

Original Research

Cross-National Study on the Convergent, Discriminant, and Concurrent Validity of the “Body Size Perception” Item in the Health Behaviour in School-aged Children Survey



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A B S T R A C T

Background: Despite its significant usefulness in adolescent health studies, the single-item “body size perception” question, developed within the Health Behaviour in School-aged Children (HBSC) survey, has yet to undergo multidimensional validation.

Objectives: To assess the convergent, divergent and concurrent validity of the HBSC body size perception question among adolescents.

Methods: The single-item HBSC body size perception question is as follows: “Do you think your body is...?” with answers ranging from “much too thin” to “much too fat.” Fifteen-year-old participants included in the analysis were 72,086 from 45 HBSC countries in 2017/18 (concurrent validity), and 595, 127, and 615 in 2021/22 in French-speaking Belgium, Ireland, and Poland, respectively. The convergent, divergent, and concurrent validity was assessed with body dissatisfaction, social desirability, and self-esteem, respectively. The concurrent validity was also examined with body mass index (BMI) from the 2017/18 HBSC data. All analyses were sex-stratified.

Results: Cohen’s Kappa values were 0.67 [confidence interval (CI): 95%: 0.62, 0.72] and 0.64 (0.59, 0.69) for boys and girls, respectively, in all 3 countries together. Body size perception was associated with social desirability, self-esteem, and BMI, with a stronger association in girls than that in boys. For instance, girls with higher social desirability were less likely to perceive themselves as “too thin” [Relative Risk Ratio (RRR) = 0.78 (0.69, 0.89)] rather than as the “right size.” Boys with higher self-esteem were less likely to perceive themselves as “too fat” [0.93 (0.90, 0.97)] rather than the “right size.” Girls with underweight were less likely to perceive themselves as “too fat” [0.38 (0.34, 0.43)] rather than “right size” and girls with overweight/obesity were more likely to perceive themselves as such [8.19 (7.49, 8.95)].

Conclusions: The single-item HBSC body size perception question demonstrated good convergent, divergent, and concurrent validity. It reflects adolescents’ own perception of body size, possibly influenced by societal norms and ideals.

Keywords: body size perception, body image, validation, adolescents, HBSC

Introduction

Body size perception is a key subconstruct of body image. It encompasses one’s perception, thoughts, feelings, and behaviors [1,2] related to one’s own body size, including body weight status and shape. Among others, body size perception is influenced by societal and cultural expectations, as well as personal experience [3]. Because of its association with adverse health

outcomes and behaviors, such as depression [4], low self-esteem [5], and eating disorders [6], a negative body size perception is of concern. Conversely, a positive perception was found to be associated with favorable outcomes, such as healthier weight status [7] and healthier behaviors, like regular physical activity and higher intakes of fruit and vegetables [8].

Adolescence is a critical period for developing an awareness of body image and concerns about body size [9]. Although

Abbreviations: CI, confidence interval; FAS, Family Affluence Scale; HBSC, Health Behaviour in School-aged Children; RRR, Relative Risk Ratio.

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pronounced cognitive, social, and emotional changes are taking place during this period [10], physical changes related to the onset of puberty can be particularly complex to cope with [11]. Among young adolescents, the rapid changes they experience can result in inconsistent body size perception. Addressing negative body size perception from mid-adolescence (~14–17 y) onward will effectively help prevent the associated psychological distress and eating disorders at an early stage.

Beyond these changes, adolescents are developing their identity, including to conform to ideals that are advocated by cultural norms, social media, and peers or relatives [9,11]. For instance, high-income countries have typically emphasized thinness for girls and muscularity for boys during the last decades [11]. The quest for body ideals can lead to body dissatisfaction [12], which, in turn, can result in excessive body and shape control, such as exercising or dieting [13], with potential harmful health consequences.

Body size perception has been extensively studied, both as a predictor of and predicted health-related indicators. For instance, the literature highlighted a bidirectional longitudinal association with weight status. On the one hand, an increase in BMI (kg/m^2) from childhood to adolescence was found to be associated with higher body dissatisfaction during early adulthood [14,15]. On the other hand, perceiving oneself as overweight, irrespective of actual weight status, was associated with an increase in BMI later in life [16], highlighting the crucial role of perception in addressing the high prevalence of childhood obesity in most high-income countries. To note, discordance between perceived and current weight status has also been cross-sectionally reported [17]. Some classified as with a normal weight status may perceive themselves as too fat, whereas others classified as with overweight may not perceive size concerns. Indeed, body size perception is not an exact representation of actual weight status. Instead, it refers to how individuals assess their own size, defined among other things by their weight [18], in relation to how they would like to be [19]. Measuring body size perception in research on adolescent health is thus essential for a better understanding of such issues.

Because body size perception may have detrimental consequences on adolescent wellbeing and health [4–6,16], its assessment should be included in population-based surveys, using a simple and reliable measurement, and as a complement to body weight assessment through BMI for instance. In this respect, numerous tools, such as single-item questions or silhouette scales [20], have been developed to assess body size perception. However, still too few have been fully and properly validated [2,21]. A thorough validation should encompass construct and criterion-related validities.

In the international “Health Behaviour in School-aged Children” (HBSC) survey, an item on body size perception has been developed and used since the 1993/94 survey [22]. It consists of the following single-item question: “Do you think your body is...?” with “much too thin,” “a bit too thin,” “about the right size,” “a bit too fat,” and “much too fat” as answers. It should be noted that a sixth category “I do not think about it” was initially used but was removed from the 2001/02 survey because the respondents in this category were not included in the related analyses.

