Overestimation of body weight and its association with parental, teacher and peer support: evidence from the Israeli Health Behaviours in Schools survey

Shir Ben-Yaish[1], Riki Tesler[2], Mona Boaz[1], Yossi Harel Fisch[3] and Vered Kaufman-Shriqui[1,]*

[1]Department of Nutrition Sciences, School of Health Sciences, Ariel University, Kiryat Hamada 3, Ariel 4076405, Israel: [2]The Department of Health Systems Management, School of Health Sciences, Ariel University, Ariel, Israel: [3]School of Education, Bar Ilan University, Ramat Gan, Israel

Abstract

Objective: To investigate the association between family, teachers and peer support patterns on gaps in adolescent's weight perceptions.

Design: A cross-sectional, school-based survey collected information on weight and height, weight perception, socio-economic and family characteristics and social support. Principal component analysis (PCA) was performed to capture social support patterns (SSP). Multivariable logistic regression was used to model adolescent weight perception, including SSP adjusted for demographic variables.

Setting: The 2014 Israeli Health Behaviours in School-Aged Children (HBSC) survey.

Participants: Adolescents aged 11–18 years (*n* 7563).

Results: In total, 16·1 % of the boys and 10·7 % of the girls were overweight or obese. Most participants perceived their size accurately. Body size was underestimated by 25·6 % of the boys and 15·1 % of the girls, while 15·2 % of the boys and 27·7 % of the girls overestimated their body size. PCA generated three SSP accounting for 81·9 % of the variance in social support. Female sex and higher SES increased odds of overestimating body size. Students in the top quartile (Q4 *v.* Q1–Q3) of family support and teacher support were less likely to overestimate their body size. Good parental communication reduced the odds of body size overestimation in middle school students. Male sex and higher family support increased odds of underestimation.

Conclusions: Significant support from parents and teachers was associated with accurate weight perceptions; thus, support skills may be amenable to intervention. Efforts should be made to educate adolescents on healthy weight.

Adolescents often inaccurately perceive their body weight, and this is a risk factor of negative self-perception[1], engagement in unhealthy weight-control behaviours and disordered eating behaviours[2,3].

It has been shown that inaccurate body weight perception in adolescents persists to adulthood[4]. Despite the substantial percentage of adolescents who are objectively overweight or obese (OWOB), findings from Europe indicate that many do not perceive themselves as such[5]. Overweight and obesity rates in Israel are high among adolescents; in the 2014 Health Behaviours in School-Aged Children (HBSC) multinational survey, overweight rates of children aged 11, 13 and 15 years were 14 % among girls

at all ages and 26 %, 20 % and 25 %, respectively, among boys[6]. Overweight adolescents with an accurate perception of their weight are more likely to attempt appropriate weight control behaviours, such as decreased energetic intake and increased physical activity[5,7]. On the other hand, underestimation, such as regarding oneself as normal weight or thin while being OWOB, may lead to lower participation rates in weight control programmes due to the misconception[8,9].

Research has focused on the development of body image and its association with significant relationships. According to the ecologic model of health, interactions with family, teachers and peers provide the social context in

Corresponding author: Email veredks@ariel.ac.il

which adolescents shape their health perceptions, attitudes and behaviours[10–13]. According to the Youth Resiliency Model[14], adolescents are primarily influenced by the presence of a significant adult in their lives, positive daily school experiences, a sense of self-worth and positive social connectedness with peers. Adolescents who report communication interactions with their parents are more likely to rate their health positively, have fewer psychological complaints and report greater life satisfaction[15]. Additionally, studies have shown that adolescents with better parent–adolescent relationships are less likely to experience body dissatisfaction[16].

Positive relationships with non-family adult mentors (mainly teachers or guidance counselors) have been related to increased physical health, self-esteem, life-satisfaction, graduating from high school and decreased levels of risk behaviours[17]. However, higher perceived support from teachers was not found to moderate the inverse association between high BMI and quality of life measures among adolescents[18].

During adolescence, perceived peer support plays a protective role against anxiety, depression and behavioural distress. Peer support was found to influence adolescent eating behaviours, possibly by supporting positive body satisfaction, which in itself has a protective role against maladaptive eating behaviours (e.g. restrictive dieting, binge eating and purging)[19]. Peer support is also considered an indicator of social connectedness[20].

While the influence of parents, teachers and peers on numerous health behaviours (e.g. smoking and suicidal behaviours) is well established[21–23], information is limited on how contextual and social support patterns shape adolescent weight perception and in what way the accuracy of weight perception is related to actual body weight.

