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The healthy body image (HBI) intervention: Effects of a school-based cluster-randomized controlled trial with 12-months follow-up

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ABSTRACT

We examined the effects of the Healthy Body Image (HBI) intervention on positive embodiment and health-related quality of life among Norwegian high school students. The intervention comprised three interactive workshops, with body image, media literacy, and lifestyle as main themes. In total, 2,446 12th grade boys (43%) and girls (mean age 16.8 years) from 30 high schools participated in a cluster-randomized controlled study with the HBI intervention and a control condition as the study arms. Data were collected at baseline, post-intervention, 3- and 12-months follow-up, and analysed using linear mixed regression models. The HBI intervention caused a favourable immediate change in positive embodiment and health-related quality of life among intervention girls, which was maintained at follow-up. Among intervention boys, however, weak post-intervention effects on embodiment and health-related quality of life vanished at the follow-ups. Future studies should address steps to make the HBI intervention more relevant for boys as well as determine whether the number of workshops or themes may be shortened to ease implementation and to enhance intervention effects.

1. Introduction

Positive embodiment and body appreciation are important aspects of health and quality of life (Avalos, Tylka, & Wood-Barcalow, 2005; Piran, 2019; Tiggemann, 2011). In previous studies, positive embodiment and body appreciation have been associated with positive self- and body esteem, healthy eating, and performing regular physical activity in boys and girls (Cash & Fleming, 2002; Neumark-Sztainer, Paxton, Hannan, Haines, & Story, 2006; Santos, Tassitano, do Nascimento, Petribú, & Cabral, 2011; Tylka & Homan, 2015). Further, body image has been found to predict health-related quality of life in boys and girls (Griffiths et al., 2017; Haraldstad, Christophersen, Eide, Natvig, & Helseth, 2011).

There is however a well-known gender difference, as fewer adolescent boys struggle with body image issues (13–45%) compared to adolescent girls (45–71%) (Martinsen, Bratland-Sanda, Eriksson, & Sundgot-Borgen, 2010; Torstveit, Aagedal-Mortensen, & Stea, 2015). In the same vein, adolescent boys report more satisfaction with their bodies and higher levels of embodiment compared to adolescent girls (Franko, Cousineau, Rodgers, & Roehrig, 2013; Holmqvist, Frisén, & Piran, 2018; Neumark-Sztainer et al., 2006; Santos et al., 2011). From a developmental perspective, changes in the experience of the body during the critical phase of adolescence can have a long-term impact on body image (Wertheim, Paxton, & Blaney, 2009). Promoting positive embodiment in adolescence is therefore vital to establish a good basis for health-related quality of life, as such quality of life has proved stable during the life course (Bisegger, Cloetta, von Rueden, Abel, & Ravens-Sieberer, 2005), and can be viewed as a core issue for public health.

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Systematic reviews show that universal intervention programs that are successful address the reduction of risk factors, as for example body dissatisfaction, in order to prevent eating disorders among adolescents (Le, Barendregt, Hay, & Mihalopoulos, 2017; Stice, Shaw, & Marti, 2007; Yager, Diedrichs, Ricciardelli, & Halliwell, 2013). Within a health promotion perspective, promoting positive embodiment represents a theoretical and methodological paradigmatic shift from the disease-preventing focus, e.g., by preventing body dissatisfaction, to a health-promotion focus (Le et al., 2017; Stice, Becker, & Yokum, 2013). This shift opens new possibilities to assess health-promotion interventions (Piran, 2015; Tylka & Wood-Barcalow, 2015; for examples, see Alleva et al., 2018; Halliwell, Jarman, Tylka, & Slater, 2018; McCabe, Connaughton, Tatangelo, Mellor, & Busija, 2017).

The research-based positive embodiment construct is defined as "positive body connection and comfort, embodied agency and passion, and attuned self-care" (Piran, 2016, p.47). Positive embodiment relates conceptually to body appreciation (Tylka & Piran, 2019), the most commonly used construct in assessing positive body image (Tylka, 2019). Both positive embodiment and body appreciation emphasize positive connection to, and appreciation of, the body, as well as attuned care of the body (Tylka & Piran, 2019). The positive embodiment construct, however, includes in addition, experiences of agency to act in the world and comfort with bodily desires (Piran, 2019).

Researchers have called for intervention studies that aim to enhance embodiment and health-related quality of life (Alleva, Sheeran, Webb, Martijn, & Miles, 2015; Tylka & Piran, 2019). Yet, most existing intervention studies lack inclusion of multidimensional instruments of positive embodiment (Webb, Wood-Barcalow, & Tylka, 2015). In particular, no randomized, controlled outcome evaluation studies have been conducted as a universal promoting program aimed at enhancing positive embodiment in both boys and girls in late adolescence (Alleva et al., 2015).

1.1. Development and implementation of the HBI intervention

We have developed the universal, multi-component health-promotion intervention "Healthy Body Image" (HBI; Sundgot-Borgen et al., 2018). The HBI intervention focuses on positive embodiment and health-related quality of life among Norwegian high school students, and employs an interactive educational approach, which has been found suitable in school settings (Yager et al., 2013).

The HBI intervention comprised three overarching themes related to body image, media literacy, and lifestyle, as these have been found to improve physical self-perception, body satisfaction and appreciation, physical competence, and body esteem, sometimes with large effect sizes (Alleva et al., 2015; Espinoza, Penelo, & Raich, 2013; Franko et al., 2013; Tomyn, Fuller-Tyszkiewicz, Richardson, & Colla, 2016). A more detailed description of the program and its rationale has been published elsewhere (Sundgot-Borgen et al., 2018).

