-control, or cohort study design; and (4) assess the association between BI (perception and/or satisfaction) and dietary patterns or DH indicators (for example, food consumption such as daily servings of fruit and vegetables, or frequency of breakfast). Studies meeting the following criteria were excluded: (1) having a stated aim to evaluate the effect of an intervention; (2) assessing the association between BIP or BIS and diet using only energy intake and/or specific nutrient intakes; (3) having a broader age range and not separately describing the results of our target population.

Screening of articles

All titles and abstracts retrieved by the electronic searches were downloaded, and duplicates were removed using the find duplicates tools in Excel, EndNote Reference Manager, and Rayyan QCRI.²⁸ Records were then imported into Rayyan QCRI, where 2 reviewers (P.B. and A.d.C.G.) separately screened all article titles and abstracts and selected those articles meeting the inclusion criteria. After this initial screening, the 2 researchers individually read all the selected publications to agree on the final list of articles to be included in the review. The researchers also assessed the cited references in the selected studies, with the aim of identifying other articles of potential interest for inclusion in the review. Any disagreements during the selection period were resolved through discussion with 2 additional researchers, who independently reviewed the disputed articles (G.S.B. and J.M.F.A.).

Data extraction

Each reviewer (P.B. and A.d.C.G.) was assigned half the articles for data extraction and subsequently double-proofed the data extraction of the other half. To facilitate study comparisons, a table was designed including

the standardized information extracted from all the articles: author and year of publication; country and year of study; sample size and the percentage of girls; age range; assessment tools; outcome of BIP, BIS, and DHs; statistical methods; and the main results of the association between BIP and/or BIS and DHs.

Quality assessment

The risk of bias was assessed independently by the 2 main reviewers (P.B. and A.d.C.G.) using the critical Appraisal tool for Cross-sectional Studies (AXIS).²⁹ This tool did not provide a numerical score. Therefore, the authors made a rational judgement about the quality of the studies. Any disagreements during the quality assessment were resolved through discussion and consultation with additional reviewers when necessary.

RESULTS

A total of 3984 articles were retrieved from the 5 electronic databases, and 7 additional articles were identified from the cited references. After removing duplicates, 2496 articles were screened. Based on their titles and abstracts, 61 studies were selected for full-text reading to assess for eligibility. Finally, 30 studies were included in the systematic review. The search process and reasons for exclusion are presented in the PRISMA flow diagram (Figure 1).

All included studies were observational (29 cross-sectional studies and 1 longitudinal cohort study) and published in English (28) or Spanish (2). All of them were published in the last 20 years (11 of them in the last 5 years). Three studies examined the same cohort but differed in the outcome measure^{30–32} and were analyzed separately. Most articles focused on adolescents in Europe (11 out of 30)^{30–40} or Asia (11 out of 30),^{41–51} with the remaining articles examining adolescents in South America (5),^{52–56} Africa (2),^{57,58} and the United States (1).⁵⁹ The focus of 15 articles was the relationship between BIP and DHs,^{33,35,36,38,39,41–43,45,47,48,51–53,59} 12 were about BIS and DHs,^{30–32,34,44,46,49,50,54–57} and 3 related both BIP and BIS to DHs.^{37,40,58} Most articles included both boys and girls (26 out of 30), 2 were specific to boys,^{36,44} and 2 were specific to girls.^{49,50} A similar majority of articles (26 out of 30) included adolescents with normal weight or overweight/obesity, whereas 2 studies included only adolescents with overweight and obesity,^{48,59} and another 2 included only adolescents with normal weight.^{45,54}

Body image

For the evaluation of BI, 12 studies used body-shape silhouettes to prompt participants to identify their own

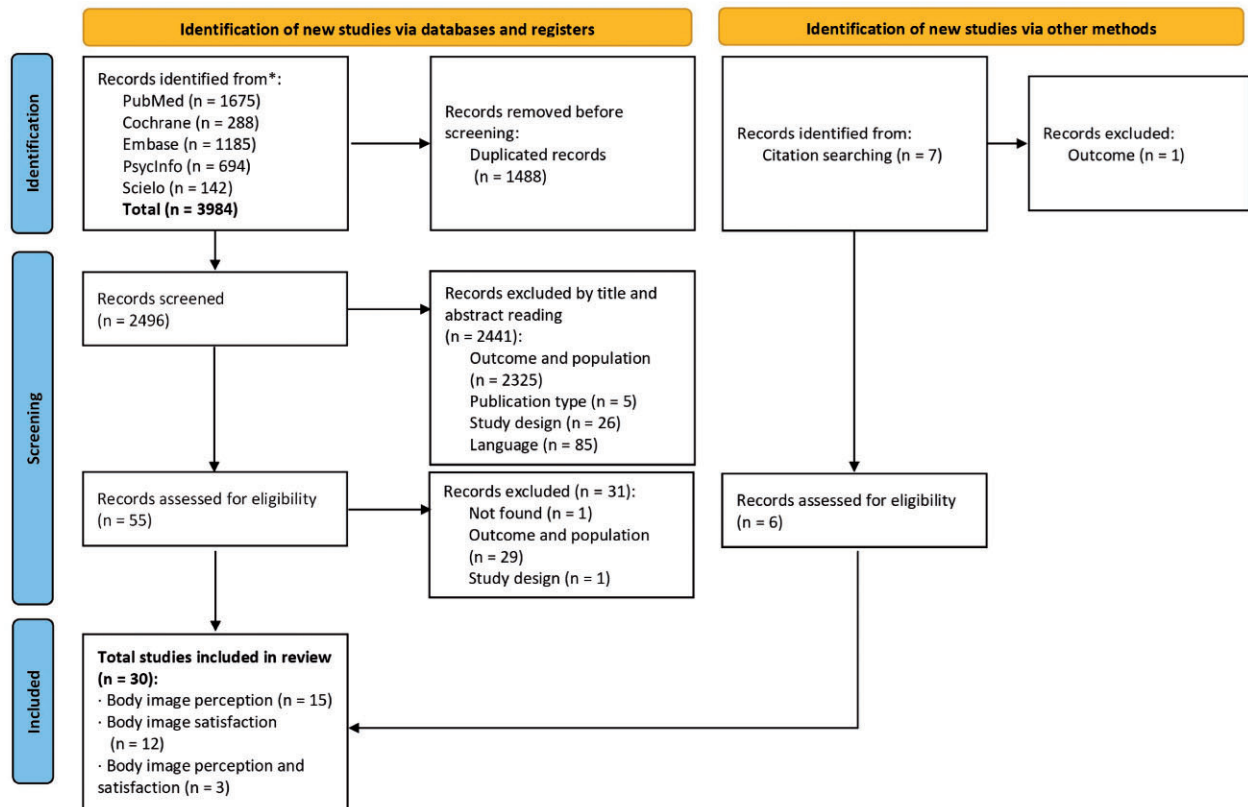


Figure 1 Flow-diagram of the literature search process.