In the present study, we leveraged a country-wide, representative sample of adolescents with the objective of investigating how support from parents, teachers and peers interact to influence the accuracy of adolescent body image.

Methods

Participants

The 2014 Israeli HBSC study surveyed 7563 students (49·6 % male, 50·4 % female) in grades 6 to 12 (ages 11 to 18 years)[21]. In brief, the HBSC is a school-based survey of adolescent health behaviours and socio-economic determinants, conducted in a representative sample of school children, using an international standardised methodological protocol[24,25]. A clustered sample of students in grades 6 to 12 (303 schools) was selected through weighted probability methods to obtain a balanced representation of school population characteristics. School characteristics used for stratification included the language of instruction (Hebrew or Arabic) and type of school (secular public

school or religious public school). Students in private schools, schools for children with special needs, schools for incarcerated youth and schools serving ultra-orthodox Jewish populations were excluded. Response rates were 303/337 (90·0 %) at the school level. The most common reasons for nonparticipation were failure to return the informed consent form, failure to receive parental consent and absence on the day of survey administration. All students in sampled classrooms present on the day of the survey were included (> 95 % pupil response). The current study focused on Hebrew speakers only.

Measures

Socio-demographic measures

Age group students were divided into two groups according to school type: middle school *v.* high school.

Family affluence. The Family Affluence Scale, a composite measure of six questions, was used as an indicator of socio-economic status[26,27]. Answers were ranged on a scale from 0 to 13 and later categorised as low (0–6), medium (7–9) or high (10–13) family affluence[26,27].

Peer and family support. Was measured using part of the Multidimensional Perceived Social Support Scale, with a higher score indicating higher social support. The revised version of the scale, which is a twelve-item questionnaire developed by Zimet *et al.*[28], measures perceived support from family (4 items), friends (4 items) and significant others (4 items), with the sum score ranging from 4 to 28 for each subscale. In the original Israeli 2014 HBSC survey, only two scales were included: perceived support from family and friends. Family support was measured by the following questions: (1) whether they felt that their family really tries to help them; (2) whether they could get emotional support from their family when they needed it; (3) whether they can talk to their family about problems and (4) whether their family is prepared to help them make decisions. Peer support was measured by the following questions: (1) whether respondents perceived that their friends really try to help them; (2) whether they could count on their friends when things go wrong; (3) if they have friends with whom they can share their sorrows and joys and (4) whether they can talk to their friends about their problems. This instrument provides response options ranging from 0 to 7 (very strongly disagree to very strongly agree)[28].

Teacher support. Three items in the questionnaire measured teacher support: "'I feel my teacher accepts me as I am'", "'I feel that my teachers care about me as a person'" and "'I feel a lot of trust in my teachers'"[17].

Dimension reduction. Dimension reduction was performed using the principal component analysis (PCA) to create psychosocial indices for inclusion in statistical models[29]. PCA procedures were applied to all variables of peer support, family support and teacher support as indicated above. Variables were included based on the condition that

correlations were greater than $r = 0.35$. PCA was performed using the eight peer and family support questions. The first factor accounted for 78·38 % of the total variance. Factor loadings are presented in supplemental Table S1.

Later, quartile cut points were later calculated (Q1–Q4) from the continuous factors, such that Q1 indicated strong disagreement, and Q4 indicated strong agreement.

Communication with parents. Participants was asked about how easy it is for them to talk to their fathers, stepfathers, mothers and stepmothers about things that really bother them. Two separated variables were generated: one for communication with the father and the other for communication with the mother. Five response choices were provided (0 do not have or see this person; 1 = very difficult; 2 = difficult; 3 = easy and 4 = very easy). The resulting father and mother communication variables were dichotomised and recoded as 'very easy/easy' and 'difficult/very difficult'[15].
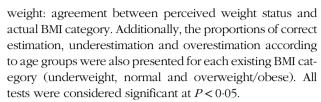
Anthropometric measures. Participants reported on their current height (in metres) and weight (in kilograms (kg)). BMI was calculated as weight in kilograms divided by height in metres squared (weight (kg)/height (m²)). We used the WHO growth reference for children aged 5–19 years to compare the prevalence of weight status in our sample, using AnthroPlus version V1.0.2 software.2[30]. According to WHO recommendations, underweight, normal weight, overweight and obese ranges were defined as BMI-Z < -2 SD, −2 SD < BMI Z-score < 1 SD, 1 SD < BMI-Z > 2 SD and BMI-Z > 2 SD, respectively[31]. Due to low obesity prevalence in the study population (2·1 % of the girls and 3·4 % of the boys), overweight and obesity were combined into a single category. Missing and extreme values exceeding the possible limits for age and sex subgroups were excluded from the analysis (i.e. values (±3 SD) of BMI Z-scores)[32].