The program was constructed to include both boys and girls in late adolescence. This was important because the peer environment is shaped by sociocultural ideals of both genders. Both boys' and girls' attitudes must change if the social environment of the whole school can be changed (Yager et al., 2013). Due to the mixed-gender sample, the intervention contained gender neutralized and gender specific contents (e.g., pictures, videos, communication examples), to make it relevant for both genders. Despite some debate on what age is most appropriate for initiation of body image interventions, evidence suggests that in prevention studies, it might be beneficial to target young adolescents prior to the onset of eating disorders (Espinoza et al., 2018; Rohde, Stice, & Marti, 2015). However, late adolescence involves pubertal, cognitive, and interpersonal changes, which increase adolescents' ability to reach a more abstract characterization of themselves, the influence of their peers increases (Rohde et al., 2015), and they may become more aware of and vulnerable to pressures to attain sociocultural beauty ideals. They are at an age where the risk for eating disorders peaks (Espinoza et al., 2018; Rohde et al., 2015; Stice et al., 2007), and promotion of positive embodiment is especially crucial, as they are moving towards the independence of young adulthood. Also, their improved ability for abstract reasoning makes them more likely to comprehend the intervention content, relate skills to their own lives, and take advantage of such taught skills.

The school context also ensures a relatively comparable participation rate between genders, which is an obvious asset since few existing studies have managed to include a balanced gender sample. Moreover, a mixed-gender approach may offer a more real-life setting in universally implemented health promotion initiatives (Yager et al., 2013).

1.2. Hypothesis

We hypothesized that the HBI intervention would be effective, resulting in more favourable scores on positive embodiment (higher) and health-related quality of life (higher) in intervention students compared to control students.

2. Method

2.1. Design and randomization

A cluster-randomized controlled design was used with schools as the clustering factor at a ratio of 1:1. Schools were randomly allocated to either the HBI intervention or the control group to equalize sample size, and the effect of socioeconomic and demographic variables, notably related to ethnicity and the urban-rural dimension. The sample would be considered representative of the adolescent population of Oslo and Akershus County. The randomization was conducted by a professional not affiliated with the study to minimize contamination biases within schools. During the intervention period, students at the control schools followed their regular school curriculum. Fig. 1 presents a diagram of the inclusion and randomization process of schools and students, respectively.

2.2. Sample characteristics

Thirty schools were randomized and 2,446, 1,254, 1,278, and 1,080 students consented to participate at pre-test, post-intervention, and 3- and 12-months follow-up, respectively (Fig. 1). The mean (range) number of students consenting at each school was 82 (22–184), 42 (5–97), 43 (4–125), and 36 (3–103) at pre-test, post-intervention, and 3- and 12-months follow-up, respectively. The number of students included in the primary outcomes analyses were 1,742, 1,190, 1,172, and 955 for the Experience of Embodiment Scale, and 1,688, 1,173, 1,158, and 925 for the KIDSCREEN-10 and General health across the four measurement occasions. The participants were 16.8 ($SD = 0.76$) years old, and 11%, and 1% were categorized as overweight and obese, respectively. Among the participants, 13% were categorized as immigrants, 39% had parents with a total income of $\geq$1 million NOK, and 82% reported one or both parents having a higher education.

2.3. Ethics approval and consent to participate

The study met the intent and requirements of the Health Research Act and the Helsinki declaration, and was approved by the Regional Committee for Medical and Health Research Ethics (P-REK 2016/142). It was enrolled in the international database

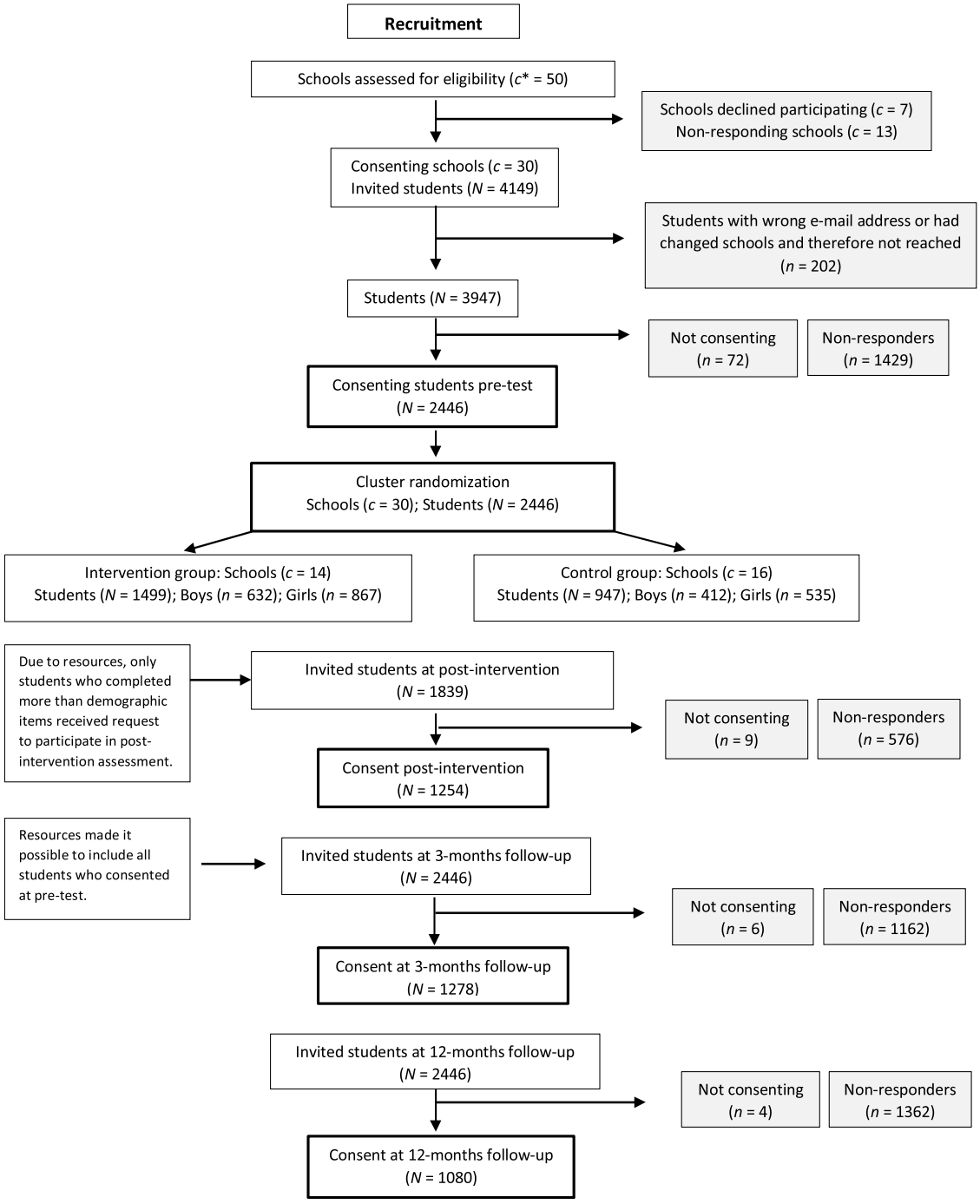

Fig. 1. Recruitment, cluster randomization of schools (*c*) and students (*N*), and response rate of participating students.