The test-retest reliability of this HBSC body size perception item was assessed twice [23]. In Belgium, 560 adolescents

answered the question twice prior to the 2001/02 survey, with 71% of respondents selecting the same category on both occasions and 16% an adjacent category. The sample characteristic of this study is not available (unpublished work described in the internal protocol 2005/06 [23]). In Finland, fifty 11-y-olds (50% boys), ninety-four 13-y-olds (54% boys), and hundred 15-y-olds (41% boys) answered the question twice in 2005, with a test-retest interval of 2 wk. Among these adolescents, 194 chose the same category on both occasions. The Kappa statistic was 0.60 in Belgium and 0.75 in Finland [23], supporting a good reliability [22]. However, to date, this item has not undergone multidimensional validation also covering construct and criterion validity. Yet, this item is widely used not only within the HBSC network [24,25] but also in other surveys or research [26, 27].

Against this backdrop, this study aimed to cross-nationally assess the convergent, discriminant, and concurrent validity of the HBSC body size perception item among adolescents attending schools. Our aims were 4-fold: on the basis of data collected in 2021/22, 1) to assess the convergent validity in French-speaking Belgium, Ireland, and Poland; 2) to assess the discriminant validity; 3) to assess the concurrent validity, both in French-speaking Belgium and Poland; and using data from the 2017/18 HBSC surveys, 4) to assess the concurrent validity across 45 HBSC countries.

Methods

This validation study was embedded in the HBSC study, a cross-national school-based survey addressing 11-, 13- and 15-year-old adolescent health behaviors, health status, and wellbeing using a standardized questionnaire [22]. Under the aegis of the World Health Organization Regional Office for Europe, the HBSC study is conducted every 4 y in Europe and Canada, in ~50 countries during the most recent rounds undertaken. More details on the HBSC study can be found in the protocol [22].

For the purpose of the present validation work, a specifically designed data collection was carried out in 2021/22 in French-speaking Belgium, Ireland, and Poland, during the pilot phase of the latest HBSC study. This data collection was referred to as the “body size perception validation survey.” In each country, approvals from institutional ethics committees were obtained, prior to data collection: Ethics Committee of the Faculty of Psychology of the Université libre de Bruxelles in Belgium (advice no. 172/2020), University of Galway Research Ethics Committee in Ireland (Ref. 2021.11.010), and the Warsaw Bioethics Committee of the Institute of Mother and Child in Poland (opinion no. 51/2021).

Population

This research primarily focused on 15-year-old adolescents for methodological reasons. This focus allowed for the use of appropriate silhouette scales that account for ongoing body changes, thereby providing reliable estimates of body size perception.

To be able to measure a Kappa of 0.6 with, among others, an expected proportion of adolescents perceiving themselves as “too thin” of 15% [28], a minimum sample size of 242 adolescents for each sex and each country was required [29]. To obtain

this sample, 1 or more classes were selected from 2 grade levels, including but not limited to 15-y-olds, in conveniently chosen schools. All adolescents in selected classes and their parents received an information letter inviting them to take part in the study. An active written consent in Ireland and Poland, and an opt-out consent in Belgium were chosen for parents. In all 3 countries, adolescents were free to choose whether to participate or not. All procedures used during data collection enabled confidentiality and anonymity [22].

Adolescents with missing data on sex, age, and body size perception were not included in any analysis. Nine out of 10 participants were aged between 14 and 16 y. Of note, 0.5% participants from the selected classes were aged 13 and 4.0% were aged 18. These adolescents were not excluded to avoid losing power in statistical analyses. In Belgium, Ireland, and Poland, 595, 127, and 615 boys and girls filled in the question on body size perception, respectively. Slightly fewer adolescents were included in each validation analyses, depending on missing data for the variables included in the respective analyses (Supplemental Figure 1).

Measures

Single-item HBSC question on body size perception

Five answers to the question “Do you think your body is...?” were given: “much too thin,” “a bit too thin,” “about the right size,” “a bit too fat,” and “much too fat.” Constrained by the small sample size of the end-of-scale categories, 3 categories were created from these 5 answers, by combining the first 2 (“too thin”) and the last 2 (“too fat”).

Main variables

Body dissatisfaction. Silhouettes scales are frequently used to assess body image disturbance [20]. Given the population age, the set of 7 adult silhouettes presented by Collins and derived from Stunkard was used [30]. Adolescents were asked to select first, the silhouette that best represented their current body size and second, the silhouette that matched their ideal body size. Body dissatisfaction was then measured using a discrepancy score between “ideal” and “current” silhouettes [20]. Three categories were created on the basis of this discrepancy score: 1) desire to be larger (current < ideal); 2) satisfied (current = ideal); and 3) desire to be thinner (current > ideal). In Poland, Stunkard’s scale composed of 9 silhouettes [31] (on which the Collins’ silhouettes are based) was inadvertently used for the ideal and current silhouettes, but the same 3 categories were derived from the discrepancy scores.

Social desirability. The short form A of the validated “Children’s Social Desirability Questionnaire” was used [32]. Socially desirable responses to the 12 items were assigned a value of 1, otherwise 0. Adolescents with 2 or more missing items were excluded from analyses. If adolescents had 1 single missing item, that item was imputed a value of “1” if most of their responses were classified as socially desirable, otherwise of “0.” This reduced the rate of missing data for this variable from 6.4% to 4.3%. Items were then summed up to obtain a score ranging from 0 to 12. The higher the score, the greater the tendency to respond in a socially desirable manner.

Self-esteem. Self-esteem was assessed using the validated Rosenberg scale, which consists of 10 items with responses on a 4-point Likert scale ranging from “strongly agree” (3 points) to “strongly disagree” (0 points) [33]. Negative items were first scored in reverse order. Adolescents with 2 or more missing items were excluded from analyses. If adolescents had 1 missing item, the value of that item was imputed as “2” if most of their responses were positive, otherwise as “1.” This reduced the rate of missing data for this variable from 9.0% to 5.2%. Afterward, all the scores were added together to range from 0 to 30. The higher the score, the higher the self-esteem.