Perceived weight status. Perceived body size was assessed by the question: 'Do you think your body is . . .' Response options included: 'much too thin,' 'a bit too thin,' 'about the right size,' 'a bit too fat' and 'much too fat.' Subjects who responded 'too thin' or 'a bit too thin' were classed as perceived underweight; subjects who responded 'about the right size' were classed as perceived normal weight; and subjects who answered, 'a bit too fat' or 'too fat') were classed as perceived overweight[33].

Agreement between BMI category and perception of weight category. The perceived weight category was compared to the actual weight status for each participant, as calculated by BMI Z-scores. Students were categorised into one of the three resulting groups: underestimation, correct estimation or overestimation of body weight status.

Statistical methods

All statistical analyses were performed using SPSS version 25.0 (IBM). Descriptive statistics of socio-demographic characteristics of the study participants according to age groups were compared using the χ^2 test. A weighted κ coefficient was applied to assess the accuracy of perceptions of body weight: agreement between perceived weight status and actual BMI category. Additionally, the proportions of correct estimation, underestimation and overestimation according to age groups were also presented for each existing BMI category (underweight, normal and overweight/obese). All tests were considered significant at $P < 0.05$.

Associations between SSP to under and overestimation of body weight were examined using multivariable stepwise conditional logistic regression models, with adjustment for selected socio-economic factors. OR and 95 % CI are presented.

Results

In total, 7811 students completed the questionnaires. Of them, ninety-one students had missing socio-economic data, and 157 students reported an extreme BMI Z-score (values greater or smaller than 3 SD of BMI-Z-scores). Those observations were excluded from the analysis. The final sample included 7563 students, equally divided by sex and school type (Table 1). The majority of students were from middle and upper-middle-class families. Most of the students were from secular schools. Most of the students were categorised as normal weight.

Table 2 presents body weight categories and the correctness of weight perception by age group. Overall, middle school students were classified as underweight three times as often as high-school students (9·7 % *v.* 3·3 %), and 16·1 % of the boys and 10·7 % of the girls were OWOB. Among high-school students, an increased rate of OWOB status was documented among 17·6 % of the boys and 11·7 % of the girls. The majority of the boys and girls perceived their body weight status correctly (59·2 % and 57·2 %, respectively), while 25·6 % of the boys and 15·1 % of the girls underestimated their weight status, and 15·2 % of the boys and 27·7 % of the girls overestimated their weight status.

Table 3 presents the agreement between BMI classification and self-perception of body weight status. The weighted Kappa coefficients indicated fair agreement between perceived weight status and actual BMI categories in both age groups and sexes.

The PCA was conducted to capture distinct SSP. Three separate SSP were generated, accounting for a total of 81·9 % of the variance. The first social support pattern accounted for 30·7 % of the variance, the second accounted for 28·5 % of the variance and the third accounted for 22·7 % of the variance. To generate unique factors, the variables that loaded the highest in each factor were entered into a second PCA. Factor loadings of the separate SSP are presented in Supplemental 1. Each continuous pattern was then divided into quartiles, such that Q1 represented the lowest factor load and Q4, the highest. The patterns were entered into a multivariable logistic regression model.

Compared to high-school students, middle school students were significantly less likely to overestimate their

Table 1 Characteristics of the study population by grade

	Total (*n* 7563)		6th, 8th grade		10th–12th grade		
	n	%	*n*	%	*n*	%	*P*-value*
Sex							
Girls	3840	50·8 %	1820	47·3 %	2020	54·4 %	<0·001
Boys	3723	49·2 %	2028	52·7 %	1695	45·6 %	
Religious background							
Secular	4647	61·4 %	2392	62·2 %	2255	60·7 %	<0·001
Religious	2916	38·6 %	1456	37·8 %	1460	39·3 %	
Country of birth							
Israel	6997	92·5 %	3620	94·1 %	3377	90·9 %	<0·001
Other*	566	7·5 %	228	5·9 %	338	9·1 %	
Mother's country of birth							
Israel	5398	71·4 %	2815	73·2 %	2583	69·5 %	<0·001
Other	2165	28·6 %	1033	26·8 %	1132	30·5 %	
Father's country of birth							
Israel	5299	70·1 %	2789	72·5 %	2510	67·6 %	<0·001
Other	2264	29·9 %	1059	27·5 %	1205	32·4 %	
FAS**							
Low	1923	26 %	885	23·6 %	1038	28·5 %	<0·001
Average	2568	34·7 %	1324	35·3 %	1244	34·1 %	
High	2903	39·3 %	1541	41·1 %	1362	37·4 %	