of controlled trials www.clinicaltrials.gov (ID: PRSNCT02901457). Students at consenting schools had the prerogative to decline participation after consent. In such cases, students were allowed to follow the HBI workshops, but without completing the questionnaires. After the final 12- months follow-up, control schools were offered one lecture where the program highlights were compressed. The methods and results are described according to the Consort Statement (Moher, Schulz, & Altman, 2001).

2.4. Procedure and data collection

As a result of a subsequent pilot study during March and April 2016 among 120 12th grade high schoolers, a few questionnaire items about body perception and nutrition were deleted to reduce the risk of error variance due to acquiescence bias. In addition, the amount of workshop assignments was reduced to allow for more time allocated to discuss mood and body satisfaction issues.

The HBI intervention included all 12th grade high school classes following a general study program, excluding students following a vocational study program. No further exclusion criteria were set. During Spring 2016, principals of all public and private high schools in Oslo and Akershus County in Norway were contacted by e-mail. Oral and written study information was provided to students and staff at the consenting schools. The Norwegian Health Research Act states that adolescents, 16 years or older, can give their informed consent with no parental consent needed. Students were sent an e-

mail with study information and a letter of informed consent. If they pressed ÿesÿto the question of consent, they were given access to a link that made the questionnaire package available, and they completed the questionnaire package through the online survey system SurveyXact 8.2. Ethical approval of the study required that the students completed the questionnaires outside regular school hours. Students were informed about their allocation into the intervention or control group after the randomization.

2.5. Measures

As described in the study protocol (Sundgot-Borgen et al., 2018), participants completed standardized questionnaires related to demographics, positive embodiment, and health-related quality of life at baseline, post-intervention, and at 3- and 12-months follow-up, respectively. All baseline assessments were conducted prior to the randomization. Post-intervention assessment was not available the same day as the last workshop, but within one week (Sundgot-Borgen et al., 2018).

2.5.1. Demographic variables

The demographic variables were collected at all measurement occasions, including age, gender, and self-reported body weight (kg) and height (cm). BMI was calculated as body weight (kg) divided by the height squared (m^2). Categorization of weight status was based on international age- and gender-adjusted cut-off scores (Cole, Bellizzi, Flegal, & Dietz, 2000). Total parental income was measured by asking the students what they believed to be their parents' total income, selecting one of five options (*less than NOK 200.000*, *NOK 200.000 - 400.000*, *NOK 500.000 - 800.000*, *NOK 900.000 - 1 million, more than NOK 1 million,* respectively). Students also ticked off if their parents had completed 1. *Primary school*, 2. *High school*, 3. *College/University*, or whether they 4. *Did not know*. Immigration status was measured by asking whether the student or both parents had immigrated (*Yes I have*, *Yes both my parents*, *No*).

2.5.2. Positive embodiment

Positive embodiment was measured using the Experience of Embodiment Scale (EES) (Teall & Piran, 2012). The Cronbach's alpha for the current study was .93 for girls and .92 for boys, similar to other studies with the range of .91–.94 (Chmielewski, Bowman, & Tolman, 2019; Holmqvist et al., 2018; Piran, 2019; Teall, 2006, 2014). Test-retest reliability over a 3-week period of the EES was also previously found to be acceptable ($r = .93$) (Piran, 2019). The 34 items covered positive connection with the body, agency and functionality, experience and expression of desire, body attunement, self-care vs. harm/neglect, and subjective lens vs. self-objectification (e.g., Ï am proud of what my body can doänd Ï care more about how my body feels than about how it looks¨). The items had a Likert-format ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), and the 17 negatively framed items (e.g., Ï ignore the signs my body sends meänd M̈y dissatisfaction with my body/appearance has a negative effect on my social life¨) were reversed so that the sum score reflected higher levels of positive embodiment.

Adequate construct validity of the EES has been found in previous studies on young adults as reflected by positive correlations with measures of body esteem in women ($rs = .76–.79$) and men ($r = .69$), body responsiveness ($r = .73$), body connection ($r = .60$), well-being ($rs = .55–.80$), and life satisfaction in men ($r = .68$) and women ($r = .66$). Further, the EES correlated negatively with measures of objectified body consciousness (rs = -0.55, -.73), eating problems (rs = -0.43, -.70), alexithymia (rs = -0.51, -.54), and depression (r = -0.63) (Chmielewski, Tolman, & Bowman, 2018; Holmqvist et al., 2018; Piran, 2019; Teall, 2006, 2014). Young men have reported higher EES scores compared to women (Holmqvist et al., 2018). Since the present investigation included late adolescents, ages 16–17, the study used the adult version of the EES. To date, most validation studies of the EES were conducted in young adult samples, such as Chmielewski et al. (2018) that included 340 women between the ages of 18–26 with an average age of 19.81.

Based on a series of confirmatory factor analyses, the global EES score was used as an outcome measure. While its original 6-factor model showed an adequate fit when modeling the method variance related to the positively and negatively worded items, $\chi^2(507) = 3311$, $p < .001$, RMSEA = 0.056, CFI/TLI = .890/.867, SRMR = .066, we used a global score since a general second-order factor, $\chi^2(516) = 3431$, $p < .001$, RMSEA = .057, CFI/TLI = .875/.864, SRMR = .076, accounted adequately for the 6-factor model.

