



## Research article

# Overweight, perceived overweight and involvement in bullying in middle adolescence



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## ABSTRACT

Overweight is reportedly a risk factor for being bullied, and body image may mediate this association. Research on associations between overweight and bullying has so far only focused on children and early adolescents. We explored associations between actual and perceived overweight at age 15 and involvement in bullying at ages 15 and 17. A total of 2070 Finnish adolescents responded to a survey at ages 15 and 17. Self-reported weight and height, perceived weight and involvement in bullying were elicited. Being overweight at age 15 was not associated with being bullied or with being a bully at age 15 or 17. Perceived overweight among girls was associated with subsequent involvement in bullying as a bully and in feeling shunned. Weight related bullying may decrease from pre- and early adolescence to middle adolescence. The associations between perceived overweight and self-identification as a bully, and those between perceived overweight and feeling isolated may be explained by the phenomena representing psychological dysfunction.

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## 1. Introduction

### 1.1. What is bullying?

Bullying is aggressive behavior where peer(s) deliberately inflict psychological harm on a victim, verbally or physically, repeatedly over time, and in a situation where there is a power imbalance between the victim and the bully/bullies (Kaltiala-Heino & Fröjd, 2011; Nansel et al., 2001). Of school-aged children and adolescents 10–20% are frequently involved in bullying, either as victims, as bullies, or as both; boys more often than girls, and younger subjects more than older ones (Kaltiala-Heino & Fröjd, 2011). Excessive victimization has been associated with being different from the majority, for example having

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disabilities and belonging to sexual minorities, although not necessarily with minority ethnic status (Blake, Lund, Zhou, Kwok, & Benz, 2012; Burton, Marshal, Chisolm, Sucato, & Friedman, 2013; Russell, 2011; Tippett, Wolke, & Platt, 2013).

### 1.2. Overweight and subjection to bullying

Among children and adolescents being overweight or obese may be a visible difference that results in being subjected to bullying. Several studies have found that overweight children and adolescents are more commonly targets of bullying than their normal weight peers, and are bullied more viciously and intensively than their non-overweight peers (Brixval, Rayce, Rasmussen, Holstein, & Due, 2012; Danielsen, 2012; Hayden-Wade et al., 2005; Lumeng, 2010; McCormack, 2011). Being bullied due to overweight may further result in unfavorable coping attempts, such as avoiding physical exercise and indulging in binge eating (Puhl & Luedicke, 2012).

Overweight/obese children and adolescents may become targets of bullying more commonly than their normal weight peers, but due to psychological distress they may also perceive hostility in neutral interactions. A slim figure is an important facet of the prevailing beauty ideal, particularly among Western white women (Greenwood & Dal Cin, 2012; Smolak, 2004). Wishful identification with the (slim) beauty ideal and perceived failure to achieve it increases body concerns in young women, and overweight/obese adolescents may consequently develop psychological distress and lowered self-esteem (Danielsen, 2012; Greenwood & Dal Cin, 2012; Hesketh, 2004; McClure, 2010; Swallen, 2005). Consequently obese/overweight adolescents may also perceive themselves to be bullied and shunned because of distorted processing of social information: an adolescent with negative self-perception may anticipate negative attention and perceive it in social interactions intended by others to be neutral or even positive, as may be the case among adolescents with depression and anxiety disorders (Kaltiala-Heino & Fröjd, 2011).

### 1.3. Perceived overweight, weight related distress and bullying

Perceived overweight refers to feeling overweight, whether or not this is really the case. Of both Western and non-Western adolescent girls, 30–60% perceive themselves to be too fat or overweight (Isomaa, Isomaa, Marttunen, Kaltiala-Heino, & Björkqvist, 2011; Kaltiala-Heino, Kautiainen, Virtanen, Rimpela, & Rimpela, 2003). Distorted perception of one's body size and weight are characteristic of eating disorders, but erroneous perception of one's weight and size, particularly that of perceiving overweight, is also commonly met with in people without eating disorders and actually within the normal weight range (Greene, 2008; Grogan, 2007; Isomaa et al., 2011). Feeling fat is a type of negative body image which in adolescents is associated with psychological distress (Isomaa, Isomaa, Marttunen, Kaltiala-Heino, & Björkqvist, 2010). Some studies have suggested that negative body image and low self-esteem due to negative body image mediate the association between being overweight and being bullied (Brixval et al., 2012; Fox & Farrow, 2009; Reulbach, 2013). Negative body image may be an indicator of more comprehensive psychological vulnerability and dysfunction that precedes involvement in bullying (Isomaa et al., 2011; Reulbach, 2013). Thus, being overweight – physically different from the majority – may contribute less to becoming involved in bullying than adolescents' distress about their perceptions of their weight and size.

### 1.4. Need for further research

To summarize, it has been suggested that being overweight may predispose children and adolescents to being bullied, but also that this association could be explained by negative subjective appraisals of one's body. However, there are still gaps in the research on the associations between perceived overweight, body image and involvement in bullying and these need to be addressed. Firstly, most of the research on overweight and bullying have been cross-sectional and unable to demonstrate causal relationships. Secondly, most of this work has been carried out among prepubertal children, thus little is known about associations between overweight and bullying in adolescence. One longitudinal study (Mamun, 2013) found that being bullied in early to middle adolescence increased the likelihood of being overweight in early adulthood. This could suggest unhealthy eating as an attempt to cope with peer victimization rather than overweight being the reason for being victimized. Another study (Lumeng, 2010), however, found no longitudinal association between being bullied and overweight in children aged 8–11. The findings are contradictory, and causal pathways may also differ between age groups. Thirdly, not only subjection to bullying but also being a bully is associated with mental health problems (Kaltiala-Heino & Fröjd, 2011). Being a bully and being a victim of bullying each increase the risk of mental health problems 2–4 fold, while being both a bully and a victim increases the risk 4–6 fold. Regarding weight and perceptions of weight in particular one study claimed that being a bully was associated with perceptions of oneself either as underweight or overweight, but not with actual weight, further emphasizing the need to consider psychological dysfunction perhaps more than physical difference in researching weight and bullying (Reulbach, 2013). However, the longitudinal associations between being overweight, having weight concerns, and being involved in bullying in different roles have been little studied. Being overweight is a visibly different physical characteristic and a potential reason for being subjected to bullying. As the slim ideal concerns especially girls and women, it could be hypothesized that being overweight is associated with involvement in bullying particularly among girls. However, if it is not the physical appearance per se but subsequent psychological vulnerability that results in involvement in bullying, perceived overweight can indeed be assumed to be associated with involvement in bullying, and could then be expected to mediate the associations between actual overweight and involvement in bullying.