perceived body shape, the body shape they considered to be ideal, and the body shape they would like to have. Of these studies, 11 applied previously described scales,^{30–32,36,48–50,53,56–58} while 1 designed a specific scale for the study.⁴² Other articles used validated questionnaires (4 out of 30)^{34,40,48,55} or direct questions (14 out of 30) such as “How satisfied are you with your own body?” or “What do you think about your body weight?”.^{35,36,38–40,43–47,51,52,54,59} Another 3 articles limited participant responses to the selection among options on a 5-point satisfaction scale.^{33,41,49} Only 1 article did not describe the specific tool used to evaluate BI.³⁷

Body image perception. BIP classification varied among the studies (Table 2).^{33,35–43,45,47,48,51–53,58,59} Eleven studies classified BIP as either underestimation, overestimation, or accurate estimation.^{35–37,41,42,45,47,51–53,58} Six studies categorized adolescents either as having a perceived underweight, perceived accurate, or perceived overweight BI^{33,38,40,43,48} or as being accurate perceivers versus misperceivers.⁵⁹ One study referred to BIP as satisfied or dissatisfied.³⁹ Moreover, the analyses used to compare these groups were very diverse, for example comparing differences by weight category, gender, or background.

The reported BI distortion among adolescents varied between 22% and 52%^{38,39,41,42,45,47,48,51–53,58,59} and was more frequent among boys than girls.^{35,37,42,45,47,48,51,59} Girls tended to overestimate their body weight more than boys, who tended to underestimate their body weight more often than girls.^{35,37,40–43,45,47,51,52}

In addition, BIP varied between studies according to adolescents’ nutritional status, which showed gender differences. A high percentage of adolescents with underweight, especially girls, tended to overestimate their body weight.^{39,42,51} Generally, girls with normal weight tended to overestimate their body weight,^{39,51} whereas boys with normal body weight tended to underestimate it.⁵¹ Adolescents with overweight and obesity were more likely to underestimate their body weight.^{36,42,51}

Body image satisfaction. The classification of BIS differed among the analyzed studies (Table 3).^{30–32,34,37,40,44,46,49,50,54–58} Seven studies classified BIS according to whether adolescents had a desire to lose weight, to gain weight, or were satisfied with their body weight.^{30–32,37,56–58} Three studies used a score to quantify BIS,^{34,44,49} and 3 others scored study participants on

Table 2 Summary of included studies on body image perception and dietary habits

| Reference | Country (study years) | Sample size (% girls) | Age range ^a | Body image perception assessment | Body image categories | Diet assessment | Dietary outcome | Statistical methods | Results |
|-------------------------------------|-----------------------|-----------------------|--------------------------------------|--|---|-----------------------------------|---|---|--|
| Andrade et al (2020) ⁵² | Brazil (2009) | 1496 (57.1%) | 11–17 (median: 14.3; IQR: 13.1–15.5) | DQ: How do you feel about your weight? | Underestimation, agreed, overestimation | Validated 97 semiquantitative FFQ | 14 food groups 4 dietary patterns (cluster analysis) | Kruskal–Wallis test Chi-square test Multinomial logistic regression model Network analysis | BI perception was not associated with any dietary pattern. Overestimation of weight was related to preferential choices of consumption of certain food groups: <ul style="list-style-type: none"> • Roots inversely correlated with oils, processed meat products, and coffee and tea. • Vegetables inversely correlated with sweetened beverages |
| Ben Ayed et al (2019) ⁵⁸ | Tunisia (2017–2018) | 1210 (59.7%) | 12–18 (15.6±2.0) | FRS of Stunkard | Underestimation, accurate, overestimation | Eating habits questions | 7 DH indicators (skipping breakfast, frequency of eating vegetables, fruit, pasta, soda, fast food, and eating between meals) | Chi-square test Univariate logistic regression model Multivariate logistic regression model | Underestimation of weight was related to having healthier DHs (eating between meals, high consumption of pasta and fast food, and low consumption of vegetables and fruit). Overestimation of weight was related to more restrictive dietary behaviors (skipping breakfast, high vegetable, and low fast-food consumption). |

(continued)

Table 2 Continued

| Reference | Country (study years) | Sample size (% girls) | Age range ^a | Body image perception assessment | Body image categories | Diet assessment | Dietary outcome | Statistical methods | Results |
|--|-----------------------|-----------------------|------------------------|---|---|---------------------------------------|---|--|---|
| Borda Pérez et al (2016) ⁵³ | Colombia (2014) | 262 (38.5%) | 10–13 (11.4±1.1) | FRS of Gardner | Negative distortion (real BMI lower than perceived BMI), positive distortion (real BMI higher than perceived BMI), accurate | Krece Plus questionnaire ^b | Poor, medium, high adherence to the MedDiet | Odds ratio Chi-square test | BI perception was not associated with DHs. |
| Buscemi et al (2018) ³⁵ | Italy (2012–2014) | 1643 (46.1%) | 11–16 (12.4±0.7) | DQ: Do you think you are underweight, about the right weight, or overweight? | Underestimation, accurate, overestimation | Validated FFQ Kidmed questionnaire | Poor, medium, high adherence to the MedDiet | Logistic regression model | Accurate estimation of weight was related to higher adherence to the MedDiet in adolescents with normal-weight and overweight. Underestimation was associated with lower adherence to the MedDiet in adolescents with normal weight and overweight. Overestimation was related to lower adherence to the MedDiet in adolescents with normal weight. |
| Cho et al (2012) ⁴¹ | Korea (2009) | 631 (44.7%) | 11.57±0.77 | Not described (BI was evaluated by adolescents marking their own body shape as 'very thin', 'somewhat thin', 'normal', 'somewhat overweight', and 'very fat') | Normal perception and overestimation | 14-item FFQ | 14 food groups | Student <i>t</i> test Chi-square test | BI perception was not associated with DHs. |

(continued)