BMI. BMI was calculated as the ratio of the selfreported weight in kilograms to the squared selfreported height in meters. Adolescents were classified into 3 groups using age- and sex-specific cut-off points on the basis of Cole and Lobstein: underweight (defined by the centile curve passing through BMI = 18.5 at 18), normal weight, and overweight/obesity (defined by the centile curve passing through BMI = 25 at 18) [34].

Covariates

To accurately assess the association of body size perception with the main variables and to control for potential confounding, several covariates were considered on the basis of their known association with body size perception. These included continuous age [28], country of data collection [28], Family Affluence Scale (FAS) [28,35], and migration status [36,37]. The FAS is a validated brief assets-based measure of family wealth composed of 6 items designed for adolescents [38]. The corresponding score ranged from 0 to 13 and was divided in quintiles and then grouped in 3 categories, by country. The first group (first quintile) corresponded to adolescents with a “low” FAS, the second group (second to fourth quintiles) to adolescents with a “medium FAS,” and the third group (fifth quintile) to those with a “high” FAS.

Migration status. Migration status was computed with the adolescents’ country of birth and that of their parents. Adolescents whose parents were born in the studied country were classified as “natives.” Adolescents born in the studied country with ≥ 1 parent born abroad were grouped as “2nd-generation immigrants.” Foreign-born adolescents with parents not born in the studied country were considered as “first-generation immigrants.” No migration data was collected in Ireland.

Statistical analyses

All analyses were stratified by sex because boys and girls experience different body changes and body size perception differs between the 2. Descriptive analyses were first performed on adolescents with available data on body size perception (see Supplemental Figure 1) to show its distribution by country and by sex, with both datasets. Ireland could not be reliably included in the following country-stratified analyses of the body size perception validation survey, because of the small sample size and missing migration status data, where relevant.

The convergent validity, a type of construct validity, aims to assess the degree of convergence between 2 measures intended to evaluate the same construct, one of which is a more comprehensive and complex reference measure that is difficult to

include in large surveys [39]. In this study, the convergence between body size perception (single-item HBSC question) and body dissatisfaction (silhouette scales), that is, the reference measure, was tested with the Cohen’s Kappa (linear weight). The convergence was assessed for Belgium, Ireland, and Poland together, and for Belgium and Poland separately. Ireland was not included in the country-stratified analyses as only 70 adolescents had data on both variables. As Cohen’s Kappa is a more robust statistic than the percent agreement, a value higher than 0.6 is considered as a moderate and acceptable agreement, and higher than 0.8 as a strong agreement [40].

The discriminant validity, a type of construct validity, aims to assess if 2 theoretically different constructs are indeed unrelated [39]. Social desirability was chosen because it was highlighted to be weakly or not associated with other subconstructs of body image [41]. Its association with body size perception was assessed using multinomial logistic regressions for Belgium and Poland together, with age, FAS, migration status, and country of data collection as covariates.

The concurrent validity, a criterion-related validity, measures the ability of the indicator to distinguish between groups that it should be able to distinguish, on the basis of a criterion measured at the same time [39]. First, it was examined by investigating the association between body size perception and selfesteem, an

indicator strongly associated with body image [42,43]. Multinomial logistic regressions, adjusted for age, FAS, migration status, and country, were conducted for Belgium and Poland together.

Second, the concurrent validity was assessed with BMI using the data from 45 countries from the 2017/18 HBSC survey (details on this survey are available elsewhere [22]). The association between the single-item HBSC question and BMI categories was explored with multilevel multinomial logistic regressions (level 1: adolescents and level 2: country), adjusted for age and FAS. FAS being not available in Armenia, the multivariate analyses were conducted on 44 instead of 45 countries.

A P value of <0.05 was considered as significant. Analyses were performed using Stata/IC 17®.

Results

The characteristics of adolescents participating in the body size perception validation survey are displayed in Table 1. The median age was 15 y in Belgium and Poland, and 14 y in Ireland. Although almost all adolescents in Poland were natives, only half in Belgium were. Across all countries, more than two-thirds had a normal weight status (Table 1). Body size perception did not significantly differ across countries but did vary by sex (Table 2).

TABLE 1

Characteristics of participating adolescents with data on body size perception, by country – body size perception validation survey, 2021/22, Belgium, Ireland, and Poland.

	Belgium (<i>n</i> _{max} = 595)	Ireland (<i>n</i> _{max} = 127)	Poland (<i>n</i> _{max} = 615)	<i>P</i> ¹
Gender				0.06
Boys	40.0	51.2	43.4	
Girls	60.0	48.8	56.6	
Age, y	15 (15–16)	14 (14–16)	15 (15–15)	<0.001
Body size perception				<0.001
Too thin	16.8	13.4	16.9	
Right body size	43.7	52.8	37.4	
Too fat	39.5	33.9	45.7	
BMI ² , kg/m ²				0.86
Underweight	11.6	13.0	10.2	
Normal weight	70.2	74.1	70.7	
Overweight/obesity	18.2	12.9	19.1	
Body dissatisfaction ³				0.01
Desire to be larger	19.1	15.7	17.5	
Satisfied	36.4	41.4	28.6	
Desire to be smaller	44.5	42.9	53.9	
Social desirability ⁴	4 (3–6)	4 (3–6)	5 (3–6)	0.59
Selfesteem ⁵	19 (14–23)	17 (12–21)	16 (12–20)	<0.001
Family Affluence Scale ⁶				0.02
Low	22.4	20.6	18.1	
Medium	55.7	63.5	65.0	
High	21.9	15.9	16.9	
Migration status ⁷				<0.001
Natives	48.9	N/A	95.2	
Second-generation immigrants	35.1	N/A	2.5	
First-generation immigrants	16.0	N/A	2.3	

Abbreviation: N/A, not applicable.