The associations between perceived overweight and involvement in bullying can be hypothesized to be similar in boys and girls, because even if the threshold for perceiving overweight was lower for girls, those describing themselves as overweight nevertheless currently report body dissatisfaction.

### 1.5. Aims of the present study

The aim of this paper is to study separately for mid-adolescent girls and boys the cross-sectional and longitudinal associations between actual and perceived overweight and involvement in bullying. This aspect of mid-adolescence has been little researched. We hypothesize that being overweight is associated with being bullied concurrently and longitudinally among girls but not among boys. We also hypothesize that perceived overweight is concurrently and longitudinally associated with involvement in bullying, similarly among both sexes.

## 2. Materials and methods

The present study is based on the Adolescent Mental Health Cohort Study (AMHC). The AMHC is a survey study on non-psychotic mental disorders and their risk and protective factors related to school work and school environment, peer relationships and family/parents (Fröjd, Kaltiala-Heino, & Marttunen, 2011). Ninth grade students from all Finnish-speaking secondary schools in two Finnish cities, Tampere (200,000 inhabitants) and Vantaa (180,000 inhabitants), completed a person-identifiable questionnaire during a school lesson while supervised by a teacher. More than 95% of the target age group attend Finnish speaking schools in these cities. The questionnaires were returned in sealed envelopes. Questionnaires with two reminders were mailed to students absent from school on the day of the survey. The final baseline (T1) sample comprised 1609 girls and 1669 boys, with a mean age of 15.5 years (SD 0.39). The response rate was 94%.

Two years later, subjects responding to the first survey were contacted through their current educational institutions, by mail and finally through the Internet to invite them to participate in the follow-up survey (T2). The final T2 sample (2070 respondents) represented 63% of the adolescents who responded to the first survey, with a mean age of 17.6 years (SD 0.41). Of the respondents 56.4% (1167) were girls.

### 2.1. Overweight

Weight (kg) and height (cm) were elicited. Body mass index (BMI) was calculated as follows:  $BMI = \text{weight (kg)} / (\text{height (m)} \times \text{height (m)})$ . BMI less than 10 or more than 40 was considered facetious and adolescents reporting such data were excluded from the analyses. Thus, 1114 girls and 884 boys were included in the analyses. BMI over the 90th percentile in this population was taken to indicate overweight, and was calculated separately for girls and boys. For girls, the 90th percentile of BMI was 23.36, and for boys it was 24.24.

### 2.2. Perceived overweight

The adolescents were asked: What do you think about your weight? The response options were: *I am of suitable weight/I am somewhat or decidedly underweight/I am somewhat overweight/I am decidedly overweight*. The distribution of the responses is given in Table 1. In the analyses weight perception was dichotomized to decidedly overweight vs. all other alternatives.

### 2.3. Involvement in bullying

Involvement in bullying was elicited at T1 and T2 by two questions derived from the WHO Youth Health Study (King, Wold, Tudor-Smith, & Yossi, 1996): "We say a pupil is being bullied when another pupil, or group of pupils, says or does nasty things to him or her. It is also bullying when a pupil is teased repeatedly in a way she or he does not like. But it is not bullying when two pupils of about the same strength quarrel or fight. Have you been bullied (bullied others/been shunned) during the ongoing school term?" The response alternatives for each question were: *many times a week, about once a week, 2–3 times a month, less frequently and not at all*. In the analyses, the responses to the bullying questions were dichotomized to *2–3 times a month or more often vs. less frequently or not at all*.

### 2.4. Covariates

The covariates used were age and pubertal timing. Age was calculated from date of birth and date of responding to the survey, and used in the analyses as continuous variable. Age used as a covariate because during adolescent development slight differences in age may have an impact on physical growth and emotional and social development likely to influence weight, height, perception of oneself, and involvement in bullying. Pubertal timing was measured by age at menarche/oigarche by asking: How old were you when you first had your periods/experienced ejaculation? The response alternatives were *10 years or less/11/12/13/14/15 or more years/I have not yet*. In the analyses pubertal timing was classified according to age at menarche/oigarche to *early (11 years or earlier), normative (12–13 years) and late (14, 15 or later and not yet)*. Pubertal timing was used as a covariate because in middle adolescence those maturing early and those maturing late are likely to differ

**Table 1**  
Frequencies (%) of the categorical variables and means (SD) of continuous variables used in the analyses.

	Girls n = 1114	Boys n = 844
Perceives being of suitable weight	50.6	61.3
somewhat or decidedly underweight	9.0	21.7
somewhat overweight	35.6	14.7
much decidedly overweight	4.6	1.9
missing	0.4	0.6
Victim of bullying at 15		
at least monthly	4.2	6.3
less or not at all	95.8	93.7
missing	0.9	–
Shunned at 15		
at least monthly	4.3	2.7
less or not at all	95.3	97.2
missing	0.4	0.1
Bullies others at 15		
at least monthly	1.6	6.3
less or not at all	98.3	93.7
missing	0.1	–
Victim of bullying at 17		
at least monthly	1.2	3.0
less or not at all	97.3	96.0
missing	1.5	1.1
Shunned at 17		
at least monthly	4.3	3.1
less or not at all	94.1	95.4
missing	1.6	1.5
Bullies others at 17		
at least monthly	0.8	3.4
less or not at all	97.7	95.6
missing	1.5	0.9
Age when first had periods/ejaculation		
11 or less	19.8	17.8
12–13	63.1	58.5
14 or more	17.1	20.1
missing	–	3.6
T1 Age (years, SD)	15.5 (0.36)	15.5 (0.36)

significantly as regards growth, and also emotional and social development. Pubertal timing is thus likely to have an impact of an adolescent's body size at a given age during the adolescent years, but it may also have associations with perception of one's weight and size relative to same aged peers and body ideal.