2.5.3. Health-related quality of life

Health-related quality of life was measured by the KIDSCREEN-10, which is a widely used and validated self-report tool (Ravens-Sieberer, 2006), and has been validated in Norwegian adolescents (Haraldstad & Richter, 2014). The scale consists of 10-items (e.g., Ḧave you felt fit and well?änd Ḧave you felt sad?¨). The sum score of the 1–10 provides a general health-related quality of life index. A separate item included in the KIDSCREEN-10 measured perceived General Health (Ïn general, how would you say your health is?¨), which has been found to correlate well with measures of physical well-being ($r = .63$) and psychological well-being ($r = .51$) (Barthel et al., 2017). All items, 1–11, had a 5-point Likert-type format from 1 (*not at all/never*) to 5 (*extremely/always*) for 10 items, and from 1 (*excellent*) to 5 (*poor*) for the General Health item. Negatively worded questions were reversed, and hence a higher score indicated higher levels of health-related quality of life. Standardized T-scores were presented at baseline to enable comparison of means across study samples and compare data to health-related quality of life norm data. A score of 50 represents the mean. A T-score < 38 on the KIDSCREEN-10 indicates lower health-related quality of life, while scores ≥ 38 indicate preferable reported health-related quality of life (Ravens-Sieberer, 2006). The internal consistency for this sample was $\alpha = .81$, and has been found to be satisfactory in other samples of adolescent boys and girls (Haraldstad et al., 2011).

2.6. The HBI intervention

There is no consensus as to which theoretical orientation may provide the most effective approach when developing a health promotion intervention aiming to promote embodiment and health-related quality of life (Alleva et al., 2015). However, a sociocultural perspective (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999) was natural to consider when aiming to change attitudes, beliefs, and knowledge related to idealized lifestyles (involving e.g., extreme exercise and diet regimes) and bodies, to further strengthen the resilience towards unhealthy internalization, and strengthen life-managing skills in a mixed-gender school-based setting. Also, an etiological model of risk and protective factors (Piran, 2015; Smolak & Piran, 2012) as well as the developmental theory of embodiment (Piran, 2017; Teall & Piran, 2012) within the realm of positive psychology (Seligman & Csikszentmihalyi, 2000), were important in its development.

Although thoroughly described in the Appendix, some important aspects of the intervention specifically aiming to promote positive embodiment are presented.

Through the body image and media literacy workshops, we aimed to improve critical awareness of unhealthy body and lifestyle idealization, critical and constructive use of social media, including consequences of current body ideals for boys and girls. By this, we intended to reduce the risk of internalization of unhealthy ideals, self-harm, and neglect, as well as promote a subjective lens while reducing self-objectification. To improve a positive connection with the body, we aimed to strengthen attitudes towards, and

Table 1
Estimated Baseline Mean (*SD*) Differences in Demographics, Positive Embodiment (EES), and Health-Related Quality of Life (KIDSCREEN) between Intervention and Control students.

	Boys (*N* = 1044)			Girls (*N* = 1402)		
	Intervention (*n* = 632)	Control (*n* = 412)	*p*-value (d/φ)	Intervention (*n* = 867)	Control (*n* = 535)	*p*-value (d/φ)
Age in years	16.84 (0.57)	16.78 (0.64)	.117	16.80 (0.54)	16.78 (0.53)	.426
BMI, kg/m^2	21.85 (3.45)	21.77 (3.26)	.741	21.41 (2.82)	21.43 (3.65)	.946
Immigration status[a]	62 (9.81%)	71 (17.20%)	.001 (0.11[g])	109 (12.50%)	87 (16.20%)	.057
Parents' income ≥ 1NOK million[b]	319 (49.9%)	186 (44.6%)	.101	324 (36.8%)	143 (26.3%)	< .001 (-.11[g])
Parents' educational level[c]	544 (86.5%)	314 (76.6%)	< .001 (-.13[g])	745 (85.1%)	416 (77.5%)	< .001 (-.10[g])
EES[d]	130.15 (20.91)	126.73 (22.18)	.054	117.31 (22.70)	114.03 (24.31)	.023 (0.15)
KIDSCREEN-10[e]	38.29 (6.10)	38.00 (6.43)	.580	35.78 (6.01)	34.53 (5.92)	.001 (0.21)
KIDSCREEN-10 T-score	53.10 (9.76)	52.55 (10.30)	.580	48.99 (9.64)	46.98 (9.48)	.001 (0.21)
General Health[f]	3.70 (1.07)	3.59 (1.17)	.254	3.30 (1.05)	3.05 (1.10)	< .001 (0.23)

Note. BMI = Body mass index. EES = The Experience of Embodiment Scale. [a] Immigration status: both parents are immigrants, [b]Parents' income: parents with total income ≥ 1 million NOK, [c]Parents' educational level: one or two parents with college or university education, presented as total number and percentage (%) of total *n* in each group and for each gender. [d]EES global score ranges from 34 to 170; [e]KIDSCREEN-10 ranges from 10-50. [f]General Health score ranges from 1-5. *p*-value < .05. *d* = Cohen's *d* and [g]φ = phi-coefficient are presented for significant differences.

knowledge about, how to promote self-care and experience of body functionality when discussing lifestyle factors, such as nutrition, exercise, and sleep.

The intervention was developed to suit the cognitive development among adolescents 16 years of age in terms of their ability for abstract reasoning. The workshop delivery was based on the elaboration likelihood model (Petty & Briño, 2012; Petty & Cacioppo, 1986). According to this model, as well as previous findings (Alleva et al., 2015; Stice et al., 2013, 2007), the program contained three 90-min interactive workshops to facilitate extensive student discussions. All workshops were arranged in classrooms during regular school hours. About 60 boys and girls (i.e., two school classes) participated per workshop. Student attendance was registered at each workshop to calculate program adherence. A 3-week interval between each workshop resulted in a 3-month intervention period.

The first and fourth author facilitated the intervention. Both are specialized in physical activity and health, sports nutrition, motivational interviewing, and body image among adolescents. Detailed information about the intervention content and targets can be found in the study protocol (Sundgot-Borgen et al., 2018).