¹ χ^2 test or Kruskal–Wallis test.

² *n*_{Belgium} = 553, *n*_{Ireland} = 54, and *n*_{Poland} = 539.

³ *n*_{Belgium} = 571, *n*_{Ireland} = 70, and *n*_{Poland} = 583.

⁴ *n*_{Belgium} = 583, *n*_{Ireland} = 94, and *n*_{Poland} = 603.

⁵ *n*_{Belgium} = 585, *n*_{Ireland} = 93, and *n*_{Poland} = 590.

⁶ *n*_{Belgium} = 580, *n*_{Ireland} = 126, and *n*_{Poland} = 602.

⁷ *n*_{Belgium} = 575, *n*_{Ireland} = 0, and *n*_{Poland} = 609.

TABLE 2

Sex-stratified body size perception in adolescents by HBSC participating country—Body size perception validation survey, 2021/22, Belgium, Ireland, and Poland.

	Boys				P ¹	Girls				P ¹	P ²
	n	Too thin (%)	Right (%)	Too fat (%)		n	Too thin (%)	Right (%)	Too fat (%)		
All	570	25.1	46.3	28.6	0.06	767	10.2	38.2	51.6	0.12	<0.001
Belgium	238	24.0	50.4	25.6		357	12.0	39.2	48.8		<0.001
Ireland	65	20.0	56.9	23.1		62	6.4	48.4	45.2		0.009
Poland	267	27.3	40.1	32.6		348	8.9	35.3	55.8		<0.001

¹ χ^2 test across countries.

² χ^2 test between sexes.

Overall, more than half of the boys and girls perceived themselves as either “too thin” or “too fat” (Table 2). About a quarter of boys perceived themselves as “too fat” in each country and half of girls perceived themselves as such.

In 2017/18, in HBSC countries, the proportion perceiving themselves as “too thin” ranged from 13.5% (Greenland) to 28.9% (Ireland) among boys, and from 6.1% (Italy) to 21.7% (Georgia and Azerbaijan) among girls (Supplemental Table 1). The proportion of boys perceiving themselves as “too fat” ranged from 9.5% (Azerbaijan) to 31.4% (Poland). It ranged from 9.3% (Azerbaijan) to 51.6% (Poland) among girls. In all countries, proportionally more boys perceived themselves as having the right body size than as being “too thin” or “too fat.” In contrast, in all countries except Armenia and Azerbaijan, more girls perceived themselves as “too fat” than “too thin.” Except for Albania, Armenia, and Bulgaria, body size perception differed according to sex (Supplemental Table 1).

Convergent validity

The proportion of boys and girls perceiving themselves as “too thin” decreased from “desired to be larger” (69.9% for boys and 70.9% for girls) to “satisfied” (15.8% for boys and 5.5% for girls), and from “satisfied” to “desire to be thinner” (0.6% for boys and 0.7% for girls) (Figure 1). The opposite trend was observed regarding the proportion of adolescents perceiving themselves as “too fat.” Among those who were satisfied with

their body, three-quarters perceived themselves as “about the right size.” However, twice as many boys satisfied with their body perceived themselves as “too thin” than “too fat,” whereas 3 times as many satisfied girls perceived themselves as “too fat” than “too thin.” Among boys who desired to be larger or to be thinner, an equal proportion of boys perceived themselves as the opposite counterpart of their desire, i.e., as “too fat” or as “too thin,” respectively. Compared with those who desired to be smaller, girls who desired to be larger are 7 times more to perceive themselves as “too fat” (Figure 1).

For all 3 countries together and Belgium and Poland separately, consistent moderate agreements were found among boys and girls (Figure 1). The linearly weighted Cohen’s Kappa [95% confidence interval (CI)] between body size perception and body dissatisfaction was 0.67 (0.62, 0.72) for boys and 0.64 (0.59, 0.69) for girls, in all the 3 countries (Figure 1).

Discriminant validity

The mean social desirability score was higher among boys and girls perceiving themselves as having the right body size and lower among those perceiving themselves as “too thin” (Table 3). In univariate multinomial logistic regressions, social desirability was significantly associated with body size perception, except for boys perceiving themselves as “too fat” [cRRR (95% CI): 0.93 (0.85, 1.01)] (data not shown). After adjusting for covariates, the associations did not change: the higher the social desirability, the