### 2.5. Statistical analyses

Bivariate associations were studied using cross-tabulations with chi-square statistics. We first studied the associations between actual and perceived overweight, and between the covariate pubertal timing and the weight variables. Concurrent and longitudinal associations between the weight variables and variables indicating involvement in bullying were also first studied using cross-tabulations with chi-square statistics. Next, logistic regression analyses were applied. Being subjected to bullying, being a bully and being shunned at age 15 and at age 17 were each in turn entered as the dependent variable. Perceived overweight and actual overweight at age 15 were first each entered alone as independent variables, and then entered simultaneously. Odds ratios (OR) with 95% confidence intervals (95% CI) are reported. Age (continuous) and pubertal timing were entered as covariates in all the logistic regression models.

Interaction between actual and perceived overweight in relation to involvement in bullying was studied by (a) adding an interaction term actual overweight \* perceived overweight to the models described above, and (b) calculating odds ratios (95% CI) for the mutually exclusive alternatives of actually being but not perceiving overweight, perceiving though actually not being overweight, and both being and perceiving overweight, using as a reference category those who neither were nor perceived themselves to be overweight. A combined variable of actually being overweight (0 = no, 1 = yes) and of perceiving oneself as decidedly overweight (0 = no, 1 = yes) was formed, where no actual or perceived overweight received the value 0, actual but not perceived overweight was coded 1, perceived but not actual overweight was coded 2, and both actual and perceived overweight was coded 3. This combined variable was then entered into the logistic regression analyses as independent variable after controlling for age and pubertal timing, and involvement in bullying variables were entered in succession as the dependent variable.

**Table 2**

Involvement in bullying (being bullied, being shunned, being a bully) at ages 15 and 17, according to actual and perceived overweight at age 15 among Finnish middle adolescent girls and boys (% (n/N)).

	Overweight			Perceived overweight		
	Yes	No	<i>p</i>	Yes	No	<i>p</i>
<i>Girls</i>						
Bullied at 15	7.2 (8/111)	3.9 (39/1003)	0.09	9.8 (5/51)	4.0 (42/1059)	0.06
Shunned at 15	9.0 (10/111)	3.8 (38/999)	0.02	11.8 (6/51)	3.9 (41/1055)	0.02
Bully at 15	–	1.8 (18/1002)	0.15	2.0 (1/51)	1.6 (17/1058)	0.57
Bullied at 17	0.9 (1/110)	1.2 (12/987)	0.62	2.0 (1/49)	1.1 (12/1044)	0.45
Shunned at 17	4.5 (5/110)	4.4 (43/986)	0.54	14.3 (4/49)	3.9 (41/1043)	0.004
Bully at 17	0.9 (1/110)	0.8 (8/987)	0.62	4.1 (2/49)	0.7 (7/1044)	0.06
<i>Boys</i>						
Bullied at 15	9.5 (8/84)	5.9 (45/760)	0.14	12.5 (2/16)	6.2 (51/823)	0.27
Shunned at 15	4.8(4/84)	2.5 (19/759)	0.19	12.2 (2/16)	2.6 (21/822)	0.07
Bully at 15	6.0 (5/84)	6.3 (48/760)	0.56	6.3 (1/16)	6.3 (52/823)	0.73
Bullied at 17	1.2 (1/81)	3.2 (24/754)	0.28	–(0/16)	3.1 (25/814)	0.61
Shunned at 17	2.5 (2/81)	3.2 (24/750)	0.52	6.3 (1/16)	3.1 (25/810)	0.40
Bully at 17	4.9 (4/81)	3.3 (25/755)	0.31	–(0/16)	3.6 (29/815)	0.56

## 2.6. Drop-out

Altogether 28% of the girls and 46% of the boys responding to the baseline survey did not respond at follow-up ( $p < 0.001$ ). Those not responding reported more often being bullies at T1 than did those participating in the follow-up (5% vs. 3%,  $p = 0.002$ ). However, non-responders were not more often subjected to bullying at T1 than participants (4% vs. 3%,  $p = 0.6$ ), nor had they been more shunned by peers (3% vs. 2%,  $p = 0.6$ ).

Of those participating at both T1 and T2 5.4% were excluded from the present study due to weight and height data being most likely facetious. This was more common among the boys (6.5% vs. 4.5%,  $p = 0.03$ ). Those excluded due to likely facetious weight/height data did not differ from those included regarding involvement in bullying except that among boys, they more often reported being shunned at T1 (8.9% vs. 2.7%,  $p = 0.03$ ).

## 2.7. Ethical considerations

The AMCH has been approved by the ethics committee of Pirkanmaa Hospital District.

## 3. Results

The distributions of weight perception, involvement in bullying at ages 15 and 17, and pubertal timing are given in [Table 1](#). Associations between actual and perceived overweight, and between weight variables and pubertal timing

Of the girls who actually were overweight, 64.0% perceived themselves to be somewhat overweight, and 25.2% decidedly overweight. On the other hand, of the girls who actually were not overweight, 32.6% nevertheless perceived themselves to be somewhat overweight, and 2.3% decidedly overweight. Of the boys who actually were overweight, 65.5% perceived themselves to be somewhat overweight, and 13.1% decidedly overweight; among those not overweight, the corresponding figures were 9.1% and 0.7%.