*Other – Russia, Europe, Ethiopia, South America, English-speaking country or other.
**FAS – family affluence scale. This socio-economic status scale has been developed for the HBSC study group.

body weight status (OR = 0·77; 95 % CI (0·68, 0·88); *P*<·001; Table 4). Girls had more than twice as likely as boys to overestimate their weight status (OR = 2·03; 95 % CI (1·76, 2·33); *P*<·001). Boys were more likely to underestimate their weight status than girls (OR = 0·63; 95 % CI (0·55, 0·72); *P*<·001; Table 5). In addition, those at the highest quartile of family support (*v*. Q1–Q3) were less likely to underestimate their body weight (OR = 0·83; 95 % CI (0·72, 0·96); *P* < 0·05; Table 5).

Students in the highest *v*. the lowest socio-economic status group were more likely to overestimate their weight status (OR = 1·19; 95 % CI (1·01, 1·41); *P*<·04). Students in the top quartile (Q4 *v*. Q1–Q3) of family support were less likely to overestimate or underestimate their body weight status. Students who had good communication (*v*. bad) with a parent were less likely to overestimate their body weight status. Students who had higher teacher support (Q4 *v*. Q1–Q3) were less likely to overestimate their body weight.

Discussion

This study examined the associations between support patterns on adolescents' perceptions of their body image.

The present study, based on a representative sample of 7563 Israeli students, found that the majority of the girls and boys in both middle and high school were normal weight; however, a significant inaccurate perception of body weight, overestimation and underestimation were detected. In a multivariate logistic regression analysis, we found that overestimation of weight status was associated with the following variables: high-school attendance;

female sex; high socio-economic status; lower family, peer and teacher support, and more insufficient communication with a parent. Underestimation of weight status was associated with male sex and higher family support.

In our research, high-school attendance was associated with higher odds of overestimation of body weight. Although we have not found similar research findings of differences in weight misperception, which are age-related, Inaccurate body weight among high-school students has been documented in studies[34,35] among adolescents and adults. About 10 % of US high-school students that participated in the 2009 National Youth Risk Behaviour Survey (YRBS) overestimated their body weight and an additional 27·8 % underestimated their body weight[36]. Among adolescents in the UK, high percentages of high-school students demonstrated misperceptions of body weight[37].

Overestimation of weight status was more commonly reported among girls than boys[8,38,39]. Several studies have examined rates of overestimation of body size among adolescents, and results varied across countries. In a representative survey conducted among adolescents in the UK, only 7 % of normal-weight adolescents perceived themselves to be too heavy, with higher percentages among girls[39]. Among adolescents in Japan, overestimation was documented among girls only, with 23·2 % of underweight girls and 45 % of low-normal weight girls who perceived themselves as a bit too fat[40]. Overestimation of body weight was prevalent among 16·6 % of the participants in the Youth Risk Behaviour Surveillance Surveys, with higher prevalence rates among sexual minorities[41]. In our study, 15·2 % of boys and 34·2 % of girls overestimated their weight status. Underestimation was found among 25·6 % of boys and 15·1 % of the girls. Body dissatisfaction and

Table 2 Weight status based on self-reported height and weight, weight perception, and correctness of weight perception by age group

	Total (n 7563)		Middle-school 6th, 8th grade		High-school 10th–12th grade		
	n	%	n	%	n	%	P-value*
Boys	(n 3723)		(n 2028)		(n 1695)		
BMI							
Mean			18·6		21·6		
SD			3·17		3·06		
Underweight	240	6·4 %	193	9·5 %	47	2·8 %	<0·001
Normal weight	2882	77·4 %	1532	75·5 %	1350	79·6 %	
OWOB	601	16·1 %	303	14·9 %	298	17·6 %	
Weight perception	n 3618		n 1958		n 1660		
Underweight	897	24·8 %	502	25·6 %	395	23·8 %	ns
Normal weight	1876	51·6 %	996	50·9 %	871	52·5 %	
Overweight	854	23·6 %	460	23·5 %	394	23·7 %	
The correctness of weight perception	n 3618		n 1958		n 1660		
Underestimation	927	25·6 %	482	24·5 %	445	26·8	<0·001
Correct estimation	2142	59·2 %	1133	57·9 %	1009	60·8 %	
Overestimation	549	15·2 %	343	17·5 %	206	12·4 %	
Girls	n 3840		n 1820		n 2020		
BMI*							
Mean			18·4		20·7		
SD			3·1		3·2		
Underweight	256	6·7 %	181	9·9 %	75	3·7 %	<0·001
Normal Weight	3173	82·6 %	1465	80·5 %	1708	84·6 %	
OWOB	411	10·7 %	174	9·6 %	237	11·7 %	
Weight perception**	n 3761		n 1780		n 1981		
Underweight	646	17·2 %	357	20·1 %	289	14·6 %	<0·001
Normal Weight	1830	48·7 %	864	48·5 %	966	48·8 %	
Overweight	1285	34·2 %	559	31·4 %	726	36·6 %	
The correctness of weight perception	n 3761		n 1780		n 1981		
Underestimation	569	15·1 %	297	16·7 %	272	13·7 %	<0·05
Correct estimation	2152	57·2 %	992	55·7 %	1160	58·6 %	
Overestimation	1040	27·7 %	491	27·6 %	549	27·7 %	