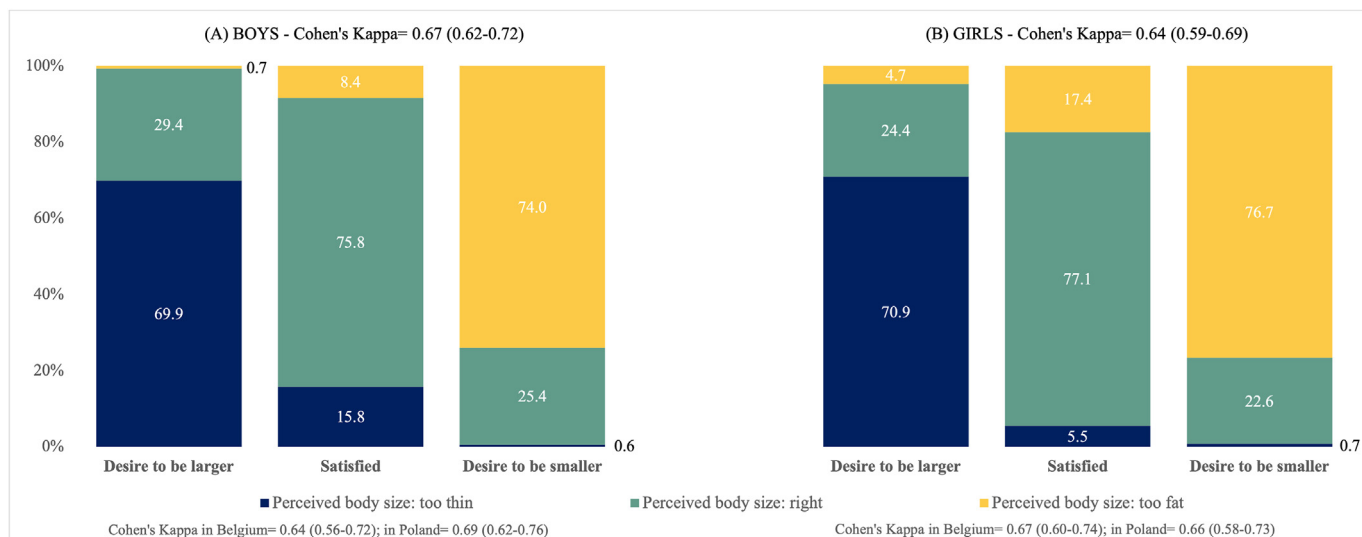


FIGURE 1. Sex-stratified distribution of perceived body size among the categories of body dissatisfaction in all the 3 countries and Cohen’s Kappa – body size perception validation survey, 2021/22, Belgium, Ireland, and Poland.

TABLE 3

Sex-stratified multivariate multinomial logistic regression to study the association between perceived body size (*Ref. right body size*) and (A) social desirability or (B) self-esteem – body size perception validation survey, 2021/22, Belgium and Poland.

	Boys (n = 475)				Girls (n = 669)					
	Too thin		Right	Too fat		Too thin		Right	Too fat	
	aRRR (95% CI) ¹	P		aRRR (95% CI) ¹	P	aRRR (95% CI) ¹	P		aRRR (95% CI) ¹	P
(A)										
Social desirability ²	0.83 (0.75, 0.91)	<0.001		0.91 (0.83, 0.99)	0.04	0.78 (0.69, 0.89)	<0.001		0.84 (0.78, 0.90)	<0.001
Age	0.97 (0.77, 1.23)	0.83		0.95 (0.76, 1.18)	0.64	1.02 (0.75, 1.38)	0.90		1.03 (0.86, 1.24)	0.76
FAS (<i>Ref. High</i>)		0.01			0.09		0.24			0.13
Medium	0.47 (0.25, 0.90)			0.53 (0.29, 0.97)		0.82 (0.42, 1.61)			0.89 (0.58, 1.37)	
Low	0.93 (0.44, 2.00)			0.76 (0.36, 1.60)		0.48 (0.20, 1.16)			0.61 (0.36, 1.03)	
Migration status (<i>Ref. Natives</i>)		0.41			0.54		0.33			0.48
Second-generation immigrants	1.59 (0.78, 3.22)			1.46 (0.75, 2.87)		0.74 (0.34, 1.60)			0.80 (0.48, 1.32)	
First-generation immigrants	1.41 (0.62, 3.20)			1.22 (0.56, 2.69)		0.39 (0.11, 1.44)			0.70 (0.37, 1.36)	
Country (<i>Ref. Belgium</i>)		0.004			0.008		0.18			0.84
Poland	2.29 (1.30, 4.04)			2.05 (1.20, 3.49)		0.66 (0.36, 1.21)			1.04 (0.70, 1.54)	
	Boys (n = 465)				Girls (n = 659)					
(B)										
Self-esteem ³	0.96 (0.92, 1.00)	0.04		0.93 (0.90, 0.97)	<0.001	0.92 (0.87, 0.96)	0.001		0.85 (0.82, 0.88)	<0.001
Age	0.96 (0.76, 1.21)	0.72		0.94 (0.75, 1.17)	0.56	1.00 (0.74, 1.35)	1.00		1.05 (0.86, 1.27)	0.66
FAS (<i>Ref. High</i>)		0.02			0.13		0.35			0.54
Medium	0.55 (0.29, 1.05)			0.61 (0.33, 1.13)		0.88 (0.45, 1.71)			0.95 (0.60, 1.50)	
Low	1.18 (0.55, 2.53)			0.97 (0.45, 2.08)		0.53 (0.22, 1.30)			0.75 (0.43, 1.32)	
Migration status (<i>Ref. Natives</i>)		0.57			0.60		0.29			0.54
Second-generation immigrants	1.44 (0.71, 2.91)			1.42 (0.72, 2.81)		0.76 (0.35, 1.64)			0.78 (0.46, 1.34)	
First-generation immigrants	1.29 (0.57, 2.93)			1.09 (0.48, 2.44)		0.36 (0.10, 1.33)			0.72 (0.35, 1.48)	
Country (<i>Ref. Belgium</i>)		0.10			0.18		0.07			0.22
Poland	1.61 (0.91, 2.84)			1.45 (0.84, 2.50)		0.56 (0.30, 1.04)			0.77 (0.50, 1.17)	

Abbreviations: CI, confidence interval; FAS, Family Affluence Scale.

¹ Adjusted relative risk ratios and their 95% CIs.

² Mean ± SEM: too thin_{boys}: 4.26 ± 0.22, right_{boys}: 5.27 ± 0.18, and too fat_{boys}: 4.81 ± 0.19 and too thin_{girls}: 3.79 ± 0.23, Right_{girls}: 5.17 ± 0.17, and too fat_{girls}: 4.15 ± 0.12.