Among the girls, the proportion of those overweight was the bigger the earlier the menarche (15.8% vs. 9.2% vs. 5.8% when menarche had been at 11 or younger vs. 12–13 vs. 14 or later,  $p = 0.002$ ), but perception of being decidedly overweight was not associated with pubertal timing ( $p = 0.21$ ). Among the boys, pubertal timing was not associated with being overweight ( $p = 0.83$ ), but there were unexpectedly more who perceived themselves to be decidedly overweight among those with later pubertal timing, although the finding was not statistically significant (0% vs. 2.0% vs. 3.6%,  $p = 0.07$ ).

### 3.1. Actual and perceived overweight and involvement in bullying

Among the girls at age 15, being overweight was not statistically significantly associated with being bullied or with being a bully. Those overweight reported more often being shunned. Perceived overweight was nearly statistically significantly associated with being bullied, and being shunned was reported more often by those perceiving themselves to be overweight. Being a bully was not associated with perceived overweight ([Table 2](#)).

Being overweight at age 15 was not associated among girls with involvement in bullying at age 17. Perceived overweight at age 15 was not associated with being bullied at age 17, but it was associated with being shunned at age 17, and almost significantly associated with being a bully at age 17 ([Table 2](#)).

Among the boys at age 15 being overweight was not associated with involvement in bullying variables. There was a tendency for those perceiving themselves to be overweight to more commonly report being shunned, otherwise perceived

**Table 3**

Risk (OR, 95% CI) for being bullied, being shunned and being a bully at age 15, according to being overweight and perceived overweight at age 15, when (a) being overweight is entered alone as independent variable, (b) when perceived overweight is entered alone as independent variable, and (c) when both are entered at the same time. In all models, age and pubertal timing are controlled for.

	Being bullied	Being shunned	Being a bully
<i>Girls</i>			
Model 1			
Overweight	1.8 (0.9–3.9)	<b>2.5 (1.2–5.2)</b>	NA
Perceived overweight	–	–	–
$p^1$	0.91	0.425	0.78
Model 2			
Overweight	–	–	–
Perceived overweight	2.5 (0.9–6.6)	<b>3.2 (1.3–8.0)</b>	1.1 (0.1–8.4)
$p^1$	0.92	0.88	0.99
Model 3			
Overweight	1.4 (0.6–3.4)	2.0 (0.9–4.6)	NA
Perceived overweight	2.1 (0.7–6.2)	2.2 (0.8–6.2)	2.5 (0.3–19.9)
$p^1$	0.97	0.20	0.63
<i>Boys</i>			
Model 1			
Overweight	1.7(0.8–3.9)	2.1 (0.7–6.6)	1.0 (0.4–2.5)
Perceived overweight	–	–	–
$p^1$	0.87	0.41	0.28
Model 2			
Overweight	–	–	–
Perceived overweight	1.9 (0.4–8.6)	<b>5.1 (1.0–25.5)</b>	1.2 (0.1–9.1)
$p^1$	0.44	0.58	0.27
Model 3			
Overweight	1.7 (0.7–3.9)	1.6 (0.4–5.6)	0.9 (0.3–2.6)
Perceived overweight	1.4 (0.3–7.0)	3.9 (0.6–23.5)	1.2 (0.1–10.3)
$p^1$	0.81	0.23	0.40

NA = not applicable;  $p^1$  = Hosmer–Lemeshow goodness of fit test ( $p$ -value). Statistically significant Odds Ratios are highlighted in bold.

overweight was not associated with involvement in bullying variables. Among boys being or perceiving oneself to be overweight at age 15 was not associated with involvement in bullying at age 17 (Table 2).

### 3.2. Multivariate associations

At age 15s among girls, both actual overweight and perceived overweight were first associated with being shunned when the weight variables were entered into the models alone, controlling for age and pubertal timing. However, when these variables were entered simultaneously, none of the weight variables was statistically significantly associated with being shunned. No associations between weight variables and being bullied or being a bully were detected among the girls at age 15 (Table 3). Among the boys at age 15 no statistically significant associations were found between weight variables and involvement in bullying variables in multivariate models (Table 3).

Among the girls, perceived overweight at age 15 increased the OR for being shunned and for being a bully at age 17 after controlling for age and pubertal timing. When actual overweight was also entered into the model these associations were actually strengthened (Table 4). Among the boys involvement in bullying at age 17 was not associated with weight variables at age 15 (Table 4).

In none of the analyses was the interaction term actual overweight \* perceived overweight statistically significantly associated with involvement in bullying variables either among girls or among boys.

As mentioned above at the beginning of Results, perception of overweight was sometimes accurate (perceived to be overweight when actually overweight) and sometimes erroneous (perceived to be overweight when not actually overweight by BMI). To disentangle the roles of accurately and erroneously perceived overweight we explored further those equations showing associations between perceived overweight and involvement in bullying, namely in relation to being shunned and to being a bully among girls at age 17. Compared to those neither overweight nor perceiving overweight at age 15, those girls perceiving but not actually being overweight had an OR of 5.4 (95% CI 1.7–16.9,  $p = 0.004$ ) for being shunned at age 17, and their OR for being a bully at age 17 was 6.8 (95% CI 0.8–58.3,  $p = 0.08$ ). Being overweight but not perceiving so, and both being and perceiving overweight did not show even tendency of being associated with involvement in bullying variables ( $p$ -values in logistic regression analyses were  $>0.1$ ).

## 4. Discussion

The hypothesis that being overweight is associated with involvement in bullying was not supported. Being overweight was not associated with being bullied or socially isolated, and it did not pose a risk for being bullied or socially isolated in the

**Table 4**

Risk (OR, 95% CI) for being bullied, being shunned and being a bully at age 17, according to being overweight and perceived overweight at age 15, when (a) being overweight is entered alone as independent variable, (b) when perceived overweight is entered alone as independent variable, and (c) when both are entered at the same time. In all models, age and pubertal timing are controlled for.

