

Christine Sundgot-Borgen

## **The Healthy Body Image intervention:**

A school-based, cluster-randomized controlled trial  
in high school students



Norwegian Women's Public Health Association

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A school-based, cluster-randomized controlled trial in high school students

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*“To be nobody but yourself, in a world which is doing its best, night and day,  
to make you everybody else- means to fight the hardest battle which any human  
being can fight; and never stop fighting.”*

- Edward Estlin Cummings



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Christine Sundgot-Borgen

*Oslo, December 2019*

## List of papers

### Paper I

Sundgot-Borgen, C., Bratland-Sanda, S., Engen, K. M., Pettersen, G., Friborg, O., Torstveit, M. K., Kolle, E., Piran, N., Sundgot-Borgen, J. & 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(1), 8.

### Paper II

Sundgot-Borgen, C., Friborg, O., Kolle, E., Engen, K. M., Sundgot-Borgen, J., Rosenvinge, J. H., Pettersen, G., Torstveit, M. K., Piran, N. & Bratland-Sanda, S. (2019). The healthy body image (HBI) intervention: Effects of a school-based cluster-randomized controlled trial with 12-months follow-up. *Body Image*, 29, 122-131.

### Paper III

Sundgot-Borgen, C., Friborg, O., Kolle, E., Torstveit, M. K., Sundgot-Borgen, J., Engen, K. E., Rosenvinge, J. H., Pettersen, G. & Bratland-Sanda, S. (2019). Does the Healthy Body Image program improve lifestyle habits among high school students? A randomized controlled trial with 12-month follow-up. *Journal of International Medical Research*. 0(0), 1-17. doi: 10.1177/0300060519889453

### Paper IV

Sundgot-Borgen, C., Stenling, A., Rosenvinge, J. H., Pettersen, G., Friborg, O., Sundgot-Borgen, J., Kolle, E., Torstveit, M. K., Engen, K. M. & Bratland-Sanda, S. (Submitted). The Norwegian Healthy Body Image Intervention promotes Positive Embodiment Through Improved Self-Esteem. *Body Image*.

## Summary

**Background:** Researchers have been encouraged to design and evaluate health promotive interventions specifically tailored to promote positive embodiment in adolescents because it is associated with important mental and physical health outcomes. Furthermore, because positive embodiment and healthy lifestyle habits are related phenomena, stimulating positive embodiment should also promote healthy lifestyle habits. It has been indicated that school-based, interactive, multicomponent interventions could be effective. However, few studies have implemented all the necessary criteria for a sound methodology: a study with a clustered-randomization, a controlled design; a large sample size, including both genders; a long-term follow-up; and a measurement of the promotion of positive embodiment, not only the lack of dissatisfaction or symptoms of eating disorder pathology. Additionally, more studies that investigate which constructs that need to be influenced in order to improve positive embodiment are needed, to further tailor content for the best possible intervention effect on boys and girls. The Healthy Body Image (HBI) intervention was a response to the lack of evidence in this field and to the reported gaps related to methodological quality.

**Objectives:** The primary objective of the thesis is to evaluate the effects of the HBI intervention on high school boys and girls. The first paper outlines the rationale and the specific study protocol for the intervention. The second paper examines both the short- and long-term effects of the intervention on positive embodiment and health-related quality of life (HRQoL), as well as the moderating effect of workshop attendance on intervention effects in boys and girls. The third paper evaluates whether the intervention has an additional effect on lifestyle habits, such as physical activity, eating, and sleep, in the same sample. The fourth paper examines whether the intervention affected positive embodiment through specific constructs such as, internalization, social media usage, self-compassion, self-esteem, and body image flexibility that the intervention aimed to target.

**Methods:** The study employs a cluster-randomized controlled design, with a health promotion approach. In total, 2,446 12<sup>th</sup> grade boys (43%) and girls (mean age 16.8 years) from 30 Norwegian high schools were randomized into the HBI intervention or the control arm. The intervention was comprised of three multicomponent, interactive workshops, with body image, media literacy, and lifestyle as the main themes. Data were collected through an electronic, self-reported questionnaire, at baseline, post-intervention, and at three- and 12-month follow-up. Linear mixed regression models were used to examine the effects of the intervention, while path analyses and mediation models investigated direct and indirect effects.