OWOB, overweight or obese.
*BMI was calculated as weight (kg) divided by the square of their height in meters (m^2).
Underweight was defined as BMI Z-score <-2 SD.
Normal weight was defined as: −2 SD < BMI Z-score < 1 SD.
Overweight or obese was defined as BMI Z-score >1 SD.
**Weight perception was self-reported by the students.

Table 3 Agreement between BMI classification (based on self-reported height and weight) and self-perception of weight category

	Weight perception (%)			
BMI (n total = 7379)	Underweight	Normal weight	Overweight	Weighted κ
6th, 8th-grade boys (n 1958)				
Underweight	5·2	3·9	0·4	0·243
Normal weight	19·5	42·8	13·2	
OWOB	1·0	4·1	9·9	
10th–12th grade boys (n 1660)				
Underweight	2·2	0·4	0·2	0·266
Normal weight	20·8	46·9	11·8	
OWOB	0·8	5·2	11·7	
6th, 8th-grade girls (n 1780)				
Underweight	4·9	4·0	0·9	0·209
Normal weight	14·8	42·9	22·6	
OWOB	0·3	1·6	7·9	
10th–12th grade girls (n 1981)				
	2·4	1·1	0·2	0·231
Normal weight	12	46·1	26·5	
OWOB	0·2	1·6	10	

OWOB, overweight or obese.
Underweight was defined as: BMI Z-score <-2 SD; normal weight was defined as (−2) SD < BMI Z-score < 1 SD; overweight or obese was defined as BMI Z-score >1 SD.

Table 4 Factors associated with overestimation of BMI category in a multivariable logistic regression analysis

	OR	95 % CI	*P*-value
Step 1			
Age group			
Middle school *v.* High school	0·77	0·68, 0·88	<0·001
Sex			
Boy *v.* Girl	2·03	1·76, 2·33	<0·001
SES			
Lowest (ref)			<0·10
Medium	1·17	0·99, 1·39	0·07
High	1·19	1·01, 1·41	0·04
Step 2			
Peer support			
Top quartile *v.* quartiles 1–3	0·93	0·79, 1·09	0·36
Family support			
Top quartile *v.* quartiles 1–3	0·81	0·69, 0·94	0·006
Communication with father			
Good *v.* poor	0·80	0·68, 0·95	0·008
Communication with mother			
Good *v.* poor	0·78	0·64, 0·95	0·01
Teacher support			
Top quartile *v.* quartiles 1–3	0·85	0·73, 0·99	0·05
Constant	0·41		<0·001

weight concerns may begin in pre-adolescence and increase after puberty, particularly among females. Some studies have found that weight issues, dietary restraint and attempts to lose weight are more prevalent among females of higher socio-economic status[42].

In consistency with our results, it has been reported that boys tend to underestimate their weight, while girls tend to overestimate their weight[8,43,44].

Body weight perception is complex and influenced by cultural and societal factors, as well as individual characters. Higher satisfaction from life has been reported among adolescents who reported higher family support[45]. Parents can play an essential role in reinforcing positive stimuli and filtering out negative influences on their children[46]. Adolescents who report easy communication with their parents are more likely to rate their health positively, mention fewer psychological complaints and report greater life satisfaction[15].

Positive relationships with non-family adult mentors (mainly teachers or guidance counselors) are related to increased physical health, self-esteem, life-satisfaction and high-school completion, and decreased levels of risk behaviours[17]. However, the role of the school in the context of adolescent weight perception remains unknown. The present study demonstrates that teacher support confers protection from the overestimation of body weight.