³ Mean ± SEM: too thin_{boys}: 18.14 ± 0.57, right_{boys}: 19.68 ± 0.39, and too fat_{boys}: 16.94 ± 0.54 and too thin_{girls}: 16.11 ± 0.63, Right_{girls}: 18.84 ± 0.36, and too fat_{girls}: 13.66 ± 0.31.

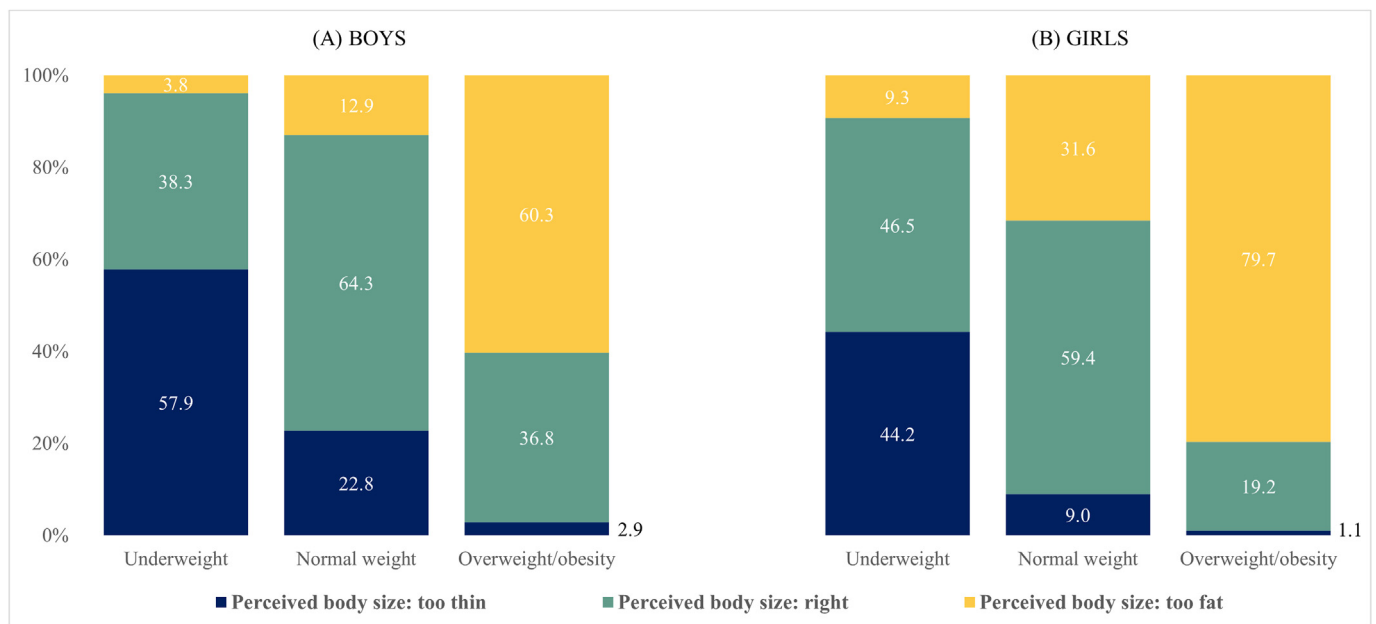


FIGURE 2. Distribution of perceived body size among boys and girls with underweight, normal weight, and overweight/obesity – 2017/2018 HBSC survey, 45 countries.

less likely boys and girls were to report perceiving themselves as “too thin” or as “too fat” than having “about the right body size” (Table 3). However, 1 exception should be noted: the association for boys perceiving themselves as “too fat,” which was close to significance in univariate [0.93 (0.85, 1.01) – data not shown], became significant because of the combined effect of all covariates in multivariate analyses.

Concurrent validity

In the body size perception validation survey, the mean self-esteem score was higher among boys and girls perceiving themselves as having the right body and lower among those perceiving themselves as “too fat” (Table 3). The higher the self-esteem score, the less likely boys and girls were to perceive themselves as “too thin” or “too fat” than having about the right body size (Table 3). On the basis of the association measures and their confidence intervals, this trend was more pronounced among girls perceiving themselves as “too fat” compared with boys with the same perception, although the association remained weak. Of note, the associations were similar between univariate and multivariate logistic regressions for both sexes (data not shown).

Additionally, on the basis of the 2017/18 survey, in all countries together, the proportion of boys and girls perceiving themselves as “too thin” decreased for adolescents with underweight (57.9% for boys and 44.2% for girls) to overweight and obesity (2.9% for boys and 1.1% for girls), adolescents with normal weight being in an intermediate position (22.8% for boys and 9.0% for girls) (Figure 2). The opposite trend was noted regarding the proportion of adolescents perceiving their body as “too fat.” In addition, the proportion of adolescents perceiving themselves as “about the right body size” was higher in boys and girls with normal weight than in those with underweight and overweight/obesity; it was higher in boys and girls with underweight than in adolescents with overweight/obesity (Figure 2). The same trends were observed in the body size perception validation survey sample (data not shown).

In the multivariate logistic regression using the 2017/18 data, body size perception was significantly positively associated with BMI (Table 4). The likelihood of perceiving themselves as “too thin,” rather than about the right body size, was higher among boys and girls with underweight (and lower for adolescents with overweight or obesity) than with normal weight. The opposite pattern was observed for boys and girls perceiving themselves as “too fat” (Table 4). Of note, the associations were similar between univariate and multivariate multinomial logistic regressions for both sexes (data not shown). These trends were verified in most countries, analyzed separately (data not shown).