	Being bullied	Being shunned	Being a bully
<i>Girls</i>			
Model 1			
Overweight	0.6 (0.08–5.1)	1.0 (0.4–2.6)	1.1 (0.1–9.3)
Perceived overweight	–	–	–
$p^1$	0.61	0.74	0.51
Model 2			
Overweight	–	–	–
Perceived overweight	1.4 (0.2–11.4)	<b>3.9 (3.6–9.2)</b>	<b>6.3 (1.3–31.6)</b>
$p^1$	0.32	0.27	0.31
Model 3			
Overweight	0.5 (0.05–5.0)	0.5 (0.2–1.6)	0.4 (0.04–4.7)
Perceived overweight	2.0 (0.2–20.8)	<b>5.2 (1.9–13.8)</b>	<b>8.9 (1.5–54.5)</b>
$p^1$	0.56	0.07	0.69
<i>Boys</i>			
Model 1			
Overweight	0.4 (0.06–3.1)	0.8 (0.2–3.4)	1.6 (0.5–4.7)
Perceived overweight	–	–	–
$p^1$	0.55	0.57	0.76
Model 2			
Overweight	–	–	–
Perceived overweight	NA	1.8 (0.2–14.8)	NA
$p^1$		0.56	
Model 3			
Overweight	0.5 (0.1–3.5)	0.7 (0.1–3.2)	1.8 (0.6–5.4)
Perceived overweight	NA	2.3 (0.2–22.5)	NA
$p^1$	0.53	0.24	0.47

NA = not applicable;  $p^1$  = Hosmer–Lemeshow goodness of fit test ( $p$ -value). Statistically significant Odds Ratios are highlighted in bold.

subsequent two years among middle adolescents This contradicts the findings of earlier studies (Brixval et al., 2012; Fox & Farrow, 2009; Hayden-Wade et al., 2005; Lumeng, 2010; McCormack, 2011; Reulbach, 2013) that overweight is associated with being bullied.

This difference from earlier research may be due to our sample being clearly older than those studied previously. Only the data of Brixval et al. (2012) included 15-year olds, and even in their study the majority of the sample was younger. By middle adolescence, most young people have already gone through the physical changes of puberty and adjusted to them. Involvement in bullying also decreases compared to that in early adolescence and childhood (Kaltiala-Heino & Fröjd, 2011). On the other hand, while being overweight is becoming increasingly common among adolescents, perceiving oneself to be overweight is actually decreasing over time among those of normal weight and those overweight (Kaltiala-Heino et al., 2003). Maybe the stigma related to overweight is diminishing as weight gain in the population increases.

It is important to acknowledge this negative finding. Both overweight and bullying are serious problems among children and adolescents, but efforts to tackle weight related stigma and harassment may need to be directed at subjects younger than those already in middle adolescence.

The hypothesis that perceived overweight is associated with involvement in bullying was partially supported among girls. Perceived overweight at age 15 was associated longitudinally among girls with being shunned and with being a bully at age 17. Perceived overweight, even if appropriately more common among those actually overweight, likely indicates psychological dysfunction and emotional disorders (Paxton & Heinicke, 2008) that have previously been associated with both being bullied and self-identifying as a bully (Kaltiala-Heino & Fröjd, 2011). As our further analyses suggested, it was erroneously perceived overweight at age 15 that was particularly associated with involvement in bullying at age 17. Mid adolescence is a developmental period where peer relationships are of utmost importance (Hall-Lande, Eisenberg, Christenson, & Neumark-Sztainer, 2007; Larson & Richards, 1991; Laursen & Hartl, 2013). Psychotherapeutic interventions that address body image and help adolescent girls obtain accurate self-perception in this domain can be expected to improve the girls' functioning in peer relationships.

Among boys, actual and perceived overweight were not associated with involvement in bullying either cross-sectionally nor longitudinally. This suggests that being overweight is not stigmatizing for boys in middle adolescence. The sociocultural norms related to the ideal body favor muscularity rather than slimness in boys (Greenwood & Dal Cin, 2012; Smolak, 2004). Even if earlier research findings permit the expectation that overweight adolescents will be bullied and shunned more commonly than those not overweight, the negative findings in the present study are perhaps less surprising as regards boys, who likely pursue muscularity and bigger size rather than slimness, and presumably more so in middle adolescence than in childhood or early adolescence. Given the different body ideal for boys, it is not surprising that few boys perceived themselves to be “decidedly overweight”.

Being overweight is a serious public health problem among children and adolescents, and it seems to be increasing worldwide (Wang, 2006). In our data the vast majority of those who actually were overweight also perceived this. This is appropriate, as motivation to lose weight, which is desirable if a minor is overweight, is unlikely to emerge s/he deems weight and size normal. However, health professionals counseling overweight or obese adolescents should be careful not to initiate negative self-appraisals and lowering of self-esteem due to feeling fat. Dwelling on such negative appraisals is unlikely to be empowering and result in healthy normalization of weight.

Particularly among girls, a considerable share of those of normal weight perceived themselves to be overweight. Health education and adolescent health counseling need to be careful to encourage and motivate appropriate weight normalization among those who are overweight, and at the same time to help normal weight adolescents to build positive body image and stop unnecessary preoccupation with their weight.