**Results:** Paper II found that the intervention caused a favorable and immediate change in positive embodiment and HRQoL among intervention girls, which was maintained and strengthened through the follow-up. Among intervention boys, weak post-intervention effects on positive embodiment and HRQoL vanished at the follow-ups. At least two sessions were needed to produce an intervention effect on positive embodiment. In Paper IV, mediation analyses found a positive indirect effect of the intervention on positive embodiment through self-esteem in both boys and girls. Paper III showed that the intervention caused a minor negative effect on physical activity level in boys at the 12-month follow-up, but no effect on girls. Furthermore, positive but transient, small – moderate effects on breakfast consumption and consumption of fruit and vegetables were found for both genders. Intervention boys and girls slept more hours on school nights at the 12-month follow-up and post-intervention, respectively, and girls reported lower sleep debt at the 12-month follow-up.

**Conclusions:** The HBI intervention produced sustained effects on positive embodiment and HRQoL in girls. However, the intervention was not as effective in boys. Due to small favorable changes in lifestyle habits in both boys and girls, it might seem as though strong associations might exist between positive embodiment and lifestyle; however, the intervention could not promote meaningful changes in both factors equally. The study provides novel information on change mechanisms in a positive embodiment intervention and suggests that self-esteem should be targeted specifically in future interventions. Lastly, the study suggests that modifications be made to the HBI by introducing hands-on activities, include male in addition to female facilitators, and a stronger emphasis on self-esteem. These modifications could increase the level of improvement among boys.

**Keywords:** Health promotion, school-based, randomized controlled study, mediation, adolescents, embodiment, body appreciation, body image, quality of life, lifestyle, eating habits, physical activity, sleep.

## Sammendrag (Summary in Norwegian)

**Bakgrunn:** Forskere har blitt oppfordret til å designe og evaluere helsefremmende intervensjoner som har til hensikt å fremme positiv kroppssopplevelse hos ungdom, da positiv kroppssopplevelse er assosiert med flere mentale og fysiske helsevariabler. Det er også foreslått at intervensjoner som har til hensikt å fremme positiv kroppssopplevelse også vil kunne fremme sunne livsstilsvaner. Skolebaserte interaktive intervensjoner som tar for seg flere temaer samtidig har vist seg å være effektive. Få studier kan per i dag vise til studiedesign karakterisert med kluster-randomisering av utvalg med en kontrollgruppe, langtidsoppfølging, et stort utvalg med begge kjønn, og utfallsmål som spesifikt måler positiv kroppssopplevelse, i motsetning til kun redusert misnøye eller risiko for spiseforstyrrelsespatologi. Det foreligger heller ikke studier som har undersøkt hvilke komponenter i en intervensjon som er med på å skape endring i utfallsmålet. Sunn kroppssopplevelse (HBI) intervensjonen ble utviklet som et svar på behovet for flere studier av høy metodologisk kvalitet som kan bidra til økt kunnskap om hvordan fremme positiv kroppssopplevelse på best mulig måte blant gutter og jenter.

**Mål:** Å måle effektene av HBI intervensjonen blant gutter og jenter i videregående skole. Den første artikkelen presenterer intervensjonens rasjonale og protokoll. Den andre artikkelen undersøker kort- og lang-tids effekten av intervensjonen på positiv kroppssopplevelse og helserelatert livskvalitet, og den modererende effekten av antall workshops elevene har deltatt på. Den tredje artikkelen undersøker i hvilken grad intervensjonen har påvirket livsstils variabler som fysisk aktivitet, korsholdsvaner og søvn blant de samme elevene. Til slutt undersøker artikkel fire om enkelte egenskaper som intervensjonen hadde til hensikt å forbedre, som internalisering, bruk av sosiale medier, selvmedfølelse, selvfølelse og kroppsbilde fleksibilitet, kan se ut til å mediere intervensjonseffekten på positiv kroppssopplevelse.

**Metode:** Studien har et kluster-randomisert kontrollert design, med et helsefremmende perspektiv. Totalt 2,446 gutter (43%) og jenter (gjennomsnittlig alder 16.8 år) i 2. klasse ved 30 Norske videregående skoler ble randomiser til enten HBI intervensjonen eller til kontrollgruppen. Intervensjonen inneholdt tre interaktive workshops med flere tematikker per workshop, men med kroppsbilde, mediekunnskap, og livsstil som de tre overordnede temaene. Data ble samlet inn via et elektronisk spørreskjema ved baseline, etter intervensjonen, og ved 3- og 12-måneders oppfølging. Lineære blandede regresjonsmodeller ble brukt for å evaluere effekten av intervensjonen, mens sti-analyser og mediasjonsmodeller ble brukt for å undersøke direkte og indirekte effekter av intervensjonen på positiv kroppssopplevelse.