2.7. Sample size and power analyses

The statistical power estimation was based on two comparison groups (α = .05 and *b* = .20) with an average within-cluster sample size of 70 students. The expected effect size was .28 according to a meta-analysis (Hausenblas & Fallon, 2006) that included 35 studies examining intervention effects on body images variables. Moreover, we assumed that the within-cluster dependency related to schools accounted for approximately 3% (ICC = .03). This is fair for variables related to psychological or mental health outcomes, as selection factors like socioeconomic status affect these variables less than for example academic performance. These considerations required a minimum of 10 clusters within each group, requiring a total sample size of 10 schools × 2 groups × 70 students ĩ1400 students.

2.8. Statistical analysis

The software program Mplus, version 8.0, was used to carry out factor analyses, while remaining statistics were analysed using IBM SPSS 24 for Windows. The adequacy of the randomization procedure was examined by comparing group differences at baseline with independent *t*-tests, chi-square tests, or Kruskal-Wallis tests (Table 2). A case was recorded as dropout if all post-intervention and follow-up data were missing. Due to several layers of dependency in the outcome data, linear mixed regression models were fit, as suggested in comparable studies (Wilksch et al., 2017). Dependency within the school clusters was accounted for by adding school as a random factor, whereas dependency between the repeated measures was accounted for by fitting a compound symmetry matrix to the residual matrices (thus assuming equal-sized correlations between measurement occasions). Students were nested within schools, which also was accounted for. The baseline score was used as a covariate to adjust for imperfections in the randomization procedure and to increase the statistical power. The fixed factors were *group* (one coefficient for the difference between the intervention and the control group), *time* (a coefficient for each time point except the last, thus detecting a non-linear change), and *group* × *time* (to detect if intervention effects were particularly pronounced at certain time points). In order to examine if the level of participations at workshops influenced the outcomes, *workshop attendance* (*WA*-number of workshops) was added as linear covariate, as well as interaction terms examining if *WA* influenced the outcome particularly at certain time points (*WA* × *time*) or additionally within just one of the groups (*WA* × *time* × *group*). The restricted maximum likelihood procedure and Type III *F*-tests were preferred. The analyses were stratified for gender. Statistically significant effects set to $p < .05$, were followed-up with planned comparison tests (LSD) examining group differences at each follow-up assessment. Results are expressed as absolute numbers (*n*) and percentage (%) for categorical data and model estimated means including 95% confidence intervals and standard deviation (*SD*) for continuous data. Effect sizes are presented as Cohen's *d* and phi-coefficients.

3. Results

3.1. Participant demographics

Participant demographics for each group are presented in Table 1. At baseline, all participants were 16–17 years of age, with a mean BMI within the normal weight range for youths (Cole et al., 2000). The baseline correlation between EES and KIDSCREEN-10 was $r = .60$ ($p < .001$) among both boys and girls. Girls in the intervention had higher scores on positive embodiment, health-related quality of life, and the general health item compared to girls in the control group. No significant difference between groups was found in boys for these outcome measures. Based on parents' total income and education level, girls in the intervention group were more likely to be defined with a higher social economic status compared to girls in the control group. Boys in the intervention group had parents with a higher level of education, and fewer were categorized as immigrants compared to boys in the control group (Table 1). The

Table 2
Immediate and Follow-up Intervention Effects in Positive Embodiment Separately for Boys and Girls.

	Intervention *n*	Total EES score [CI 95%]	Control *n*	Total EES score [CI 95%]	Mean difference [CI 95%]	*p*-value	Cohen's *d*
Boys							
Baseline	428	130.15 [129.39, 131.77]	220	126.73 [124.72, 128.17]	3.42 [-0.05, 6.90]	.054	
Post-intervention	268	136.93 [135.23, 138.63]	132	133.96 [131.55, 136.36]	2.98 [0.03, 5.93]	.048	0.21
Follow-up (3 months)	245	136.76 [134.69, 138.82]	132	135.58 [132.56, 138.59]	1.18 [-2.48, 4.84]	.526	
Follow-up (12 months)	192	137.54 [135.00, 140.07]	94	133.99 [130.17, 137.81]	3.55 [-1.04, 8.13]	.129	
Girls							
Baseline	696	117.31 [116.26, 117.00]	377	114.03 [112.58, 114.44]	3.45 [0.53, 6.37]	.023	0.15
Post- intervention	534	123.80 [122.74, 124.87]	256	119.78 [118.28, 121.29]	4.02 [2.17, 5.87]	< .001	0.35
Follow-up (3 months)	536	124.89 [123.59, 126.18]	259	120.49 [118.62, 122.36]	4.40 [2.12, 6.68]	< .001	0.31
Follow-up (12 months)	459	125.54 [124.06, 127.03]	210	119.08 [116.87, 121.30]	6.46 [3.79, 9.13]	< .001	0.42

Note. All estimations were adjusted for school as a random factor, and BMI, age, immigration status, parents' income, and parents' education as fixed covariates (if statistically significant). *p*-value < .05. EES = The Experience of Embodiment Scale. The baseline EES score was included as a covariate. EES score range: 34-170. CI 95% = 95% confidence interval. *d* = Cohen's *d*, and are presented for significant differences.

Table 3
Immediate and Follow-up Intervention Effects in Health-Related Quality of Life separately for Boys and Girls.