#### 4.1. Methodological considerations

The study was based on a large population sample. The coverage of compulsory comprehensive school until age 16 in Finland is more than 99%. The cohort can thus be considered representative of Finnish adolescents except for those with mental handicaps or severe sensory deficits. The material, however, was collected exclusively in urban areas, thus the results may not be generalizable to rural populations. The response in the AMHC baseline survey was good. However, psychosocial and health problems may be more common among those who dropped out at baseline than among participants. Thus their absence may result in the reported prevalence rates of the studied problems being underestimates at T1. The response rate in the AMHC follow-up was satisfactory. Among boys, not responding at follow-up was associated with being a bully at T1, and it was also associated with reporting off-time maturation at T1. This suggests that some caution is needed in drawing firm conclusions on the findings, given that non-response in general was also greater among boys. However, even high levels of attrition may not necessarily affect the associations studied in health surveys (Van Loon, 2003).

In evaluating the validity of information obtained through logistic regression analyses, which we used to study multivariate associations, it is also important to consider the goodness of fit of the models, not only the significance of the Odds Ratios for the different variables. Most of the logistic regression models showed adequate fit according to the Hosmer–Lemeshow goodness of fit test. Our aim, however, was to ascertain if the selected predictors were statistically significantly associated with the dependent variables, not to create the optimal model beyond the chosen independent variables. In future studies it would be interesting to include more theoretically motivated variables, but that was beyond the scope of the present study.

To confirm the findings we also ran the analyses exploring associations between perceived overweight and involvement in bullying including both “somewhat overweight” and “decidedly overweight” as perceived overweight, but this did not change the results (data not shown).

A limitation of this study is that BMI was calculated based on self-reported weight and height only. There may be a risk of inaccurate reporting due to not knowing one’s height and weight exactly, or due to reporting desirable rather than accurate figures. If wishful thinking biases weight and height information, it would likely be toward producing a slimmer image for the girls and perhaps a bigger image for the boys in keeping with the different body ideals (Smolak, 2004).

Our definition of being overweight was based on the distribution of BMI in the population studied. This approach ensures that those studied as overweight subjects clearly differ from the average, which was the very basis for assuming a possible association with involvement in bullying: that different adolescents become targets of negative peer attention. This approach has been used in defining overweight in child and adolescent populations, for example, in the USA (Barlow & Diez, 1998), and also in earlier research among Finnish adolescents (Kaltiala-Heino et al., 2003). However, Cole, Bellizzi, Flegal, and Dietz (2000) criticized this proportional approach and proposed BMI cut-points for adolescents of different ages corresponding to BMI 25, the accepted definition of overweight among adults. In the criteria proposed by Cole et al. the cut-points for overweight are 23.60 for boys and 24.17 for girls aged 15.5 years. Our 90th percentile based cut-points, 23.36 for girls, and 24.24 for boys, classified girls slightly more often as overweight, even if we used the 90th percentile instead of the more commonly used 85th percentile (Barlow & Diez, 1998; Cole et al., 2000; Kaltiala-Heino et al., 2003), whereas for boys, our definition was stricter than Cole’s criteria.

Regarding perceived overweight, we decided to focus on reporting the perception of being “decidedly overweight” instead of also including “somewhat overweight”, because feeling “somewhat overweight” was so common among girls that it is almost a norm. However, we carried out the analyses setting the cut-point at “somewhat overweight”, with largely similar results (data not shown).

Involvement in bullying was measured by self-reports only. Peer nominations or observational methods might yield a more reliable picture of an adolescent’s involvement in bullying (Cole, Cornell, & Sheras, 2006; Kim, 2006). It has been suggested that a self-report survey method is likely to result in underreporting of being victimized (Theriot, Dulmus, Sowers, & Johnson, 2005), and the same could apply to self-reporting of being a bully, due to social desirability. However, most of the research actually uses self-report methods, particularly in large data such as ours, and actually very commonly the same WHO questions (Kaltiala-Heino & Fröjd, 2011). Self-report and peer nomination actually seem to yield similar findings as to who are the victims, but regarding who is a bully, self-report may further identify more emotionally disturbed adolescents than peer nomination (Kaltiala-Heino & Fröjd, 2011). Involvement in bullying was also exceptionally rare in the present data (Kaltiala-Heino & Fröjd, 2011), and this is why we used 2–3 times a month as indicative of involvement in bullying instead of weekly involvement. Unfortunately we do not know why involvement in bullying was apparently less common in the

study area than elsewhere in Finland (see, for example, Torikka et al. (2014), but the same phenomenon is seen in AMHC replication data from 2012 to 2013 (not reported in this study).

Bullying has been described as comprising a variety of aggressive behaviors, including physical (i.e., hitting, kicking), verbal (like name-calling) and relational (spreading rumors, excluding from group) (Fekkes, Pijpers, & Verloove-Vanhorick, 2005; Nansel et al., 2001). In the original WHO questions on involvement in bullying (see Materials and methods), no distinction is made between different forms of bullying, but the active role of the bully is emphasized (“says or does nasty things”). In the AMHC study we wanted to make a distinction between active bullying (saying or doing nasty things) and passive rejection, namely shunning. We think that there is a difference between actively bullying and not including someone, which is why we analyzed these both separately; and indeed findings were different regarding being bullied and being shunned. The additional question about being shunned has also been used in a large Finnish School Health Promotion Study ([www.thl.fi/kouluterveyskysely](http://www.thl.fi/kouluterveyskysely)), and we also wanted to be able to relate the AMHC data to that large dataset when appropriate.

Menarche is an accepted milestone in measuring pubertal timing (Dick, Rose, Viken, & Kaprio, 2000; Kaltiala-Heino, Koivisto, Marttunen, & Frojd, 2011; Rimpela & Rimpela, 1993). Onset of ejaculations can be considered a corresponding way of measuring puberty in boys in survey studies (Carlier & Steeno, 1985), even if there is more room for error. Young boys may be uncertain whether or not they ejaculate even if it occurs spontaneously at night. Another method of assessing oigarche is to measure morning spermaturia (Schaefer, Marr, Seidel, Tilgen, & Scharer, 1990). However, even after reaching oigarche, sperm cannot be observed in all the urine samples of males. Many studies on the impact of pubertal timing on mental health and psychosocial problems have used Tanner stages as self-report (Graber, Lewinsohn, Seeley, & Brooks-Gunn, 1997; Hayatbakhsh, Najman, McGee, Bor, & O’Callaghan, 2009; Tanner, 1962). Studies using age at menarche/oigarche and Tanner stages yield similar results regarding pubertal timing and mental health (Kaltiala-Heino et al., 2011).