**Resultater:** Artikkel II viser at HBI intervensjonen hadde en akutt effekt på positiv kroppsopplevelse og helserelatert livskvalitet som ble forsterket ved 12-mndr oppfølging blant intervensjonsjentene. Blant intervensjonguttene gav intervensjonen kun en svak, korttids effekt på de to variablene. Deltagelse på to workshoper ga best effekt. I artikkel IV viste mediasjonsanalysene at intervensjonen hadde en indirekte effekt på positiv kroppsopplevelse igjennom økning av selvfølelse hos både gutter og jenter. Artikkel III viste at intervensjonen førte til en svak reduksjon i fysisk aktivitetsnivå blant intervensjonguttene ved 12-mndr oppfølging, mens ingen endring ble observert blant jentene. Videre ble det funnet små til moderate, forbigående positive effekter på inntak av frokost og frukt og grønt blant intervensjongutter og jenter. Intervensjons elever rapporterte økning i antall timer søvn om natten på skoledagene, ved 12-mndr oppfølging for guttene og post-intervensjon for jentene. Jenter rapporterte i tillegg redusert søvngjeld ved 12-mndr oppfølging.

**Konklusjon:** Intervensjonen fremmet positiv kroppsopplevelse og helserelatert livskvalitet hos jenter. Intervensjonen kan ikke sies å ha hatt tilsvarende effekt på guttene. Med bakgrunn i minimale effekter av intervensjonen på livsstil hos både gutter og jenter, kan det antas at HBI intervensjonen ikke klarte å fremme en betydningsfull endring i både positiv kroppsopplevelse og livsstil, tross for en observert assosiasjon mellom variablene i tidligere studier. Studien presenterer ny informasjon om mulige endringsmekanismer som kan være sentrale i en intervensjon for å fremme positiv kroppsopplevelse. Det foreslås videre at selvfølelse bør ansees som spesielt viktig å fokusere på i en intervensjon for sterkest mulig intervensjonseffekt. Til slutt foreslås det at en modifisert intervensjon med tema-spesifikke aktiviteter, inklusjon av både kvinnelige og mannlige workshopholdere, og ytterligere fokus på selvfølelse under workshopene, muligens kan forsterke intervensjonseffekten også blant gutter.

**Nøkkelord:** Helsefremming, skolebasert, randomisert kontrollert studie, mediasjon, ungdom, kroppsopplevelse, kroppsaksept, kroppsbilde, livskvalitet, livsstil, spisevaner, fysisk aktivitet, søvn.

## Abbreviations

<i>EES</i>	Experience of Embodiment Scale
<i>HBI</i>	Healthy Body Image
<i>HRQoL</i>	Health-related Quality of Life
<i>NSSS</i>	The Norwegian School of Sport Sciences
<i>PA</i>	Physical Activity
<i>RCT</i>	Randomized Controlled Trial
<i>WS</i>	Workshops

## Introduction

### Background for the study

Promoting and optimizing adolescent lifestyle is described as essential for physical, mental and social health in a life course perspective, and adolescents who adopt healthy lifestyle habits during their school years are more likely to maintain such behaviors as adults (WHO, 2019b). Hence, investment in adolescent health and wellbeing is beneficial for the individual and the society not only now, but for future decades, and next generations (Patton et al., 2016).

The numerous future health benefits of turning lifestyle habits healthier to achieve good mental health among adolescents call for health promotion initiatives (Dick & Ferguson, 2015).

In general, adolescents report good physical and mental health. They report having healthy physical activity and eating habits, and few adolescents report that they smoke, drink or take drugs. Nevertheless, mental distress and mental problems among adolescents have increased over the last few years, and adolescents report that pressure to be perceived as perfect, including presenting the perfect body, is exhausting and challenge their well-being (Bakken, 2018). Notably, there is a need to focus on body image and body dissatisfaction (Bucchianeri & Neumark-Sztainer, 2014). The mental, social, and physical changes that characterizes adolescence strengthens the need for health promotion during this period of life (Robert-McComb & Massey-Stokes, 2014).