	Intervention *n*	Total score [CI 95%]	Control *n*	Total score [CI 95%]	Mean difference [CI 95%]	*p*-value	Cohen's *d*
Boys							
KIDSCREEN-10 [a]							
Baseline	418	38.29 [38.05, 38.73]	213	38.00 [37.51, 38.50]	0.29 [-0.74, 1.32]	.580	
Post- intervention	263	38.26 [37.69, 38.82]	127	37.48 [36.68, 38.28]	0.78 [-0.20, 1.76]	.119	
Follow-up (3 months)	243	38.62 [37.98, 39.26]	128	37.65 [36.72, 38.58]	0.97 [-0.16, 2.10]	.093	
Follow-up (12 months)	188	37.98 [37.22, 38.74]	89	36.84 [35.71, 37.97]	1.14 [-0.22, 2.50]	.100	
General Health [b]							
Baseline	418	3.70 [3.64, 3.77]	213	3.59 [3.50, 3.68]	0.10 [-0.07, 0.29]	.580	
Post- intervention	263	3.84 [3.73, 3.95]	127	3.61 [3.45, 3.77]	0.23 [0.03, 0.42]	.021	0.25
Follow-up (3 months)	243	3.72 [3.59, 3.84]	128	3.72 [3.54, 3.89]	0.00 [-0.21, 0.22]	.989	
Follow-up (12 months)	188	3.78 [3.63, 3.92]	89	3.63 [3.40, 3.85]	0.15 [-0.11, 0.42]	.256	
Girls							
KIDSCREEN-10 [a]							
Baseline	692	35.78 [35.61, 36.13]	365	34.53 [34.18, 34.88]	1.25 [0.49, 2.01]	.001	0.21
Post- intervention	530	34.82 [34.41, 35.22]	253	34.82 [34.24, 35.39]	−0.00 [-0.71, 0.70]	.999	
Follow-up (3 months)	532	34.87 [34.42, 35.32]	255	34.88 [34.23, 35.54]	−0.01 [-0.81, 0.79]	.980	
Follow-up (12 months)	446	34.88 [34.38, 35.38]	202	33.62 [32.87, 34.37]	1.26 [0.36, 2.16]	.006	0.23
General Health [b]							
Baseline	692	3.30 [3.24, 3.33]	365	3.05 [2.99, 3.12]	0.24 [0.11, 0.38]	< .001	0.23
Post- intervention	530	3.35 [3.27, 3.43]	253	3.18 [3.07, 3.29]	0.17 [0.04, 0.30]	.013	0.19
Follow-up (3 months)	532	3.29 [3.21, 3.37]	255	3.15 [3.04, 3.27]	0.14 [-0.01, 0.28]	.059	0.15
Follow-up (12 months)	446	3.39 [3.30, 3.48]	202	3.16 [3.02, 3.29]	0.23 [0.07, 0.40]	.006	0.24

Note. All estimations were adjusted for school as a random factor, and BMI, age, immigration status, parents' income, and parents' education as fixed covariates (if statistically significant). *p*-value < .05. KIDSCREEN-10 = Health-related quality of life. The baseline KIDSCREEN-10 score was included as a covariate. [a] KIDSCREEN-10 score ranges from 10-50. [b] General Health score ranges from 1-5. CI 95% = 95% confidence interval. *d* = Cohen's *d*, and are presented for significant differences.

linear mixed regression models were adjusted for group differences at baseline.

3.2. Dropout analysis

No differences were observed in the outcome variables between dropouts and completers in either boys or girls. More students in the control group (p = .001, φ = 10.61), and more boys (p < .001, φ = 52.48) dropped out. Boys who dropped out had slightly higher BMI (p = .044, d = 0.15) and body weight (p = .010, d = 0.20), while girls who dropped out were slightly older (p = .014, d = 0.17). Effect analyses were therefore adjusted for these variables.

3.3. Positive embodiment intervention effects

For boys, the linear mixed regression model showed that the main effect of *group* (p = .072), *time* (p = .756) and the interaction effect of *group* × *time* (p = .543) were nonsignificant. The planned comparison analyses showed that boys in the intervention group reported higher positive embodiment at post-intervention compared to boys in the control group, suggesting a short-term favorable small effect. However, this effect was lost at the 3- and 12-month follow-ups (Table 2).

For girls, the main effect of *group* was significant, $F(1, 777) = 33.11$, p < .001, while *time* (p = .267) and *group* × *time* (p = .133) effects were nonsignificant. The planned comparison analyses showed a significant and favorable effect of the intervention on positive embodiment for girls in the intervention group. This effect was maintained at the 3- and 12-months follow-up, respectively. The effect size increased slightly over time, and with a peak at the last follow-up assessment (see Table 2).

3.4. Health-related quality of life intervention effects

For boys, the linear mixed regression model showed a significant main effect of *group* for health-related quality of life, $F(1, 360) = 4.78$, p = .029, while the *time* (p = .148) and *group* × *time* (p = .871) effects were nonsignificant. Although the mean differences between boys in the intervention and control groups increased across the assessment time-points, no planned comparison analyses showed statistical significance (see Table 3).

Table 4
Dose-Response Analyses with Degree of Attendance as a Moderator of Positive Embodiment (EES) Intervention Effects.

	Degree of attendance			
	0 workshops $M_{\text{diff CI 95\%}}$ p (d)	1 workshop $M_{\text{diff CI 95\%}}$ p (d)	2 workshops $M_{\text{diff CI 95\%}}$ p (d)	3 workshops $M_{\text{diff CI 95\%}}$ p (d)
Boys	n = 508	n = 491	n = 621	n = 829
Post- intervention	5.54 [-2.27, 13.35] .164	4.15 [-4.11, 12.40] .324	0.08 [-4.04, 4.19] .972	3.86 [0.66, 7.06] .018 (0.16)
Follow-up (3 months)	−0.57 [-9.26, 8.13] .898	2.34 [-9.65, 14.33] .701	−0.21 [-5.29, 4.88] .936	1.83 [-2.16, 5.82] .369
Follow-up (12 months)	2.51 [-8.24, 13.27] .646	−3.83 [-18.28, 10.63] .602	2.75 [-3.13, 8.64] .358	4.26 [-0.83, 9.35] .101
Girls	n = 635	n = 630	n = 838	n = 1053
Post- intervention	−0.32 [-5.52 - 4.88] .906	1.36 [-2.61 - 5.33] .501	3.86 [1.43 - 6.30] .002 (0.23)	5.48 [3.40 - 7.56] < .001 (0.32)
Follow-up (3 months)	−1.37 [-7.61 - 4.89] .668	4.94 [0.13 - 9.76] .044 (0.24)	4.13 [1.15 – 7.11] .007 (0.20)	5.57 [3.02 - 8.12] < .001 (0.26)
Follow-up (12 months)	−2.16 [-9.35 - 5.03] .555	4.49 [-0.79 - 9.78] .095	7.28 [3.84 – 10.71] < .001 (0.30)	7.75 [4.77 - 10.72] < .001 (0.31)

Notes.EES = The Experience of Embodiment Scale. M_{diff} = Mean group difference (a positive score favors the intervention). CI 95% = 95% confidence interval, p-value < .05. d = Cohen's d, and are presented for significant differences.