Table 2 Continued

| Reference | Country (study years) | Sample size (% girls) | Age range ^a | Body image perception assessment | Body image categories | Diet assessment | Dietary outcome | Statistical methods | Results |
|---|---------------------------|--|--------------------------------------|--|---|---|--|---|---|
| Edwards et al (2010) ⁵⁹ | United States (2007) | 3687 (42.2%) (adolescents with BMI \geq 85th percentile) | Not described (9th grade–12th grade) | DQ: How do you describe your weight? | Accurate perception, misperception | DQ: Fruit and vegetable daily intake during the previous 7 days | Eat \geq 5 servings of fruit and vegetables per day | Chi-square test Multivariate logistic regression model | Accurate estimation of weight was associated with not meeting the recommended intake of fruit and vegetables. |
| Hernández Camacho et al (2015) ³⁶ | Spain (not described) | 87 (0.0%) | 12–18 (13.5 \pm 1.5) | DQ: In relation with your weight, how do you consider your current status? FRS Stunkard BI figures ad hoc | Underestimation, accurate, overestimation | Kidmed questionnaire | DH items from Kidmed questionnaire | Chi-square test | BI perception was associated with fast food and vegetable intake. |
| Hsu et al (2016) ⁴² | Taiwan (2006–2007) | 29 313 (48.4%) | 10–18 (not described) | | Underestimation, accurate, overestimation | FFQ | 5 DH indicators (eating breakfast, fruit and vegetable servings, fried foods, soft drinks, night snacks) | Multivariate logistic regression model | Underestimation of weight was related to skipping breakfast and eating fried foods more frequently. |
| Jankauskiene and Bacevičienė (2019) ³⁷ | Lithuania (not described) | 579 (51.6%) | 14–16 (15.0 \pm 0.4) | Not described (body weight perception was assessed as the discrepancy between current self-reported body weight and the reported desire to lose or to gain weight) | Underestimation, accurate, overestimation | Validated 11-item FFQ Eating habits questions | 11 food groups 2 DH indicators (breakfast, number of meals) | Kruskal–Wallis test | Underestimation in boys was related to a higher consumption of milk products, fats, spreads, oils, and a higher number of meals and frequency of having breakfast. Underestimation in girls was related to higher consumption of sweets. |

(continued)

Table 2 Continued

| Reference | Country (study years) | Sample size (% girls) | Age range ^a | Body image perception assessment | Body image categories | Diet assessment | Dietary outcome | Statistical methods | Results |
|------------------------------------|-----------------------|---|------------------------|---|--|---|---|--|---|
| Lee and Lee (2016) ⁴⁵ | South Korea (2014) | 20 264 (52.3%) (adolescents with normal weight) | 12–18 (16.4±0.01) | DQ: What do you think of your body image? | Underestimation, correct estimation, overestimation | Eating habits questions | 5 food groups 3 DH indicators (frequency of eating breakfast, lunch, and dinner) | ANOVA Chi-square test | Underestimation was related to a higher consumption of high calorie, low nutrient foods (fast food, soda). Overestimation was related to a lower frequency of having breakfast and dinner, eating fast food, sodas, or milk. |
| Lim and Wang (2013) ⁴⁷ | South Korea (2009) | 72 399 (47.3%) | 12–18 (not described) | DQ: How do you describe your weight? | Underestimation, accurate, overestimation | 8 eating habits questions | 8 DH indicators (frequency of having breakfast, eating fruits, vegetables, milk, sugar sweetened beverages, fast foods) | Chi-square test Logistic regression model | Underestimation of weight was related to unhealthier DHs (higher fast food and unhealthy snacks daily consumption and breakfast skipping). Overestimation of weight was related to consuming less sugar sweetened beverages daily. |
| Marques et al (2018) ³⁸ | Portugal (2014) | 3693 (53.4%) | 14–17 (14.7±1.1) | DQ: Do you think your body is. . .? | Perceived underweight, perceived normal weight, perceived overweight | DQ: Describe your eating habits; do you eat well? 6-item eating practice score | Realistic negative (reported bad eating practice and eating habits), underestimators (reported good eating practice, but bad eating habits), overestimators | Chi-square test Logistic regression model | Normal weight perception was related to being realistic positive about diet. |

(continued)

Table 2 Continued

| Reference | Country (study years) | Sample size (% girls) | Age range ^a | Body image perception assessment | Body image categories | Diet assessment | Dietary outcome | Statistical methods | Results |
|------------------------------------|-----------------------|--|------------------------|---|--|--|---|--|---|
| Mikkilä et al (2002) ³⁹ | Finland (1996–1997) | 60 252 (50.7%) | 14–16 (not described) | DQ: What do you think about your body weight? | Dissatisfaction, satisfaction ^c | Validated 15-item FFQ 2 eating habits questions | (reported bad eating practice, but good eating habits), realistic positive (reported good eating practice and eating habits) 3 dietary patterns (factor analysis): <i>Fast food</i> (hamburgers and hot dogs, meat pasties, pizza, soft drinks sweetened with sugar, crisps, chips, and sweets), <i>Healthy food</i> (fruits and berries, rye bread, fresh vegetables, salad, and yoghurt), and <i>Traditional food</i> (coffee, sweet buns, and sausages) | Logistic regression models | Dissatisfaction was related to less frequently following the <i>Fast food</i> (girls and boys) and the <i>Healthy food</i> (boys) dietary patterns. |
| Niswah et al (2021) ⁴⁸ | Indonesia (2017) | 2144 (48%) (adolescents with overweight and obesity) | 12–18 (not described) | Adapted and validated FRS (not specified) Adapted Body Shape Questionnaire | Thin, normal, overweight/obese | Qualitative FFQ Eating habits questions | 5 DH indicators (frequency of snacks, fast food, ready-to-eat meals, sweetened beverages, and fruits) | Chi-square test Cox regression models | Accurate perception in girls was related to a lower consumption of high-caloric snacks. BI perception was not associated with DHs in boys. |

(continued)

Table 2 Continued

| Reference | Country (study years) | Sample size (% girls) | Age range ^a | Body image perception assessment | Body image categories | Diet assessment | Dietary outcome | Statistical methods | Results |
|--|-----------------------|-----------------------|------------------------|--|---|--|--|--|---|
| Oellingrath et al (2015) ⁴⁰ | Norway (2010) | 469 (50.5%) | 12–13 (12.7±0.3) | DQ: How do you consider your current status? | Perceived underweight, perceived accurate, perceived overweight | Modified validated 69-item FFQ (reported by parents) | 4 dietary patterns (PCA): <i>Junk/convenience</i> (high energy processed fast foods, refined grains, cakes and sweets), <i>Varied Norwegian</i> (fruits and vegetables, brown bread, fish, water and regular breakfast and lunch, close to official nutritional advice), <i>Snacking</i> (sugar-rich snack items and drinks, low intakes of vegetables and brown bread, low frequency of breakfast and dinner and high frequency of eating between meals), and <i>Dieting</i> (foods and drinks often associated with weight control, like artificially sweetened drinks and other 'light' products) | Multivariate logistic regression model | Underweight perception in boys was related to unhealthier DHs (<i>Junk/Convenience</i> dietary pattern). |

(continued)