In our models, peer support was not a significant predictor of accuracy of body weight. This may be caused by the fact that perceptions of body weight are developed at early life stages[16]. However, during adolescence, peer support plays a protective role against anxiety, depression and behavioural distress. Peer support may influence adolescent eating behaviours, suggesting that perhaps by supporting body satisfaction. This may play a protective role against maladaptive eating behaviours such as restrictive dieting, binge eating and purging[19]. Having a supportive group of friends is an essential part of healthy adolescent development and for overweight adolescents, it could be a protective factor against body dissatisfaction[47]. Body weight dissatisfaction and fear of being overweight in early adolescence are important risk factors for disordered eating. Overestimation of body weight may increase weight loss attempts, perhaps leading to disordered eating[47–51]. Little or insufficient support from family and friends may cause a negative self-image. Conversely, a sense of support from the immediate social environment may serve as a

Table 5 Factors associated with underestimation of BMI category in a multivariable logistic regression analysis

	OR	95 % CI	*P*-value
Step 1			
Age group			
Middle school *v.* High school	0·87	0·76, 1·01	0·057
Sex			
Boy *v.* Girl	0·63	0·55, 0·72	<0·001
SES			
Lowest (ref)			0·17
Medium	0·91	0·76, 1·08	0·30
High	1·05	0·89, 1·24	0·53
Step 2			
Peer support			
Top quartile *v.* quartiles 1–3	0·93	0·79, 1·09	0·36
Family support			
Top quartile *v.* quartiles 1–3	0·83	0·72, 0·96	<0·05
Communication with father			
Good *v.* poor	0·91	0·77, 1·08	0·30
Communication with mother			
Good *v.* poor	0·93	0·75, 1·15	0·50
Teacher support			
Top quartile *v.* quartiles 1–3	1·09	0·93, 1·27	0·25
Constant	0·57		<0·001

protective factor from the social pressures that are hypothesised to foster body dissatisfaction[52].

Our study had several limitations. We present a cross-sectional analysis, precluding the determination of causality. BMI status and classification of weight were based on self-reported height and weight. Adolescents have been found to overreport their height and underreport their weight. Therefore, it is possible that some students who were OWOB were misclassified as normal weight. Additionally, we have used the WHO BMI-Z scores cut-off values for weight categories which is accepted by the Israeli Ministry of Health and not the International Obesity Task Force which makes it harder to compare our results to the standard HBSC prevalence rates of weight categories. Our research is based on the 2014 survey data so social and weight patterns may have changed; however, those do not change rapidly and there was no national programme which can justify such change. The main strength of the study was the use of a large and representative Israeli sample, which allowed for comparison between the different variables,

In conclusion, the present study identifies that female sex, high-school attendance and upper socio-economic status are associated with overestimation of weight status, while support from significant adults and peers reduces the risk for this perception.

Acknowledgements

Supplementary material

For supplementary material accompanying this paper visit https://doi.org/10.1017/S1368980021002676