For the general health outcome item, the model showed no effect of *group* (p = .120), *time* (p = .953), or *group* × *time* (p = .191) for boys. The planned comparison analyses did show a favorable and significant post-intervention effect for boys in the intervention group compared to boys in the control group, which was not maintained at follow-up (see Table 3).

For girls, the main effect of group for health-related quality of life was not significant (p = .186), whereas significant *time*, $F(2, 860) = 3.99$, p =.019, and *group* × *time*, $F(2, 860) = 4.47$, p = .012, effects were observed. The planned comparison analyses showed no significant difference in health-related quality of life between girls in the intervention and control groups at post-intervention and 3-months follow-up. However, a "sleeping effect" was evident, as girls in the intervention group had a significantly higher health-related quality of life (small effect size) at the 12-months follow-up compared to girls in the control group (see Table 3).

The model with the general health variable as outcome showed a significant *group* effect, $F(1, 807) = 10.54$, p = .001, while the effect of *time* (p = .466) and *group* × *time* (p = .598) were non-significant. The planned comparison analyses showed that girls in the intervention group had significantly more favorable general health at post-intervention compared to girls in the control group (small effect size), which was maintained at follow-up, as well (see Table 3).

3.5. Dose-response effect related to the number of attended workshops

Since the degree of attendance was irrelevant for the control group, the group variable was recoded as 0 (control group), and 1–4 (1 = 0 workshops in intervention student, 2 = 1 workshop, 3 = 2 workshops, 4 = 3 workshops). Neither *group* (p = .290), *time* (p = .715), nor *time* × *group* (p = .750) were significant among boys in the intervention group. However, in girls, the main effect of *group* was significant, $F(4, 756) = 10.96$, p < .001. The *time* (p = .284) and the interaction effects (*time* × *group*) (p = .335) were nonsignificant. The follow-up tests, as presented in Table 4, indicate that an increasing attendance yielded a stronger intervention effect. A noteworthy finding was that boys and girls needed to attend at least three and two workshops, respectively, in order to benefit from the HBI intervention. This moderation effect was lost among boys at follow-up, but not among girls. All effect sizes were in the small range (see Table 4). Comparable analyses on health-related quality of life and the general health variable revealed no significant moderation effects.

4. Discussion

The HBI intervention promoted a post-intervention effect on positive embodiment and perceived general health for boys, although no sustained effects were observed. However, for girls, the HBI intervention promoted immediate and sustained positive embodiment. Additionally, for girls, there was a consistent pattern of improvement in perceived general health at post-intervention and 12-months follow-up, whereas the effects on health-related quality of life were only demonstrated at 12-months follow-up. These findings seem to converge with other body image programs that include follow-up measures (Espinoza et al., 2013; Neumark-Sztainer et al., 2010). The effect sizes in girls were also strongest at the 12-months follow-up, which is noteworthy. The current study increases the knowledge base of the long-term and delayed effect of body image interventions, which currently is scarce. Our study emphasises the importance of long-term follow-ups as some intervention effects may mature in a slower manner.

The intervention was intended to facilitate awareness of how attitudes towards the body and lifestyle choices are transmitted through different learned social channels, and, through that, shape students' attitudes, feelings, and lifestyles. According to a socio-cultural perspective (Thompson et al., 1999), an increase in critical awareness could have improved the ability to withstand unhealthy idealization, reducing the risk of internalization of such ideals (Teall & Piran, 2012). Students were also taught to become aware of, and use, factors in everyday life that enhance their embodiment. Further, body functionality and well-being were emphasized, rather than appearance, when discussing lifestyle factors. This could have promoted healthy perspectives on how to engage in lifestyle behaviours, similar to positive embodiment characteristics (Tylka & Wood-Barcalow, 2015).

The HBI intervention is to our knowledge, the first one among body image interventions to report on effects on health-related quality of life. In girls, the diffusion of the health-related quality of life effect from improving their embodiment was expected because these variables have been found to be highly correlated (Griffiths et al., 2017; Haraldstad et al., 2011). By strengthening the ability to filter media information, reduce unhealthy comparisons, and promote positive self-talk, it might be easier to improve body acceptance which may transform into better psychological well-being. Moreover, improving self-care and a healthy conscious lifestyle, may ultimately improve physiological health, which may explain the observed improvements in health-related quality of life.

The effect sizes were in general small and comparable with previous studies (Franko et al., 2013; Halliwell, Jarman, McNamara, Risdon, & Jankowski, 2015; Lindwall & Lindgren, 2005; Morgan, Saunders, & Lubans, 2012; Sharpe, Schober, Treasure, & Schmidt, 2013). In contrast to clinical studies, the interpretation of small effect sizes may be more favourable. Thus, such small effect sizes are common in universal interventions, and may be expected due to low base rates for clinical symptoms, and a high probability of ceiling effect for positive health indices. Similarly, by definition, study variables in health promotion studies do not pre-select participants having scores within a clinical range (Wilksch, 2014).

Attention has been given in the literature (Piran, 2001) to how students perceive the credibility of those who deliver intervention programs. In the present study, students were informed about the facilitators' education and academic position. In addition, the facilitators were attentive to the quality of their verbal and non-verbal communication with the students. Nevertheless, the students' perceived credibility of the workshop facilitators was not assessed.

An explicit rationale for the HBI intervention was to promote the interaction between boys and girls, and to mirror the across-gender sociocultural influences on body experiences that occurs in a realistic real-life setting. Strategies to accomplish this rationale included the use of different interactive components, thus, to enhance the chance of effect in both genders. Our study only found long-term effects in girls. This may support previous suggestions that girls are more receptive to body image interventions (Stice et al., 2007) even when efforts have been made to make the intervention gender neutral. Importantly, our results do not document that a single-gender intervention is preferred. Further, the HBI intervention is a health promotion intervention, where the aim is not only to reduce risk factors, but to promote health-related factors. Based on our findings, a mixed-gender approach might have been important to girls despite the lack of effect in boys. To further investigate whether single- or mixed-gender approaches is most effective, future studies need to include more arms (control, mixed-gender, single-gender- group) into the study design.