Table 2 Continued

| Reference | Country (study years) | Sample size (% girls) | Age range ^a | Body image perception assessment | Body image categories | Diet assessment | Dietary outcome | Statistical methods | Results |
|---|-----------------------|-----------------------|---|--|--|--|---|--|---|
| Shirasawa et al (2015) ⁵¹ | Japan (2005–2009) | 1731 (48.9%) | 12–13 (mean ± sd both boys and girls: 12.3 ± 0.4) | DQ: Do you think you are very thin, thin, normal weight, heavy, or very heavy? | Underestimation, accurate, overestimation | DQ: Snacking after dinner and skipping breakfast | 2 DH indicators (snacking after dinner, skipping breakfast) | Logistic regression model | Overestimation in girls was related to higher consumption of snacks after dinner. |
| Tilles-Tirkkonen et al (2015) ³³ | Finland (2012–2013) | 887 (52.0%) | 10–17 (not described) | Not described (BI was evaluated from adolescents' perceptions of their body on a five-point scale ranging from 'too fat', through 'somewhat fat', 'appropriate size', and 'somewhat thin' to 'too thin') | Somewhat fat or too fat, appropriate size, and somewhat thin or too thin | Eating habits questions | Balanced and imbalanced school lunch eaters | Chi-square test Logistic regression model | Appropriate perception was related to having a healthier diet (balanced school lunch eaters). |

(continued)

Table 2 Continued

| Reference | Country (study years) | Sample size (% girls) | Age range ^a | Body image perception assessment | Body image categories | Diet assessment | Dietary outcome | Statistical methods | Results |
|--------------------------------|-----------------------|-----------------------|------------------------|--|---|---|--|---------------------------|--|
| Xie et al (2006) ⁴³ | China (2002) | 6863 (51.7%) | 14.8 ± 1.7 | DQ: What do you think about your body shape? | Perceived underweight, perceived overweight, misperceived (underweight or overweight) | 5 questions from adapted the US YRBSS questionnaire | 5 DH indicators (frequency of eating vegetables, fruit and fruit juice, meat or poultry, milk and dairy products, and snack foods) | Logistic regression model | Overweight perception in girls was related to higher consumption of fruit and snacks and lower consumption of milk and dairy products. Underweight perception in girls was related to lower consumption of vegetables and fruit and higher consumption of milk and dairy products. Underweight perception in boys was related to higher consumption of snacks. |

^aAge y.o. (mean ± sd) unless otherwise specified.

^bThe Krece Plus questionnaire was defined but the Kidmed questionnaire was used.

^cThis article misclassified BI perception as satisfaction.

BI, body image; BMI, body mass index; DH, dietary habit; DQ, direct question; FFQ, food-frequency questionnaire; FRS, figure rating scale; IQR, interquartile range; MedDiet, Mediterranean diet; YRBSS, Youth Risk Behavior Survey.

a range from lower to higher BIS.^{40,46,55} One study classified BIS as misperception or no misperception.⁵⁴ Lastly, 1 article did not describe dissatisfaction categories.⁵⁰ Despite these differences in how BIS was categorized, the results were commonly reported as satisfied versus dissatisfied or as the desire to lose weight versus the desire to gain weight.

Studies focusing on BI dissatisfaction reported prevalence values of between 19.5% and 77%,^{30,40,46,50,54–58} with girls being more dissatisfied than boys.^{30,37,40,54} Girls were more likely to desire to lose weight,^{30,31,37,54,57,58} whereas boys tended to desire a thicker body.^{30,31,37,57}

Diverse associations were found between BIS and nutritional status. BI dissatisfaction tended to increase with weight.^{37,40,50} Adolescents with underweight tended to desire a thicker body, while a large majority of adolescents with overweight and obesity desired a thinner figure.^{31,37,56,57}

Dietary habits

DHs were assessed using food-frequency questionnaires (15 studies),^{30,31,35,37,39–42,44,48,49,52,55–57} 24-hour dietary recalls (2 studies),^{30,54} quality of diet questionnaires (5 studies),^{32,34–36,53} or direct questions about eating habits (14 studies).^{31,33,37–39,43,45–48,50,51,58,59} Some studies used more than one dietary assessment tool (7 studies). Six studies derived dietary patterns through statistical methods (principal component analysis,^{40,54} factor analysis,^{30,39,55} or cluster analysis⁵²). Only 1 of these derived dietary patterns by gender.³⁰ Most studies (24 out of 30) assessed diet using DH indicators such as number of daily meals, breakfast habit, daily intake of fruit and vegetables,^{31,36,37,41–43,45,47,48,51,56–59} or indices of diet quality.^{32–35,38,44,46,49,50,53} One author used both methods (dietary patterns and DH indicators).⁵²

Although the findings regarding adolescent DHs were very heterogeneous, there was a general tendency toward unhealthy behaviors. For instance, fewer than 30% of the adolescents showed good adherence to the Mediterranean diet,^{32,35,36,53} less than half ate 1 or more portions of vegetables a day, and over 60% consumed fast food weekly.⁴⁵ The most frequently derived dietary patterns were identified from unhealthier diets, “Western/Fast food/Processed,” to healthier diets, “Traditional,” and “Healthy.”^{30,39,40,52,54,55} Some studies found gender differences in the consumption of specific food groups such as fruit, meat and poultry, milk and dairy products, and snacks⁴³ or in DH indicators such as the number of meals per day, breakfast frequency, or eating lunch as a family.^{34,37,54}

Body image perception and dietary habits

The studies that explored the relationship between BIP and DHs used highly variable methods and produced highly variable results, the principal characteristics of which are shown in Table 2. Overall, adolescents with an accurate perception and who overestimate their body weight tend to engage more in healthier DHs, while adolescents who underestimate it engage in unhealthier DHs.

An accurate perception of body weight was associated with good eating habits^{33,38} and a higher adherence to the Mediterranean diet in adolescents with normal weight and overweight; it was, therefore, also associated with meeting more frequently the recommendations of a healthy diet.³⁵ In addition, girls with overweight and obesity who perceived themselves accurately had a lower intake of unhealthy foods⁴⁸; similarly, boys with an accurate perception of their body weight had higher odds of engaging in a “Healthy food” dietary pattern (fruits and fresh vegetables, rye bread, and yoghurt).³⁹ Nonetheless, some articles reported that accurate perception was related to lower odds of meeting fruit and vegetables intake recommendations, especially among boys,⁵⁹ and a higher odds of eating fast food.³⁹

Adolescents who underestimated their body weight, both overall and stratified by gender, were found to have unhealthier DHs, with higher odds of skipping breakfast^{42,47}; eating between meals and consuming more fast food, sodas, snacks, and sweets^{37,40,42,43,45,47,58}; and eating less fruit and vegetables.⁵⁸ Additionally, adolescents who underestimated their body weight also showed a lower adherence to the Mediterranean diet, especially those with normal weight and overweight.³⁵ In contrast, 1 study found that boys who underestimated their body weight had a higher number of meals per day and had breakfast more frequently than accurate body weight perceivers and overestimators.³⁷