## 5. Conclusion

Being overweight is not necessarily a reason for being bullied after early adolescence. Perceived overweight is associated with involvement in bullying among middle adolescent girls, and the association is likely because perceived overweight, self-identifying as a bully, and perception of being shunned all indicate psychological dysfunction and the emotional difficulties of the individual rather than reciprocal social interactions. Efforts to reduce the stigma related to overweight are nevertheless needed, particularly among younger schoolchildren and their families. Health policies should aim at mitigating the unnaturally thin female body ideal prevalent in Western countries. In clinical practice, screening for, and, when appropriate, counseling for mental health problems among adolescent girls with weight concerns is required. Psychotherapeutic interventions that help adolescent girls obtain accurate self-perception in this domain can be expected to improve the girls’ functioning in peer relationships. In counseling adolescents who actually are overweight professionals need to be careful not to initiate unnecessarily negative self-appraisals and lowering of self-esteem due to overweight, as this is unlikely to result in healthy weight normalization but rather in further psychosocial problems.

## Conflict of interest

The authors declare no conflict of interest.

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## References

- Barlow, S. E., & Diez, W. H. (1998). Obesity evaluation and treatment: Expert committee recommendations. The maternal and child health bureau, health resources and services administration, and the department of health and human services. *Pediatrics*, *102*(3), E29–E30–E40
- Blake, J. J., Lund, E. M., Zhou, Q., Kwok, O. M., & Benz, M. R. (2012). National prevalence rates of bully victimization among students with disabilities in the United States. *School Psychology Quarterly*, *27*(4), 210.
- Brixval, C. S., Rayce, S. L., Rasmussen, M., Holstein, B. E., & Due, P. (2012). Overweight, body image and bullying – An epidemiological study of 11- to 15-year-olds. *European Journal of Public Health*, *22*(1), 126–130. <http://dx.doi.org/10.1093/eurpub/ckr010>
- Burton, C. M., Marshal, M. P., Chisolm, D. J., Sucato, G. S., & Friedman, M. S. (2013). Sexual minority-related victimization as a mediator of mental health disparities in sexual minority youth: A longitudinal analysis. *Journal of Youth and Adolescence*, *42*(3), 394.
- Carlier, J. G., & Steeno, O. P. (1985). Oigarche: The age at first ejaculation. *Andrologia*, *17*(1), 104–106.
- Cole, J. C. M., Cornell, D. G., & Sheras, P. (2006). Identification of school bullies by survey methods. *Professional School Counseling*, *9*(4), 305–306.
- Cole, T. J., Bellizzi, M. C., Flegal, K. M., & Dietz, W. H. (2000). Establishing a standard definition for child overweight and obesity worldwide: International survey. *British Medical Journal*, *320*(7244), 1240.
- Danielsen, Y. S. (2012). Factors associated with low self-esteem in children with overweight. *Obesity Facts*, *5*(5), 722–733.
- Dick, D. M., Rose, R. J., Viken, R. J., & Kaprio, J. (2000). Pubertal timing and substance use: Associations between and within families across late adolescence. *Developmental Psychology*, *36*(2), 180–189.
- Fekkes, M., Pijpers, F. I. M., & Verloove-Vanhorick, S. P. (2005). Bullying: Who does what, when and where? Involvement of children, teachers and parents in bullying behavior. *Health Education Research*, *20*(1), 81–91.
- Fox, C. L., & Farrow, C. V. (2009). Global and physical self-esteem and body dissatisfaction as mediators of the relationship between weight status and being a victim of bullying. *Journal of Adolescence*, *32*(5), 1287.