Similar to the effects of the HBI intervention, weak and transient effects from a body image intervention has been found in other studies on young adult men (Jankowski et al., 2017). Importantly, although undocumented, the presenters observed that the boys found the topics of "comparison," "self-talk," and "communication" not as relevant as the girls, which could have made it more difficult to be engaged and receptive to the workshop content. Previous studies have shown that enhancing peer comradery and connection, and including masculine points of reference, helped engage boys and men in an intervention (Seaton et al., 2017). Perhaps the female implementers in the HBI intervention may have had challenges with potentially important factors to engage boys as well as may have under-communicated the masculine aspects.

Virtually no effects among boys may also be explained by scores above norm data for health-related quality of life at baseline (Ravens-Sieberer, 2006). Although no norm data for the EES exists for late adolescent boys, one study on young men showed that boys scored significantly higher on the EES compared to girls (Holmqvist et al., 2018). This could reflect that boys at baseline are more accepting of their bodies, and therefore have a lower improvement potential compared to girls. At present, it remains unsettled whether the intervention may work better among boys with lower baseline health-related quality of life and embodiment, and whether it may work equally well in a girls-only group.

Our findings contradict the suggestion (Wilksch, 2017) that a single-session (workshop) intervention may suffice. Although a one-session may be more feasible in school settings, our results are in line with the elaboration likelihood model (Petty & Briño, 2012; Petty & Cacioppo, 1986) and previous meta-analyses (Stice & Shaw, 2004; Stice et al., 2007), that at least two workshop sessions were needed for girls to maintain the intervention effects at follow-up.

4.1. Strengths, limitations, and future directions

Assets of the present study are the theoretical framework, the user involvement through a pilot study, the randomized controlled design and the adequate statistical power. However, a loss of power at the follow-ups may have increased the probability of Type II errors, especially in boys. The fact that boys who dropped out had a slightly higher BMI is consistent with previous observations in health- and body image-related interventions and classroom-based activities (Finn, Faith, & Seo, 2018), that those with higher BMI feel self-conscious when exposed to the intervention content. However, boys who dropped out did not differ in positive embodiment or health-related quality of life, which reduces the reasons to believe that many of those who might especially benefit from our intervention dropped out.

Drop-outs seem almost inevitable, yet some steps may be mentioned to counteract them. Although we used measures of positive aspects of body image and not measures of body dissatisfaction, care should be taken when considering the comprehensiveness of the questionnaire, and to decrease the number of included questions, notably those of a sensitive nature. To facilitate improvement potential, one challenge is to select outcome measures where both genders have room for improvement.

Before a broader dissemination of the HBI intervention, modifications to the workshops should be tested, with male facilitators, to further investigate whether it might be possible to achieve genuine and sustainable effects for boys. Also, although the credibility of the workshop holders was planned and facilitated for, the students' perceptions of this credibility were not assessed. This is a limitation, and future studies should include such assessment. In addition, there is a need to study the dismantling potentials. The present findings clearly indicate that among girls, two interactive and multicomponent workshops may suffice. However, future studies need to address the issue of which of the three workshops that may be deleted from the program. This would inform which of the themes (i.e. body image, media literacy, and lifestyle factors) that should be retained.

4.2. Conclusion

The HBI intervention promoted a post-intervention effect on positive embodiment and perceived general health in boys. The intervention promoted a sustained effect on positive embodiment and health-related quality of life in girls. Future studies should examine the effect of only two workshops for girls and modifications of the workshops for boys to see if it is possible to obtain sustained effects in boys as well.

Competing interests

The authors declare that they have no competing interests.

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Appendix A

Outline of content and targets of Workshops #1 - #3 in the Healthy Body Image Intervention

#1 Body image

Main content	***Targets***
Project introduction	Experience of meaningfulness and motivation
Influencing factors on body perception. What promotes and reduces positive body image, and how can we enforce the health promoting factors?	Body image and body acceptance
Where does body idealization come from? Why does it conflict with positive body image and potential health consequences from striving for the idealized body?	Psychoeducation to prevent idealization and internalization of a particular body ideal
Fat talk and focus on lifestyle only related to appearance in everyday communication. To what degree do we participate, how does it make us feel, and can we reduce it?	Reduce fat talk and negative body talk
Introduction to self-talk and self-esteem in Workshop #2	Stimulate motivation for next workshop

#2 Media literacy

Main content	***Targets***
Social media perception and use. Empower yourself to choose mood enhancing over mood destructive content	Enhance media literacy
Extreme exposure without filter equals need to be critical to sources of information and awareness of retouching	Enhance media literacy
The nature of comparison, how to recognize destructive comparison and reduce its presence in everyday life	Reduce amount of comparison
Strengthen acceptance and love for individual differences, defining characteristics of ones' own and among friends. Students write down compliments to a friend and him/herself unrelated to appearance	Improve positive self-talk Improve self-compassion
Experiences and benefits of positive self-talk	Improve skills to strengthen self-esteem

#3 Lifestyle

Main content	***Targets***
Benefits on body experience from listening to bodily needs such as physical activity and healthy eating	Improve experience of embodiment
Truths and myth about lifestyle products and literature	Improve ability to reject exercise and nutritional myths - health information literacy
From aesthetic to functional focus; how can change in focus improve body experience and healthy lifestyle that again benefit well-being?	Change from potential unhealthy focus to healthy focus on the body
How may regular exercise and smart nutrition promote positive body image and what are the basic recommendations?	Body experience enhancing attitudes and behaviours

Note. Retrieved from Sundgot-Borgen, C., Bratland-Sanda, S., Engen, K. M. E., Pettersen, G., Friborg, O., Torstveit, M. K., … Rosenvinge, J. H. (2018). The Norwegian healthy body image programme: Study protocol for a randomized controlled school-based intervention to promote positive body image and prevent disordered eating among Norwegian high school students. *BMC Psychology*, *6*, 5. doi:10.1186/s40359-018-0221-8. Copyright 2018 by Sundgot-Borgen et al. (2018).

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