Multiple studies related overestimation of body weight to a tendency to report better DHs.^{43,45,47,58} These adolescents leaned towards reporting a higher intake of vegetables and lower intakes of fast food, sugar-sweetened beverages, and milk,^{45,47,58} although they were also more often inclined to skip meals (breakfast and dinner).^{45,58} One study found that girls who overestimated their body weight had a higher consumption of fruits and a lower consumption of milk and dairy products.⁴³ Conversely, overestimator girls were associated with a higher intake of snacks.⁵¹

One study reported an association between BIP and fast food and vegetable intake but did not

Table 3 Summary of included studies on body image satisfaction and dietary habits

| Author (year of publication) | Country (study years) | Sample size (% girls) | Age range ^a | Body image satisfaction assessment | Body satisfaction categories | Diet assessment | Dietary outcome | Statistical methods | Results |
|-------------------------------------|-----------------------|-----------------------|------------------------|------------------------------------|---|--|--|---|---|
| Balluck et al (2016) ⁵⁷ | Mauritius (2014–2015) | 200 (52.0%) | 14–17 (15.5 ± 1.1) | FRS of Stunkard | Desire to gain weight/become thicker, desire to lose weight/become thinner, satisfied | 54-item semi-quantitative FFQ | 14 food groups 6 DH indicators (skipped breakfast, skipped lunch, skipped dinner, snacking habits, fast food consumption, and number of meals) | Chi-square test Student <i>t</i> test | Satisfaction was related to higher consumption of fruit. |
| Ben Ayed et al (2019) ⁵⁸ | Tunisia (2017–2018) | 1210 (59.7%) | 12–18 (15.6 ± 2.0) | FRS of Stunkard | Desire to gain weight, desire to lose weight, satisfied | Eating habits questions | 7 DH indicators (skipping breakfast, frequency of eating vegetables, fruit, pasta, soda, fast food, and eating between meals) | Chi-square test Univariate logistic regression model Multivariate logistic regression model | Desire to gain weight was related to poorer DHs (more skipping breakfast, eating between meals and fast food, and eating less fruit). Desire to lose weight was associated with healthier DHs (low frequency of skipping breakfast, eating between meals, and soda, pasta, and fast food consumption). |
| Bibiloni et al (2012) ³⁰ | Spain (2007–2008) | 1231 (53.4%) | 12–17 (not described) | FRS of Stunkard | Desire for a thicker body, desire for a thinner body, desire to remain the same | 24-hour dietary recall Validated 145-item semi-quantitative FFQ | 2 dietary patterns (factor analysis): <i>Western</i> (yoghurt and cheese, dairy desserts, red meat, poultry, sausages, eggs, bread, cereals, pasta, rice dishes, pizza, fruit juices, canned fruits, nuts, soft drinks, | Chi-square test Univariate logistic regression model Multivariate logistic regression model | Desire to lose weight (boys and girls) and satisfaction (girls) were related to less frequently following the <i>Western</i> dietary pattern. |

(continued)

Table 3 Continued

| Author (year of publication) | Country (study years) | Sample size (% girls) | Age range ^a | Body image satisfaction assessment | Body satisfaction categories | Diet assessment | Dietary outcome | Statistical methods | Results |
|-------------------------------------|-----------------------|-----------------------|------------------------|------------------------------------|---|---|---|---|--|
| Bibiloni et al (2013) ³¹ | Spain (2007–2008) | 1231 (53.4%) | 12–17 (not described) | FRS of Stunkard | Desire for a thicker body, desire for a thinner body, desire to remain the same | Validated 145-item semiquantitative FFQ Eating habits questions (number not described) | high-fat foods, other oils and fats, sweets, and chocolates) and <i>Mediterranean</i> (yoghurt and cheese, red meat, poultry, fish and seafood, eggs, legumes, pasta, fresh fruit, fruit juices, vegetables, potatoes and tubercles, and olive oil) 28 food groups 2 DH indicators (breakfast habit, number of meals) | Chi-square test Multivariate logistic regression model | Desire to lose weight in boys with excess weight was related to lower intake of red meat, pasta and rice dishes, and oils and fat. Desire to lose weight in girls with excess weight was related to lower intake of dairy desserts and chocolates and a higher frequency of skipping breakfast. |
| Bibiloni et al (2016) ³² | Spain (2007–2008) | 1231 (53.4%) | 12–17 (not described) | FRS of Stunkard | Desire for a thicker body, desire for a thinner body, desire to remain the same | Kidmed questionnaire | Kidmed score Poor, medium, high adherence to the MedDiet | ANOVA Multivariate logistic regression model | Desire to lose weight in boys was associated with poor adherence to MedDiet. |

(continued)

Table 3 Continued

| Author (year of publication) | Country (study years) | Sample size (% girls) | Age range ^a | Body image satisfaction assessment | Body satisfaction categories | Diet assessment | Dietary outcome | Statistical methods | Results |
|---|------------------------------|-----------------------|---------------------------|---|---|--|--|--|---|
| Hyun et al (2017) ⁴⁴ | China and South Korea (2011) | 406 (0.0%) | 15–18 (not described) | DQ: How are you satisfied with your own body shape? | Mean satisfaction with BI | 9-item FFQ | DH score (breakfast, fruit, vegetables, protein foods, milk, laver, and kelp intake, and amount and balance of intake during meals) | Student <i>t</i> test Pearson correlation coefficient | Satisfaction was positively correlated with DH score. |
| Jankauskiene and Baceviciene (2019) ³⁷ | Lithuania (not described) | 579 (51.6%) | 14–16 (15.0 ± 0.4) | Not described (Body Weight Discrepancy was measured as the difference between self-reported body weight, and perceived ideal body weight) | Desire to gain weight, desire to lose weight, satisfied | Validated 11-item FFQ Eating habits questions | 11 food groups 2 DH indicators (having breakfast, number of meals) | Kruskal–Wallis test | Dissatisfaction was related to lower number of meals a day. A desire to lose weight among girls was associated with a lower frequency of having breakfast. |
| Lee and Ahn (2007) ⁴⁶ | South Korea (not specified) | 260 (49.6%) | Not described (5th grade) | DQ: How much are you satisfied with your body shape (image)? | Satisfied, neutral, dissatisfied | Eating habits questions | Eating behavior score | ANOVA | Dissatisfaction in girls was related to an unhealthier DH score. BI satisfaction was not related to DHs in boys. |
| Oellingrath et al (2015) ⁴⁰ | Norway (2010) | 469 (50.5%) | 12–13 (12.7 ± 0.3) | Physical Appearance subscale | Low appearance satisfaction, high appearance satisfaction | Modified validated 69-item FFQ (reported by parents) | 4 dietary patterns (PCA): <i>Junk/convenience</i> (high-energy processed fast foods, refined grains, cakes, and sweets), <i>Varied Norwegian</i> (fruits and vegetables, brown bread, fish, water, and regular breakfast and lunch, close to official nutritional advice), <i>Snacking</i> (sugar- | Multivariate logistic regression model | Low satisfaction in girls was related to more restrictive dietary patterns (<i>Dieting</i> dietary pattern). High satisfaction in girls was related to engaging in a <i>Snacking</i> dietary pattern. |