Discussion

This cross-national study aimed to validate the HBSC “body size perception” question among adolescents using multidimensional validation components. Our results pointed to good convergent, discriminant and concurrent validity of the single-item HBSC question. A moderate level of agreement was observed between the HBSC “body size perception” item and body dissatisfaction. Although the opposite was first hypothesized, the single-item body size perception question was associated with social desirability. As expected, body size perception was also found to be associated with self-esteem and positively associated with BMI.

Body size perception is one of the many facets of the complex psychological construct of body image. Body image encompasses “self-perception and attitudes (i.e., thoughts, feelings, and behaviors) vis-a-vis one’s own body,” and consists of affect and investment [1]. Body image is usually not studied as a whole but through 1 or more several specific dimensions. However, the terms, especially related to body size, are often used interchangeably in the growing literature [25,27]; hence, the need to clarify the differences to understand the subtleties related to the subject. Although all the dimensions can be said to involve body perception and related attitudes, they differ in the part of the

TABLE 4 Sex-stratified multilevel multinomial logistic regression to study the association between perceived body size (Ref. right body size) and BMI (Ref. Normal weight) – 2017/2018 HBSC survey, 44 countries.

	Boys (n = 27,924)			Girls (n = 29,973)		
	Too thin	Right	Too fat	Too thin	Right	Too fat
	aRRR (95% CI) ¹	P	aRRR (95% CI) ¹	P	aRRR (95% CI) ¹	P
BMI (Ref. Normal weight)						
Underweight	4.49 (4.10, 4.92)	<0.001	0.52 (0.42, 0.65)	<0.001	6.34 (5.85, 6.88)	<0.001
Overweight/obesity	0.22 (0.19, 0.26)		8.30 (7.73, 8.91)		0.39 (0.29, 0.54)	
Age	1.07 (0.98, 1.17)	0.15	0.89 (0.81, 0.98)	0.02	0.81 (0.73, 0.90)	<0.001
FAS (Ref. High)		<0.001		0.09		<0.001
Medium	1.23 (1.13, 1.34)		1.06 (0.96, 1.16)		1.62 (1.46, 1.80)	
Low	1.07 (1.00, 1.16)		1.07 (0.99, 1.16)		1.27 (1.15, 1.39)	
Intercept	0.12 (0.03, 0.46)	0.002	1.06 (0.24, 4.75)	0.94	3.06 (0.57, 16.37)	0.19

Abbreviations: CI, confidence interval; FAS, Family Affluence Scale.

¹ Adjusted Relative Risk Ratios and their 95% CIs.

body to which they refer. Thus, body size refers to one’s own size, including factors such as height, weight, and shape [18]. Body size therefore encompasses weight and body shape. The former refers to the quantitative measurement of body mass whereas the latter includes the overall body proportions and distribution of fat.

Body dissatisfaction is often used interchangeably when referring to body size perception or its components [44]. Indeed, body dissatisfaction extends beyond mere perception and encompasses the discrepancy between one’s current and ideal body [20]. This is possibly why a moderate Kappa was observed between the HBSC body size perception question and body dissatisfaction computed with the silhouette scales. Despite this theoretical distinction from body size perception, and in the absence of a true gold standard, body dissatisfaction was used to assess the convergent validity of the HBSC question because it is 1 of the closest valuable concepts to body size perception [20, 45].

Body perception is greatly influenced by how closely one believes their body matches with or deviates from the internalized ideal [11,46]. The concept of an ideal body is implicit in the HBSC question, leading to the conclusion that both concepts must converge toward the same construct. However, the association is neither perfect nor strong. First, the notions of current and ideal body are explicitly mentioned in 1 question each for body dissatisfaction. Conversely, both concepts are implicitly included in the single-item question on body size perception. Consequently, adolescents may assign varying importance to either concept in their responses, on the basis of what matters most to them. Second, the use of drawings may impart a different response from adolescents than descriptors. In fact, the tangible nature of the drawings could potentially reveal unsatisfied adolescents, who would not have categorized themselves as such with abstract descriptors, as they would not be consciously aware of their dissatisfaction. Lastly, “right size” as an answer was proposed with the single-item body size perception question, whereas no mention or guidance for what was considered “right” was provided with the silhouettes. In addition, to be classified as “right size,” the same silhouette for both scales had to be selected, irrespective of the position. This represents a significant distinction between the tools, potentially accounting for the moderate agreement [i.e., 0.67 (0.62, 0.72) for boys and 0.64 (0.56, 0.72) for girls] found between the 2. However, on the basis of the aforementioned differences and similarities between the 2 tools, we are inclined to conclude that the HBSC single-item question does effectively measure body size perception. Therefore, the question is suitable for measuring this construct.

The mention of “right” in the HBSC answer could also partly explain the association between body size perception and social desirability. To some extent and in conjunction with the other answer options containing adverbs of degree, social desirability cannot be ruled out to play a role in the HBSC question; those who were most subject to social desirability may have thought that “about the right size” was the most acceptable answer to the question [47]. Yet social desirability was initially chosen to assess the discriminant validity. In fact, body size perception was intended to be free of social desirability, in line with the literature on silhouettes [41]. However, a relatively moderate association was found between the 2 concepts. As a result, we can conclude that the single-item HBSC question encompasses

personal perception of body size, which is partly shaped by the perception of what others think.

The related results imply that the more adolescents responded in a socially desirable manner, the less dissatisfied they were with their bodies. With the extensive promotion of body positivity on social media, today's adolescents in high-income countries may better accept their body size, whatever that may be, stepping away from the *thinspiration* or *fitspiration* phenomena [48].