- Fröjd, S., Kaltiala-Heino, R., & Marttunen, M. (2011). Does problem behaviour affect attrition from a cohort study on adolescent mental health? *European Journal of Public Health, 21*, 301–306.
- Graber, J. A., Lewinsohn, P. M., Seeley, J. R., & Brooks-Gunn, J. (1997). Is psychopathology associated with the timing of pubertal development? *Journal of the American Academy of Child & Adolescent Psychiatry, 36*(12), 1768–1776.
- Greene, S. (Ed.). (2008). *Psychology of emotions, motivations and actions: Body image: Perceptions, interpretations and attitudes*. New York: Nova.
- Greenwood, D. N., & Dal Cin, S. (2012). Ethnicity and body consciousness: Black and white American women's negotiation of media ideals and others' approval. *Psychology of Popular Media Culture, 1*(4) <http://dx.doi.org/10.1037/a0029411>, 220–221–235
- Grogan, S. (2007). *Body image: Understanding body dissatisfaction in men, women and children* (2nd ed.). Taylor & Francis.
- Hall-Lande, J., Eisenberg, M., Christenson, S., & Neumark-Sztainer, D. (2007). Social isolation, psychological health, and protective factors in adolescence. *Adolescence, 42*, 265–286.
- Hayatbakhsh, M. R., Najman, J. M., McGee, T. R., Bor, W., & O'Callaghan, M. J. (2009). Early pubertal maturation in the prediction of early adult substance use: A prospective study. *Addiction, 104*(1), 59–66.
- Hayden-Wade, H., Stein, R. L., Ghaderi, A., Saelens, B. E., Zabinski, M. F., & Wilfley, D. E. (2005). Prevalence, characteristics, and correlates of teasing experiences among overweight children vs. non-overweight peers. *Obesity Research, 13*(8), 1381.
- Hesketh, K. (2004). Body mass index and parent-reported self-esteem in elementary school children: Evidence for a causal relationship. *International Journal of Obesity & Related Metabolic Disorders: Journal of the International Association for the Study of Obesity, 28*(10), 1233–1237.
- Isomaa, R., Isomaa, A. L., Marttunen, M., Kaltiala-Heino, R., & Björkqvist, K. (2010). Psychological distress and risk for eating disorders in subgroups of dieters. *European Eating Disorders Review, 18*(4), 296–303.
- Isomaa, R., Isomaa, A. L., Marttunen, M., Kaltiala-Heino, R., & Björkqvist, K. (2011). Longitudinal concomitants of incorrect weight perception in female and male adolescents. *Body Image, 8*(1), 58.
- Kaltiala-Heino, R., & Fröjd, S. (2011). Correlation between bullying and clinical depression in adolescent patients. *Adolescent Health Medicine & Therapeutics, 2*, 37–44.
- Kaltiala-Heino, R., Kautiainen, S., Virtanen, S. M., Rimpela, A., & Rimpela, M. (2003). Has the adolescents' weight concern increased over 20 years? *European Journal of Public Health, 13*(1), 4–10.
- Kaltiala-Heino, R., Koivisto, A. M., Marttunen, M., & Fröjd, S. (2011). Pubertal timing and substance use in middle adolescence: A 2-year follow-up study. *Journal of Youth & Adolescence, 40*(10), 1288–1301.
- Kim, Y. S. (2006). School bullying and youth violence: Causes or consequences of psychopathologic behavior? *Archives of General Psychiatry, 63*(9), 1035–1041.
- King, A., Wold, B., Tudor-Smith, C., & Yossi, H. (1996). *The health of youth. A cross national survey. WHO regional publications, European series no. 69*. Copenhagen: WHO Europe.
- Larson, R., & Richards, M. H. (1991). Daily companionship in late childhood and early adolescence. Changing developmental contexts. *Child Development, 62*, 284–300.
- Laursen, B., & Hartl, A. (2013). Understanding loneliness during adolescence: Developmental changes that increase the risk of perceived social isolation. *Journal of Adolescence, 36*, 1261–1268.
- Lumeng, J. C. (2010). Weight status as a predictor of being bullied in third through sixth grades. *Pediatrics, 125*(6), e1301–e1307.
- Mamun, A. A. (2013). Adolescents' bullying and young adults' body mass index and obesity: A longitudinal study. *International Journal of Obesity, 37*(8), 1140–1146.
- McClure, A. C. (2010). Characteristics associated with low self-esteem among US adolescents. *Academic Pediatrics, 10*(4), 238–44.e2.
- McCormack, L. A. (2011). Weight-related teasing in a racially diverse sample of sixth-grade children. *Journal of the American Dietetic Association, 111*(3), 431–436.
- Nansel, T. R., Overpeck, M., Pilla, R. S., Ruan, W. J., Simons-Morton, B., & Scheidt, P. (2001). Bullying behaviors among US youth: Prevalence and association with psychosocial adjustment. *Journal of the American Medical Association, 285*(16), 2094.
- Paxton, S. J., & Heinicke, B. E. (2008). Body image. In S. Wonderlich, J. E. Mitchell, M. de Zwaan, & H. Steiger (Eds.), *Annual review of eating disorders. Part 2*. Oxford: Radcliffe Publishing.
- Puhl, R. M., & Luedicke, J. (2012). Weight-based victimization among adolescents in the school setting: Emotional reactions and coping behaviors. *Journal of Youth and Adolescence, 41*(1), 27.
- Reulbach, U. (2013). Weight, body image and bullying in 9-year-old children. *Journal of Paediatrics & Child Health, 49*(4), E288–E293.
- Rimpela, A. H., & Rimpela, M. K. (1993). Towards an equal distribution of health? Socioeconomic and regional differences of the secular trend of the age of menarche in Finland from 1979 to 1989. *Acta Paediatrica, 82*(1), 87–90.
- Russell, S. T. (2011). Lesbian, gay, bisexual, and transgender adolescent school victimization: Implications for young adult health and adjustment. *Journal of School Health, 81*(5), 223–230.
- Schaefer, F., Marr, J., Seidel, C., Tilgen, W., & Scharer, K. (1990). Assessment of gonadal maturation by evaluation of spermaturia. *Archives of Disease in Childhood, 65*(11), 1205–1207.
- Smolak, L. (2004). Body image in children and adolescents: Where do we go from here? *Body Image, 1*(1), 15.
- Swallen, K. C. (2005). Overweight, obesity, and health-related quality of life among adolescents: The national longitudinal study of adolescent health. *Pediatrics, 115*(2), 340–347.
- Tanner, J. M. (1962). *Growth at adolescence: with a general consideration of the effects of hereditary and environmental factors upon growth and maturation from birth to maturity* (2nd ed.). Oxford: Blackwell Scientific Publications.
- Theriot, M. T., Dulmus, C. N., Sowers, K. M., & Johnson, T. K. (2005). Factors relating to self-identification among bullying victims. *Children and Youth Services Review, 27*(9), 979.
- Tippett, N., Wolke, D., & Platt, L. (2013). Ethnicity and bullying involvement in a national UK sample. *Journal of Adolescence, 36*, 639–640–649.
- Torikka, A., Kaltiala-Heino, R., Rimpela, A., Marttunen, M., Luukkaala, T., & Rimpela, M. (2014). Self-reported depression is increasing among socio-economically disadvantaged adolescents – repeated cross-sectional surveys from Finland from 2000 to 2011. *BMC Public Health, 14*, 408.
- Van Loon, A. J. M. (2003). Survey non-response in the Netherlands: Effects on prevalence estimates and associations. *Annals of Epidemiology, 13*(2), 105–110.
- Wang, Y. (2006). Worldwide trends in childhood overweight and obesity. *International Journal of Pediatric Obesity, 1*(1), 11–25.