(continued)

Table 3 Continued

| Author (year of publication) | Country (study years) | Sample size (% girls) | Age range ^a | Body image satisfaction assessment | Body satisfaction categories | Diet assessment | Dietary outcome | Statistical methods | Results |
|--|-----------------------------------|-----------------------|------------------------|---|---|-----------------------|--|---|--|
| Ribeiro-Silva et al (2017) ⁵⁵ | Brazil (2009) | 1496 (57.1%) | 11–17 (not described) | Body Shape Questionnaire | Satisfied, slightly dissatisfied, moderately or highly dissatisfied | Validated 97-item FFQ | rich snack items and drinks, low intakes of vegetables and brown bread, low frequency of breakfast and dinner, and high frequency of eating between meals), and <i>Dieting</i> (foods and drinks often associated with weight control, like artificially sweetened drinks and other 'light' products) 3 dietary patterns (factor analysis): <i>Western</i> (sweets and sugars, soft drinks, typical Brazilian dishes pastries, fast food, milk and dairy, oils, beef), <i>Traditional</i> (chicken, fish, eggs, processed meat products, cereals, baked beans), and <i>Vegetarian</i> (granola, roots, vegetables, and fruits) ^b | Logistic regression model | Slight and moderate dissatisfaction in adolescents with excess weight was inversely related to unhealthier DHs (<i>Western</i> dietary pattern). High dissatisfaction in adolescents with excess weight was related to healthier diet (<i>Vegetarian</i> dietary pattern). |
| Ro and Hyun (2012) ⁴⁹ | China and South Korea (2011–2012) | 448 (100%) | 15–18 (not described) | Not described (BI was evaluated by adolescents' body satisfaction on a 5-point scale) | Mean satisfaction with BI | 9-item FFQ | DH score (breakfast, fruits, vegetables, protein foods, milk, laver, and kelp) | Student <i>t</i> test Pearson correlation coefficient | BI satisfaction was significantly related to more desirable DHs. |

(continued)

Table 3 Continued

| Author (year of publication) | Country (study years) | Sample size (% girls) | Age range ^a | Body image satisfaction assessment | Body satisfaction categories | Diet assessment | Dietary outcome | Statistical methods | Results |
|-----------------------------------|-----------------------|---|------------------------|--|--|--|---|--|--|
| | | | | ranging from 'very satisfied', through 'satisfied', 'so-so', 'unsatisfied', to 'very unsatisfied' FRS (reference unavailable) | | | intake, and amount and balance of intake during meals) | | |
| Shaban et al (2016) ⁵⁰ | Kuwait (2015) | 169 (100%) | 10–14 (not described) | FRS of Stunkard (desired BI) | Dissatisfaction categories (not described) | DQ: Do you consider your diet to be healthy? | Healthy, and unhealthy | Chi-square test Ordinal regression | Dissatisfaction was marginally related to unhealthier DHs. |
| Silva et al (2021) ⁵⁴ | Brazil (2013–2014) | 52 038 (49.8%) (adolescents with normal weight) | 12–17 (14.7) | DQ: Are you satisfied with your weight? In your opinion, at what level is your current weight? | Misperception (underestimation, overestimation), no misperception ^c | 24-hour dietary recall | 3 dietary patterns (PCA): <i>Traditional Brazilian</i> (rice, beans, vegetables and meat), <i>Processed meat sandwiches and coffee</i> (processed meat, coffee/tea, bread, cheese, oils and fats), and <i>Ultraprocessed and sweet foods</i> (sugar-sweetened beverages, desserts/sweets, and ultraprocessed foods) | Simple Poisson regression models Adjusted multiple regression model stratified by sex | Misperception is related to unhealthy DHs. Underestimation was related to unhealthier dietary patterns (higher odds to <i>Processed meat, sandwiches and coffee</i> and <i>Ultraprocessed and sweet foods</i> dietary patterns). Overestimation was inversely related to the <i>Traditional Brazilian</i> dietary pattern in both girls and boys, and to the <i>Processed meat sandwiches and coffee</i> and <i>Ultraprocessed and sweet foods</i> dietary patterns only in girls. |

(continued)

Table 3 Continued

| Author (year of publication) | Country (study years) | Sample size (% girls) | Age range ^a | Body image satisfaction assessment | Body satisfaction categories | Diet assessment | Dietary outcome | Statistical methods | Results |
|--|------------------------|-----------------------|------------------------|---|---|----------------------|---|---|---|
| Tapia-Serrano et al (2021) ³⁴ | Spain (2018–2019) | 2216 (44.2%) | 10–16 (13.1 ± 0.90) | Body Image Dimensional Assessment questionnaire | Mean body dissatisfaction | Kidmed questionnaire | Poor, medium, high adherence to the MedDiet | Student <i>t</i> test Pearson correlation | BI dissatisfaction was associated with better adherence to the MedDiet. |
| Tebar et al (2020) ⁵⁶ | Brazil (not described) | 1074 (55.1%) | 10–17 (13.1 ± 3.5) | Brazilian Silhouettes' Scale | Desire to gain weight, desire to lose weight, satisfied | Validated FFQ | 6 food groups | ANOVA Chi-square test Logistic regression model | The desire to lose weight was related to lower intake of fruit and vegetables. The desire to gain weight was related to lower consumption of vegetables and higher consumption of sweets. |

^a Age y.o. (mean ± sd) unless otherwise specified.

^b The authors also defined this dietary pattern as 'Restrictive,' considering the food groups associated with this dietary pattern; we decided to use the term 'Vegetarian.'

^c This article misclassified BI satisfaction as perception.