### Adolescence and self-perception

The major changes during adolescence also include social skills, environments, self-perception, and behaviors related to lifestyle (Somerville et al., 2017). Together and individually, these significant changes will most likely influence the body image in some direction (Figure 2). If this direction is more positive or negative depends on individual, social and environmental factors.

From childhood and through adolescence (10-19 years), boys and girls develop their *social processing skills*, and they become better at recognizing and understanding other people's feelings, attitudes, beliefs, intentions, and perceived social norms in their environment (Blakemore, 2008).

Alongside of this awareness improvement, there are major *physiological changes* during this period. Girls normally increase their body fat percentage, while boys tend to increase in muscle mass and height (Warren, 2013). For the average girl, puberty means a larger gap between the social idealized body, while it becomes easier for many boys to approach the idealized body as they develop



towards adulthood (O'Dea & Abraham, 1999). In later adolescence (15-19 years), peer relationships become more important than previously, and *self-evaluation* is more based on peer norms and perception of their evaluations (Jones & Crawford, 2006; Steinberg & Morris, 2001). Their self-concept becomes more related to perceived norms and expectations from others (Choudhury, Blakemore, & Charman, 2006), and *body comparison* becomes a normal phenomenon (Bessenoff, 2006). Thus, due to these concurrent complex changes, adolescence is often labeled as a period with increased body appearance evaluation, and high vulnerability towards the society's *body idealization* (Littleton & Ollendick, 2003).

*Internalization* occurs when adolescents adopt socially prescribed body ideals as personal standards of attractiveness, often followed by regular monitoring of their body appearance to evaluate whether it meets the characteristics of the internalized ideal (Thompson & Stice, 2001). The body image is then affected by level of perceived discrepancy between the real and the idealized body. Idealization of natural, healthy bodies, and a wide range of body types in the environment increases the chance of body acceptance, while unrealistic ideals increase the risk of a large discrepancy and a negative body evaluation (Rousseau & Eggermont, 2018).

The characteristics of social environments, influences (peers, family, social media) and communication which the adolescent engage in, are likely to affect the perceived importance of body appearance and the intensity of body evaluation (Tantleff-Dunn & Lindner, 2011) (Figure 2).

### Body image

Body image has been defined somewhat differently throughout the literature. It can shortly be described as “*the subjective picture of our own body which we form in our mind; that is to say, the way in which the body appears to ourselves.*” (Schilder, 2007, p. 11). Body image has further been conceptualized as a multidimensional construct, comprising a cognitive, affective, perceptual, and a behavioral component (Cash & Pruzinsky, 1990), and where the subjective experience of one's appearance is more powerful than what could be defined as objectively true or observed by others in a social setting (Cash, 2004).

### Prevalence of body dissatisfaction

Depending on the measurement methods and the sample being assessed, body dissatisfaction is generally prevalent in adolescent boys and girls in the western society, and is described as normatively (Tiggemann, 2011). Dissatisfaction is reported among 37 % of boys and 64% of girls

(14-18 years) in Canada (Duchesne et al., 2017), and 23 % and 37 % of American boys and girls, respectively (Bearman, Presnell, Martinez, & Stice, 2006). In Ireland, 54.8 % of boys and 80.8 % of girls (12-19 years) reported a wish to change their bodies, while in Norwegian high school samples, the prevalence of body dissatisfaction was 15 % and 31 % (Torstveit, Aagedal-Mortensen, & Stea, 2015), and 21 % and 50 % (Martinsen, 2010) in boys and girls, respectively. A recent study also found that 8 % and 28 % of Norwegian 13-16-year-old boys and girls, respectively, had low body satisfaction (Hestetun, Svendsen, & Oellingrath, 2019).