References

1. Lucibello KM, Sabiston CM, O'Loughlin EK *et al.* (2020) Mediating role of body-related shame and guilt in the relationship between weight perceptions and lifestyle behaviours. *Obes Sci Pract* **6**, 365–372.
2. Pasch KE, Klein EG, Laska MN *et al.* (2011) Weight misperception and health risk behaviors among early adolescents. *Am J Health Behav* **35**, 797–806.
3. Haynes A, Kersbergen I, Sutin A *et al.* (2018) A systematic review of the relationship between weight status perceptions and weight loss attempts, strategies, behaviours and outcomes. *Obes Rev* **19**, 347–363.
4. Aloufi AD, Najman JM & Mamun AA (2019) Predictors of persistent body weight misclassification from adolescence period to adulthood: a longitudinal study. *J Epidemiol Glob Health* **9**, 116–124.
5. Yang K, Turk MT, Allison VL *et al.* (2014) Body mass index self-perception and weight management behaviors during late adolescence. *J Sch Health* **84**, 654–660.
6. Inchley J, Currie D, Young T *et al.* (2016) Health behaviour in school-aged children (HBSC) study: International Report from the 2013/2014 survey. *Health Policy Child Adolesc* **7**, 1–277.
7. Lenhart CM, Daly BP & Eichen DM (2011) Is accuracy of weight perception associated with health risk behaviors in a diverse sample of obese adolescents? *J Sch Nurs* **27**, 416–423.
8. Kim S & So WY (2014) Prevalence and sociodemographic trends of weight misperception in Korean adolescents. *BMC Public Health* **14**, 452.
9. Park E (2011) Overestimation and underestimation: adolescents' weight perception in comparison to BMI-based weight status and how it varies across socio-demographic factors. *J Sch Health* **81**, 57–64.
10. Alikasifoglu M, Erginoz E, Ercan O *et al.* (2015) The role of parental, school, and peer factors in adolescent bullying involvement: results from the Turkish HBSC 2005/2006 study. *Asia Pac J Public Health* **27**, 1591–603.
11. Johannesen CK, Andersen S & Bast LS (2020) Estimating future smoking in Danish youth – effects of three prevention strategies. *Scand J Public Health*. Published online: 14 August 2020. doi: 10.1177/1403494820942678.
12. Kim S & Kim GS (2019) Ecological factors affecting obesity among middle school students in South Korea. *J Sch Health* **89**, 181–90.
13. Garcia ML, Gatdula N, Bonilla E *et al.* (2019) Engaging intergenerational Hispanics/Latinos to examine factors influencing childhood obesity using the PRECEDE–PROCEED Model. *Matern Child Health J* **23**, 802–810.
14. Harel-Fisch Y (2014) "Youth Resiliency": an evidence-based positive social psychology framework to reduce adolescent risk behaviors while enhancing well-being. In *Approached to Prevention*, pp. 67–83 [H Bonnie & R Tzimer, editors]. Jerusalem: Bialik Publishing.
15. Vokáčová J, Vašíčková J, Hodačová L *et al.* (2017) Trends in parent-adolescent communication in the Czech republic between 2002 and 2014: results of the HBSC study. *Cent Eur J Public Health* **25**, 36–41.
16. Hosseini SA & Padhy RK (2020) *Body Image Distortion*. Treasure Island FL: StatPearls Publishing.
17. Walsh SD, Harel-Fisch Y & Fogel-Grinvald H (2010) Parents, teachers and peer relations as predictors of risk behaviors and mental well-being among immigrant and Israeli born adolescents. *Soc Sci Med* **70**, 976–984.
18. Lebacq T, Dujeu M, Méroc E *et al.* (2019) Perceived social support from teachers and classmates does not moderate the inverse association between body mass index and health-related quality of life in adolescents. *Qual Life Res* **28**, 895–905.

19. Pace U, D'Urso G & Zappulla C (2018) Negative eating attitudes and behaviors among adolescents: the role of parental control and perceived peer support. *Appetite* **121**, 77–82.

20. Pryce H, Moutela T, Bunker C *et al.* (2019) Tinnitus groups: a model of social support and social connectedness from peer interaction. *Br J Health Psychol* **24**, 913–930.

21. Madjar N, Walsh SD & Harel-Fisch Y (2018) Suicidal ideation and behaviors within the school context: perceived teacher, peer and parental support. *Psychiatr Res* **269**, 185–190.

22. White J, Hawkins J, Madden K *et al.* (2017) Adapting the ASSIST model of informal peer-led intervention delivery to the Talk to FRANK drug prevention programme in UK secondary schools (ASSIST + FRANK): intervention development, refinement and a pilot cluster randomised controlled trial. *Public Health Res* **5**, 1–126.

23. Xie B, Palmer P, Li Y *et al.* (2013) Developmental trajectories of cigarette use and associations with multilayered risk factors among chinese adolescents. *Nicotine Tob Res* **15**, 1673–1681.

24. Currie C, Inchley J, Molcho M *et al.* (2014) *Health Behaviour in School-Aged Children (HBSC) Study Protocol: Background, Methodology and Mandatory Items for the 2013/14 Survey*. UK: Child and Adolescent Health Research Unit (CAHRU).

25. Roberts C, Freeman J, Samdal O *et al.* (2009) The Health Behaviour in School-Aged Children (HBSC) study: methodological developments and current tensions. *Int J Public Health* **54**, 140–150.

26. Voráčová J, Sigmund E, Sigmundová D *et al.* (2016) Family affluence and the eating habits of 11- to 15-year-old Czech adolescents: HBSC 2002 and 2014. *Int J Environ Res Public Health* **13**, 23–25.

27. Dalmasso P, Borraccino A, Lazzeri G *et al.* (2018) Being a young migrant in italy: the effect of perceived social support in adolescence. *J Immigr Minor Health* **20**, 1044–1052.

28. Zimet GD, Dahlem NW, Zimet SG *et al.* (1988) The multidimensional scale of perceived social support. *J Pers Assess* **52**, 30–41.

29. Kaiser HF (1974) An index of factorial simplicity. *Psychometrika* **39**, 31–36.

30. World Health Organization (2019) WHO Anthro Survey Analyser and other tools. http://www.who.int/childgrowth/software/en/ (accessed September 2020).