BI, body image; DH, dietary habit; DQ, direct question; FFQ, food-frequency questionnaire; FRS, figure rating scale; MedDiet, Mediterranean diet; PCA, principal component analysis.

clearly specify the direction of this association.³⁶ Only 3 studies found no association between BIP and diet.^{41,52,53} Nonetheless, a network analysis in one of these studies showed that, in body-weight overestimation, preferential choices of certain food groups were made.⁵²

Body image satisfaction and dietary habits

The main characteristics, assessment methods, and major results of articles included in the review that explored the relationship between BIS and DHs are summarized in [Table 3](#). Overall, BIS was related to healthy DHs, whereas the desire to gain weight was related to unhealthier DHs. Moreover, both BI dissatisfaction and the desire to lose weight showed conflicting results: adolescents in these groups had both healthy and unhealthy DHs, the latter being mostly related to restrictive diets. One study found that adolescents satisfied with their BI had better DHs than those who were dissatisfied.⁵⁷ This is in line with another study in which body-satisfied girls had lower odds of following a “Western” dietary pattern, defined by intake of dairy products, meat, canned fruit, fast food, high-fat foods, and sweets and chocolates.³⁰ Similarly, in other studies, comparison of BIS between cohorts from different countries revealed a significant positive correlation between body-satisfied adolescents and higher DH scores (higher intake of breakfast, fruit, vegetables, protein-rich foods, milk, a higher food quantity intake during meals, and more balanced meals).^{44,49}

While some studies reported a relationship between body dissatisfaction and unhealthy DHs,^{50,54} others linked body dissatisfaction to healthier habits. Body dissatisfaction was related to better adherence to the Mediterranean diet³⁴ and to “Vegetarian” (granola, roots, vegetables, fruit) and “DiETING” (light products) dietary patterns.^{40,55} In contrast, body-dissatisfied adolescents also tended to have fewer meals per day.³⁷ These associations were also found for body-dissatisfied girls, who had less healthy and more restrictive DHs.^{40,46}

Only 3 studies found a significant relationship between the desire to gain weight and an unhealthy diet, with these adolescents reporting a lower consumption of fruit and vegetables^{56,58}; more frequent skipping of breakfast, snacking, and fast-food consumption^{54,58}; and a higher intake of sweets^{54,56} than their body-satisfied counterparts. No study reported an association between the desire to gain weight and a healthy diet.

Studies showed different trends regarding the association between the desire to lose weight and diet. Adolescents who desired to lose weight consumed fewer sodas and less fast food than body-satisfied adolescents,

and had lower odds of snacking⁵⁸ or engaging in a “Western” dietary pattern (dairy products, meat, canned fruit, fast food, high-fat foods, and sweets and chocolates).³⁰ Nevertheless, 1 study also showed that adolescents desiring to lose weight ate less fruit and vegetables,⁵⁶ in line with another study in which the desire to lose weight among normal-weight adolescents was less associated with a healthy dietary pattern (“Traditional Brazilian” defined by rice, beans, vegetables, and meat).⁵⁴ In particular, girls desiring to lose weight tended to avoid the “Processed meat sandwiches and coffee” (processed meat, coffee/tea, bread, cheese, oils and fats), and “Ultraprocessed and sweet foods” (sugar-sweetened beverages, desserts/sweets, and ultraprocessed foods) as unhealthier dietary patterns,⁵⁴ whereas boys desiring to lose weight reported a lower adherence to the Mediterranean diet.³² In adolescents with excess weight, the desire to be thinner was related to healthier DHs than those seen among body-satisfied adolescents with normal weight and body-satisfied boys with excess weight.³¹ Regarding breakfast habits, 2 studies found that girls with a drive for thinness skipped breakfast more frequently,^{31,37} while 1 study reported that adolescents who desired to lose weight had a lesser tendency to skip breakfast.⁵⁸

Quality assessment

Details of the quality of each study are shown in [Table S3 in the Supporting Information online](#). In general, the quality of studies was medium to good, with a mean 73% compliance with the assessment criteria. Some internal discrepancies between the results reported in the tables and those reported in the main text were found in a few studies.

DISCUSSION

This systematic review included 30 studies that assessed the relationship between BIP and/or BIS and different DH characteristics in adolescents between the ages of 10 years and 18 years. The majority of the articles used silhouette scales or direct questions to evaluate BI, and most of them assessed diet using food-frequency questionnaires or specific questions concerning DHs. In this systematic review, we focused exclusively on DHs rather than energy intake or the nutritional quality of the diet, since the behaviors and habits that revolve around diet transcend nutrient content. The results of our analysis are somewhat heterogeneous, in line with the results of a recent systematic review on BI, unhealthy eating, and physical activity.²²

Body image perception and dietary habits

The evidence gathered in this review indicated that accurate perception of body weight is related to healthy eating behaviors and higher adherence to the Mediterranean diet.^{33,35,38,39,48} This finding is in line with the findings of other studies, in which children who misperceived their body weight were more likely to have unhealthy dietary patterns.⁶⁰ In contrast, other articles included in the present review concluded that adolescents who perceived their body weight accurately less frequently achieved the recommended intake of fruit and vegetables or had higher odds of following an unhealthy dietary pattern (hamburgers, hot dogs, meat pasties, pizza, sweetened beverages, chips and sweets) than misperceivers.^{39,59} This conclusion was supported by evidence that children who misperceived their body weight were more likely to have a healthier diet (consuming fewer dairy products, sugar-sweetened beverages, sweets, and salty snacks) than accurate perceivers.²¹ This difference may be due to adolescents who underestimate their body weight being unaware of their excess weight and therefore unconcerned about engaging in unhealthy habits,⁶¹ whereas overestimating adolescents may take more care of their eating habits in order to reduce the perceived excess weight. In this regard, a few articles showed that children and adolescents who underestimate their body weight lean towards unhealthier eating habits, with higher consumption of high-calorie meals^{37,40,42,43,45,47} and lower adherence to the Mediterranean diet,³⁵ and lower consumption of fruit and vegetables.⁵⁸ This might be because these children have a lower sense of having excess weight and are therefore less motivated to engage in controlling their diet and taking action to lose weight.^{60,61} These behaviors might also be triggered by the social misconception that being below or at normal weight implies not having to worry about eating healthily. For the most part, overestimating adolescents have been reported as engaging in healthy eating habits such as eating more vegetables and less fast food and sugar-sweetened beverages.^{45,47,58} Another study found that overestimating adolescents tend to eat more fruit and vegetables and less fast food.²¹ There is also evidence that overestimating adolescents have more restrictive habits, such as more frequently skipping breakfast or dinner,^{45,58} which is in line with the wider literature. For instance, a Chinese study reported that participants who overestimated their body weight tended to engage in a “Malnourished” dietary pattern (lower intake of vegetables, fruits, drinking milk, snacks, fast food, and fries, and more frequent breakfast skipping),⁶⁰ and a Japanese study reported that girls who overestimated their body weight reported not eating breakfast on a daily basis.¹¹

Adolescents who have a sense of having excess weight may tend to engage into activities that they relate to losing weight, which can be healthy (such as healthy DHs and regular physical activity) or unhealthy (restrictive eating habits and extreme physical activity).^{7,62,63}