Body dissatisfaction is associated with inactivity and weight gain (Añez et al., 2016; Grogan, 2006; Kantanista, Osiński, Borowiec, Tomczak, & Król-Zielińska, 2015; Shirasawa et al., 2015), low self-esteem (Cash & Fleming, 2002), symptoms of depression (Paxton, Eisenberg, & Neumark-Sztainer, 2006; Paxton, Neumark-Sztainer, Hannan, & Eisenberg, 2006), social anxiety (Cash & Smolak, 2011a), perfectionism (Wade & Tiggemann, 2013), disordered eating (Neumark-Sztainer, Paxton, Hannan, Haines, & Story, 2006), and an increased risk of developing eating disorders (Rosenvinge, 2015). In a public health perspective, body dissatisfaction is understood as a threat to the adolescents' health (Bucchianeri & Neumark-Sztainer, 2014). The promotion of a positive embodiment is described as an effective measure to help adolescents maintain their health into adulthood (Levine & Smolak, 2016; Tylka & Piran, 2019b).

### **A paradigm shift in the field of body image**

The field of body image has a long history, and since the early 1900s, studies have provided insight into different aspects of humans' relationships towards their bodies (Figure 1). Previously, the field of body image mainly focused on the negative dimensions and pathological aspects of body image such as body dissatisfaction, disordered eating and eating disorders (Smolak & Cash, 2011). However, during the last decade it has been argued that mainly focusing on alleviating symptoms of negative body image without considering how to promote positive body image, has delayed and limited the development in the field. It has been argued that at best, previous focus may only promote a neutral body image (Tylka & Wood-Barcalow, 2015b). This is also strongly supported by Seligman (2000), who argues that "psychology is not only the study of disease, weakness and damage, it is also the study of human strength and virtue". This is also in line with WHO's definition of mental health, which focuses on well-being and abilities, not only the absence of illness and disease (WHO, 2014). More specifically, health promotion is about empowering people to increase control over their health (Nutbeam, 1998). One could argue that in a health promotive

perspective, it should not be enough for adolescents just to tolerate their bodies, but they should develop skills to appreciate their bodies.

### Positive body image

In the early years of 2000, body image research developed towards acknowledging the importance of promoting a positive body image. Researchers were now encouraged to conceptualize the construct, and improve knowledge on the protective and promotive factors, associations, and methods to promote positive body image in different populations (Tylka & Wood-Barcalow, 2015b) (Figure 1).

A positive body image captures other aspects than appreciation of appearance, and it is associated with well-being aspects even when controlled for negative body image (Avalos, Tylka, & Wood-Barcalow, 2005). As such a positive body image is not just the opposite or counterpart of a negative body image. Hence, people with positive body image have been characterized as having "*an overarching love and respect for the body that allows individuals to (a) appreciate the unique beauty of their body and the functions that it performs for them; (b) accept and even admire their body, including those aspects that are inconsistent with idealized images; (c) feel beautiful, comfortable, confident, and happy with their body, which is often reflected as an outer radiance, or a "glow;" (d) emphasize their body's assets rather than dwell on their imperfections; (e) have a mindful connection with their body's needs; and (f) interpret incoming information in a body-protective manner whereby most positive information is internalized and most negative information is rejected or reframed.*" (Wood-Barcalow, Tylka, & Augustus-Horvath, 2010, p. 112).