31. De Onis M, Onyango AW, Borghi E *et al.* (2007) Development of a WHO growth reference for school-aged children and adolescents. *Bull World Health Organ* **85**, 660–667.

32. WHO (2019) WHO Child Growth Standards: Head Circumference-for-Age, Arm Circumference-for-Age, Triceps Skinfold-for-Age and Subscapular Skinfold-for-Age: Methods and Development. *Am J Clin Nutr*. https://apps.who.int/iris/handle/10665/43706 (accessed September 2020).

33. Marques A, Naia A, Branquinho C *et al.* (2018) Adolescents' eating behaviors and its relationship with family meals, body mass index and body weight perception. *Nutr Hosp* **35**, 550–556.

34. Maximova K, McGrath JJ, Barnett T *et al.* (2008) Do you see what I see? Weight status misperception and exposure to obesity among children and adolescents. *Int J Obes* **32**, 1008–1015.

35. Opie CA, Glenister K & Wright J (2019) Is social exposure to obesity associated with weight status misperception? Assessing Australians ability to identify overweight and obesity. *BMC Public Health* **19**, 1222.

36. Ibrahim C, El-Kamary SS, Bailey J *et al.* (2014) Inaccurate weight perception is associated with extreme weight-management practices in US high school students. *J Pediatr Gastroenterol Nutr* **58**, 368–375.

37. Viner RM, Haines MM, Taylor SJC *et al.* (2006) Body mass, weight control behaviours, weight perception and emotional well being in a multiethnic sample of early adolescents. *Int J Obes* **30**, 1514–1521.

38. Steinsbekk S, Klöckner CA, Fildes A *et al.* (2017) Body size estimation from early to middle childhood: stability of underestimation, BMI, and gender effects. *Front Psychol* **8**, 2038.

39. Jackson SE, Johnson F, Croker H *et al.* (2015) Weight perceptions in a population sample of English adolescents: cause for celebration or concern? *Int J Obes* **39**, 1488–1493.

40. Nishida A, Foo JC, Shimodera S *et al.* (2019) The association of weight status and weight perception with number of confidants in adolescents. *PLoS One* **14**, e0225908.

41. Mantey DS, Yockey A & Barroso CS (2020) Role of sex on the relationship between sexual minority status and misperceptions of body weight among high school students. *J Adolesc*. Published online: 16 July 2020. doi: 10.1016/j.jadohealth.2020.05.051.

42. O'Dea JA (2001) Association between socioeconomic status, weight, age and gender, and the body image and weight control practices of 6- to 19-year-old children and adolescents. *Health Educ Res* **16**, 521–532.

43. Yan AF, Zhang G, Wang MQ *et al.* (2009) Weight perception and weight control practice in a multiethnic sample of US adolescents. *South Med J* **102**, 354–360.

44. Page RM, Johnson E & Simonek J (2006) Self-perception of body weight, weight management practices and goals, and other weight-related factors in central and eastern European adolescents. *Q Community Health Educ* **27**, 39–58.

45. Schnettler B, Miranda-Zapata E, Lobos G *et al.* (2018) The mediating role of family and food-related life satisfaction in the relationships between family support, parent work-life balance and adolescent life satisfaction in dual-earner families. *Int J Environ Res Public Health* **15**, 2549.

46. Al Sabbah H, Vereecken CA, Elgar FJ *et al.* (2009) Body weight dissatisfaction and communication with parents among adolescents in 24 countries: international cross-sectional survey. *BMC Public Health* **9**, 52.

47. Dunkley TL, Wertheim EH & Paxton SJ (2001) Examination of a model of multiple sociocultural influences on adolescent girls' body dissatisfaction and dietary restraint. *Adolescence* **36**, 265–279.

48. Eichen DM, Conner BT, Daly BP *et al.* (2012) Weight perception, substance use, and disordered eating behaviors: comparing normal weight and overweight high-school students. *J Youth Adolesc* **41**, 1–13.

49. Farrell C, Lee M & Shafran R (2005) Assessment of body size estimation: a review. *Eur Eat Disord Rev* **13**, 75–88.

50. Heilbrun AB & Friedberg L (1990) Distorted body image in normal college women: possible implications for the development of anorexia nervosa. *J Clin Psychol* **46**, 398–401.

51. Jankauskiene R & Baceviciene M (2019) Body image concerns and body weight overestimation do not promote healthy behaviour: evidence from adolescents in Lithuania. *Int J Environ Res Public Health* **16**, 864.

52. Chen H, Gao X & Jackson T (2007) Predictive models for understanding body dissatisfaction among young males and females in China. *Behav Res Ther* **45**, 1345–1356.