Body image satisfaction and dietary habits

The literature suggests an association between healthy BIS and DHs, but no clear evidence has been found for an association between BI dissatisfaction and DHs. Most studies in this review showed that adolescents who are satisfied with their BI have healthier eating behaviors,^{44,49} such as eating more fruit and vegetables⁵⁷ or, for girls, having lower odds of following a “Western” dietary pattern (dairy products, high fat and sugar foods and drinks, red meat, poultry, cereals, pasta, rice dishes).³⁰ Likewise, some studies stated that body dissatisfaction is related to unhealthier DHs (mainly eating fewer meals)^{37,50,54}; however, others linked dissatisfaction to better adherence to the Mediterranean diet or to eating more fruit and vegetables.^{34,55} These findings agree with a Swiss study that linked body dissatisfaction in adolescents to a higher intake of fruit and vegetables and more frequent skipping of breakfast.⁶⁴ Although these behaviors can appear contradictory, both are socially associated with losing weight, in a healthy or unhealthy way. This mixed pattern is also supported by the current analysis, with some of the articles included in the review showing associations between a desire to lose weight and healthier DHs and a low frequency of skipping breakfast,^{30,31,58} whereas others reported the opposite association, with low adherence to the Mediterranean diet,³² restrictive behaviors like skipping breakfast more frequently,^{31,37} or lower consumption of fruit and vegetables.⁵⁶ No article in the review sample showed an association between the desire to gain weight and a healthy diet; instead, articles in the review found that adolescents seeking to gain weight tend to eat less fruit and more sweets, snacks, and fast food.^{56,58} This behavior might be based on a belief that eating high-energy foods would lead to weight gain.

Body image, dietary habits, and gender

The surveyed articles consistently show that girls and boys with accurate BIP or who are satisfied with their body weight engage in healthier eating behaviors,^{30,39,44,49,50} and girls and boys who underestimate their body weight engage in unhealthier behaviors.^{37,40,43} However, girls who overestimate their body weight or want to lose weight tend to eat more fruit and fewer dairy products and snacks⁴⁸ and processed

foods,⁵⁴ and to skip breakfast more often.^{31,37} This pattern is not common among overestimating boys, who tend to engage in healthier DHs³¹ or have a lower adherence to the Mediterranean diet.³² In addition, boys usually underestimate their body weight, whereas girls overestimate it,^{35,37,40–42,45,47,51,52,58} and girls tend to be more body-dissatisfied and to desire to decrease their body weight, whereas boys want to increase it.^{37,40} This divergence might reflect social pressures related to current ideal body types, with girls leaning towards thinner body shapes and therefore engaging in what they perceive as weight-reducing behaviors, whereas boys would prefer to have a muscular body.^{42,65}

The results obtained in this review reveal a high prevalence among adolescents of misperception or dissatisfaction with body weight, accompanied by a tendency to engage in unhealthy or restrictive DHs. It is particularly important to address this issue, as unhealthy habits can lead to the development of eating disorders.¹⁶ Previous studies have claimed that BI distortion and dissatisfaction can increase the risk of developing unhealthy lifestyle behaviors, such as excessive physical activity,^{66,67} and have emphasized the need for strategies to prevent these behaviors.^{67,68} The development of a healthy lifestyle is known to depend on effective health promotion from childhood.⁶⁹ In addition to the established components of diet and physical activity, health-promotion strategies should also include emotion management. Self-esteem plays an essential role in BI, acting as a protective factor in the association between body mass index and BIP and BIS.^{6,70} Accumulated research shows the importance of training children and adolescents in healthy habits through programs that aim to disprove myths about diet and physical activity and promote appropriate emotion management.^{6,9} Schools and families are the most suitable environments in which to implement health-education programs that encourage healthy choices and positive attitudes towards health and self-care.^{13,69,71,72}

Limitations and strengths

There are some limitations to this systematic review. First among these is the lack of consensus on how to define BI, with different articles using the same scale with different interpretations, thus complicating synthesis of their results. It further appears that 1 study may have mistakenly classified BIP as satisfied or dissatisfied, while another framed BIS as misperception versus no misperception.^{39,54} A second limitation is that several studies showed inconsistencies between the results shown in the tables and those presented in the text, making it difficult to know what conclusions to extract.

Although no tool has been demonstrated to be superior to the others, another limitation is the diversity of instruments and statistical methods used to relate BI and DHs, which made comparison difficult. Likewise, the variety of tools (food-frequency questionnaire, 24-hour recall, quality questionnaires) and statistical techniques (cluster analysis, principal component analysis, etc.) used to assess diet was an additional difficulty due to the heterogeneity of DHs derived. Additionally, the review only included studies that measured diet as an indicator or as dietary patterns, and therefore studies that examined the relationship between BIP or BIS, and energy, micro-, and macro-nutrient intake were excluded. Furthermore, the lack of longitudinal studies impeded the determination of cause and effect in the relationship between BIP and/or BIS and DHs. Finally, the search was limited to articles in English, French, and Spanish, and hence additional studies in other languages may have been overlooked. Due to the great heterogeneity in the description of the association between BIP and/or BIS and DHs in the studies included in this review, it was not possible to carry out a meta-analysis.

A strength of this analysis is that it is, to our knowledge, the first systematic review to exclusively study the relationship between BI and DHs in adolescents. The review also marks an important step towards clarifying the definitions of and differences between BIP and BIS, helping to set the ground for future studies of the links between BIP and BIS and DHs.

CONCLUSION

Despite the heterogeneity of the results, adolescents who underestimate their body weight tend to report healthier DHs, while those overestimating or accurately perceiving their body weight lean toward a healthier diet. Moreover, adolescents with a desire to gain weight have healthier DHs, while those with a drive for thinness engage in either healthy or unhealthy habits associated with weight loss. Differences in BI and DHs by gender generally reflect a desire among girls for a thinner body and among boys for a thicker one.

These results highlight the need to carry out intervention programs on BI, taking into account gender, socioeconomic, and cultural perspectives in order to fight stereotypes and misbeliefs that might lead adolescents to unhealthy habits, such as restrictive diets or extreme physical activity. In addition, further longitudinal studies may help better understand and quantify the association between BIP and/or BIS and DHs over time by using harmonized methods to help clarify the heterogeneity of the results.

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Author contributions. P.B., A.d.C.G., and L.A.M. conceived the overall study. P.B. and A.d.C.G. were the main reviewers and performed the screening and data collection. G.S.B. and J.M.F.A. assisted as independent reviewers. G.S.B., J.M.F.A., R.F.J., and L.A.M. provided scientific support over the course of this work. P.B. and A.d.C.G. drafted the first version of the manuscript. All authors revised the manuscript critically for intellectual content and approved the published version.

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Declaration of interest. The authors have no relevant interests to declare.

Supporting Information

The following Supporting Information is available through the online version of this article at the publisher’s website.

[Table S1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses \(PRISMA\) 2020 checklist](#)

[Table S2 Search strategy](#)

[Table S3 Quality of the studies included in the systematic review assessed by AXIS tool](#)

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