### Positive embodiment

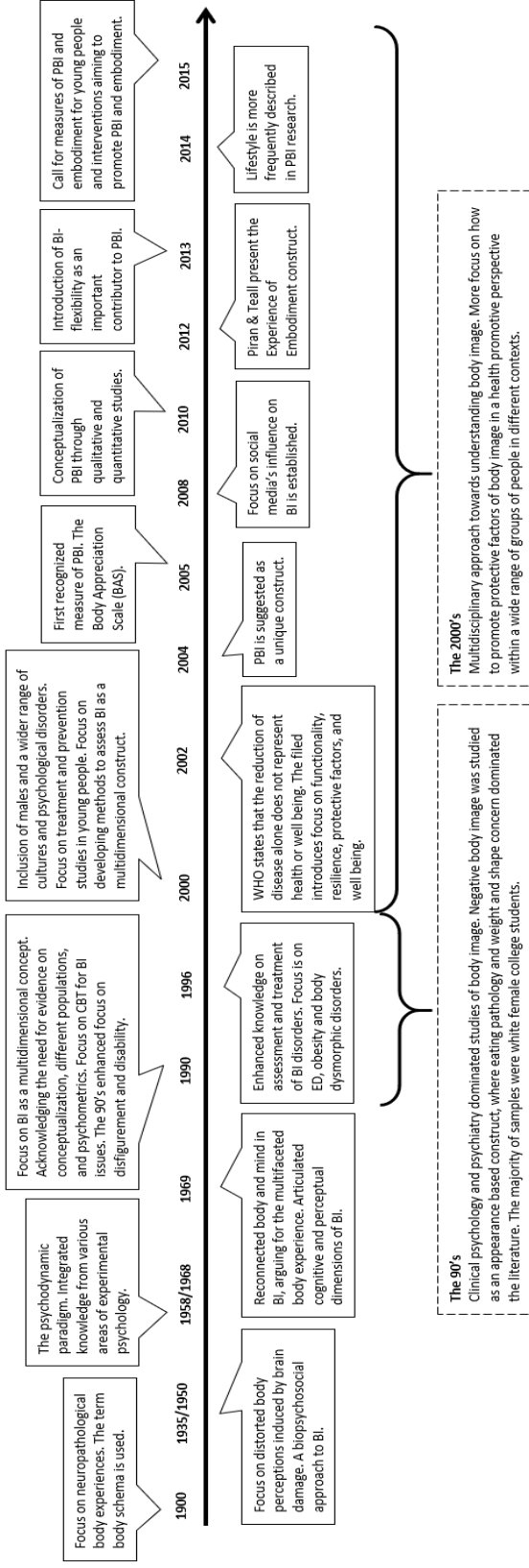
The conceptualization of the construct *embodiment* originates back to the French philosophers Merleau-Ponty (1962) and Foucault (1995). Merleau-Ponty understood embodiment as perceptual experiences of engagement of the body in the world. Through the concept of embodiment, he posited that one could not separately conceive the body as a physical or subjective concept. Hence, by rejecting a dualistic division, the mind and the body was completely integrated. He described that the body is further affected by the engagement it has with the world, in the perceptions of each social and cultural contexts (Merleau-Ponty, 1962). Foucault (1995) additionally focused on the power that social institutions have on people's body. He emphasized that the focus found in social discussions, strongly affected body culture and peoples' self-surveillance of their own compliance with social expectations. Furthermore, this affected the maintenance of the societal structures of power. The former sociology associated embodiment construct has been important

in the later psychological understanding of the complexity of body image and how it is developed and affected in the social context of the modern society (Piran, 2016).

Within such a psychological understanding, qualitative studies have excavated a multidimensional core construct called the Experience of Embodiment (EE) (Piran, 2017). This core construct has furthermore been a foundation for developing the Experience of Embodiment Scale (EES) for women (Teall, 2014) aiming to unravel the quality of embodied lives through five dimensions; Body connection and comfort, Agency and functionality, Experience and expression of desire, Attuned self-care, and inhabiting the body as a subjective site (Piran, 2019).

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). In relation to the field of positive body image, positive embodiment relates conceptually to body appreciation, the most commonly used construct in assessing positive body image. 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, 2019b). In addition, the positive embodiment construct, however, includes experiences of agency to act in the world and comfort with bodily desires (Piran, 2019).

# Introduction



**Figure 1.** Historical overview of how the focus within the body image research has shifted (Cash & Smolak, 2011b; Halliwell, 2015; Tylka & Wood-Barcalow, 2015b). BI= body image, ED= eating disorder, PBI= positive body image, CBT= cognitive behavioral therapy.

## **The new body ideal**

The growth of the fitness industry and the increased societal focus on being fit, has gradually moved the body ideal towards the extreme athletic body type, with low body fat percentage and toned muscles. This body type has become a visual symbol of health (Novella, Gosselin, & Danowski, 2015), but ironically represents an unhealthy and unrealistic body composition. Frequently described body modification methods do not comply with current evidence-based recommendations for physical activity and nutrition and can lead to severe health consequences if followed (The Norwegian Directorate of Health, 2019; Nordic Council of Ministers, 2014). The new body ideal can be described as a potential threat to boys' and girls' body image, their relationship to exercise and nutrition, and lifestyle behaviors (Tiggemann & Zaccardo, 2015; Yoo & Yurchisin, 2018). Due to the extreme amount of appearance focused exercise and nutrition information that adolescents are exposed to in social media (Pilgrim & Bohnet-Joschko, 2019), enhancing skills to cope with lifestyle information might help them to maintain a healthy focus and relationship towards lifestyle components. Redefining the meaning of exercise and eating habits might cultivate attitudes that facilitate safe and sustained motives for lifestyle choices, such as feeling good rather than looking good (Piran, 2017).