Self-esteem and BMI are well known to be each strongly associated with components of body image [14–17,42,43], and were thus involved in the assessment of the concurrent validity. In our survey, self-esteem was weakly associated with body size perception for both sexes. Among the potential underlying mechanisms are social concerns about appearance in girls, and negative ratings of attractiveness in boys [42]. The weak association we found reveals that self-esteem and the single-item HBSC body size perception question may not play a prominent role in relation to each other, unlike other subconstruct of body image [42].

In line with the literature [14–17], a strong association between BMI and body size perception was found for both sexes. Noteworthy, despite being in the healthy weight category, one-fifth of boys perceived themselves as “too thin” and one-third of girls perceived themselves as “too fat.” The discrepancy between the reality and their perception could be explained in part by the sex-specific ideals that develop during adolescence [49]. Girls might experience societal pressure to conform to the thin feminine ideal, when they are already usually more concerned about their weight and appearance. For boys, the emphasis is on bulking up, although leanness may also be promoted in some groups [49]. These sex-specific ideals could also partially account for the stronger inverse association between self-esteem and perceiving oneself as “too fat” in girls than boys. These viewpoints on ideals have been upheld for many years in high-income countries, yet further research is required to delve into the sex-specific association between BMI, self-esteem, and body size perception. In addition, the recent shifts in body portrayal by both social media and the fashion industry could have led to different underlying mechanisms.

Our BMI-related findings indicated that body size perception did not solely reflect weight status. In fact, body size perception incorporates subjectivity and encompasses other factors than body weight, such as body shape. Such a distinction between body size perception and BMI highlights the importance of considering both concepts simultaneously in research with the final aim to improve the overall health of adolescents. Weight underestimation can be concerning, as it leads to a disregard for the actual weight status and thus for the associated health risks of being overweight [17]. Similarly, weight overestimation can also be an issue if excessive behaviors such as eating disorders are adopted [17]. However, it may help some adolescents to engage in healthy eating and physical activity behaviors with the positive support of family and health practitioners.

Strengths and limits

This research is the first multidimensional validation of the HBSC single-item question on body size perception. The analyses were carried out on 2 different surveys conducted before and after the COVID-19 pandemics. The BMI-related findings

based on pre-COVID data should be further confirmed, as youth mental health may have been affected when the validation study was carried out [50]. It is, however, worth noting that, in the body size perception validation survey carried out in 2021/22, the conclusion on the association between BMI and body size perception was consistent with the present results (data not shown), further supporting the 2017/18-based conclusions.

One of the main strengths of this study consists of the culturally diverse sample, including in terms of body size perception, obtained by including 45 countries across Europe in 2017/18 and 3 countries of different European regions in the body size perception validation survey. However, Ireland was only included in the analysis on convergent validity, because of its small sample size. Although the sample remained diversified, it would also have been beneficial to confirm the results in more diverse countries, such as Southern European countries. Moreover, body image contains a strong origin-based component [36, 37]. Thus, our analyses carried out with the body size perception validation survey were also adjusted for migration status. However, migration status was found to not change the association between body size perception and 1) self-esteem and 2) social desirability (data not shown).

It should be noted that the same underlying questions were asked but, inadvertently, 2 different sets of silhouettes were used: Collins' derived from Stunkard in Belgium and Ireland, Stunkard in Poland. The method of computing body dissatisfaction mitigated the possible impact of the number of silhouettes. Furthermore, the consistent Kappa values observed across the countries indicate that our results were not influenced by the specific type or number of silhouettes used, further supporting the convergent validity of the HBSC question. Nonetheless, although the silhouette scales are recognized as valuable [20], the convergent validity could not be assessed with a gold standard, because of the absence of such a reference.

The concurrent validity was secondly assessed with BMI, computed with self-reported weight and height. Although discrepancies between self-reported and measured BMI exist [51], both types measures have been shown to be strongly associated with body size perception [14–17], reducing the impact of measurement choice on validity assessment. However, further studies incorporating both self-reported and measured BMI are recommended to provide a more comprehensive understanding of the constructs assessed by the HBSC question on body size perception.

Further research with a broader age range is also needed to confirm the overall validity of the HBSC question. Our analyses were adjusted on age, but age-specific analyses could not be performed because of the limited variability in age. Indeed, our investigation was purposely centered around 15-y-olds, as established silhouette scales can be used with them. Including a wider age range would have required different silhouette scales better suited to the various stages of adolescent development. However, there is currently no consensus on which silhouettes and methodology are most appropriate for younger adolescents.

Lastly, test-retest reliability could not be assessed within this survey, but previous research has demonstrated good reliability [22,23].

In conclusion, our study highlighted good convergent, discriminant, and concurrent validity of the single-item HBSC

body size perception question. It emphasized that the HBSC question measures an individual's perception of their body size, considering 1) their ideal and 2) the societal expectations associated with the body size norm. Unlike other body image indicators, the HBSC body size perception question was weakly associated with self-esteem, which suggested an ancillary nature of self-esteem. Henceforth, findings from studies using the HBSC "body size perception" question must be interpreted in light of these findings.

We encourage the use of the validated HBSC question on body size perception in studies beyond the HBSC network, and aiming to measure what this question is designed to assess. This single-item question is appropriate for large-scale surveys aiming at studying body size perception among adolescents and is complementary to body weight status using BMI. Identifying adolescents who negatively perceive their body size, whatever their body weight status, will help to develop and implement preventive actions against associated psychological problems and eating disorders.

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Author contributions

The authors' responsibilities were as follows – TL, KC: designed research; TL, AD, CK, CM, KC: conducted research; MR: analyzed data; MR, KC: drafted the article; MR: had primary responsibility for final content; and all authors: read and approved the final manuscript.

Conflict of interest

The authors report no conflicts of interest.

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Data availability

Data described in the manuscript, code book, and analytic code will be made available upon reasonable request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.cdnut.2024.104445>.

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