## **Body image and lifestyle**

Only 50% of Norwegian 15-year-olds meet current recommendations of physical activity, a prevalence that declines with age (Dalene et al., 2018). In the same age group only 17-34% meet dietary recommendations for fruit, berries and vegetable intake (Samdal et al., 2016; Stea & Torstveit, 2014), and average reported hours of sleep is significantly lower than what is recommended (Stea, Knutsen, & Torstveit, 2014). These findings are all in accordance with international data on physical activity (Cooper et al., 2015; WHO, 2019a), diet (WHO, 2016) and sleep (Gradisar, Gardner, & Dohnt, 2011). Considering the numerous benefits of healthy lifestyle habits in adolescents, promotion is needed (Chaput et al., 2016; Janssen & Leblanc, 2010; Paiva, Gaspar, & Matos, 2015; Roberto et al., 2015; Stea et al., 2014).

Correlational studies in adolescent boys and girls found positive correlations between physical activity level and their feelings and attitudes towards their body (Kantanista et al., 2015), towards physical appearance (Kololo, Guskowska, Mazur, & Dzielska, 2012), and their physical self-esteem (Altıntaş & Aşçi, 2008). The positive association has further been supported by a

longitudinal study on adolescent girls, which found that body appreciation predicted physical activity level one year later (Andrew, Tiggemann, & Clark, 2016).

In terms of eating behaviors, one study found that eating breakfast with parents more regularly was positively associated with appearance satisfaction, in children and adolescents (Ramseyer, Jones, & O’Neill, 2019). Furthermore, one longitudinal study in adolescent boys and girls found that body satisfaction positively predicted not only levels of physical activity, but also intake of fruits and vegetables (Neumark-Sztainer et al., 2006).

Sleep is another lifestyle factor that is important for the general development in adolescents (Tremblay et al., 2016). Sleep is connected to how individuals experience negative and positive emotions and their reactions to negative experiences (Palmer & Alfano, 2017). Studies have shown that time to fall asleep and hours of sleep were associated with body dissatisfaction and distorted body perception in college students (McGaughey, 2018; Mori, Sekine, Yamagami, & Kagamimori, 2009). One intervention study on female college students showed that expressive writing about body image concerns reduced sleep difficulty in addition to less body-focused upward social comparison at follow-up compared to controls (Arigo & Smyth, 2012). Sleep has been associated with physical activity (Kredlow, Capozzoli, Hearon, Calkins, & Otto, 2015), and sleep deprivation with excessive energy intake and metabolic dysregulation, with overweight and obesity as potential outcomes (Depner et al., 2019). Because sleep seems to be related to mental health and lifestyle habits in adolescents, future studies on adolescent body image should aim to investigate sleep as an outcome (Palmer & Alfano, 2017; Tremblay et al., 2016). Suggested relationships between lifestyle and body image is presented in Figure 2.

## **Body image and health-related quality of life**

Since quality of life strongly relates to the adolescents’ lifestyle and the associated health, it is also considered as an important factor in health promotion (Nayir et al., 2016). The interest in the connection between body functionality, lifestyle, and body image has grown, which has led to the investigation of the relationship between body image and health-related quality of life (HRQoL). HRQoL includes aspects of both self-perceived physical and mental health status (Centers for Disease Control and Prevention, 2000). Adolescents holding a positive embodiment are characterized by healthy exercise habits, being intuitive eaters, with a focus on giving the body what it needs to function, which thereby promotes an experience of good health (Frisen & Holmqvist, 2010; Homan & Tyłka, 2014). This might potentially explain previous findings that body image predicts HRQoL (Griffiths et al., 2017; Haraldstad, Christophersen, Eide, Natvig, & Helseth,

2011). In studies aiming to promote body image and lifestyle, it would be natural to investigate HRQoL as a secondary outcome.

### **Body image and associated psychosocial factors**

Resistance towards societal pressure of appearance, by possessing skills to *combat unhealthy internalization*, has been described as important to promote positive embodiment in adolescents (Rodgers, McLean, & Paxton, 2015). *Media literacy* has been identified as such a skill as it helps in the ability to critically evaluate and challenge the presentation of idealized bodies and lifestyles, and to further acknowledge the unattainability of the extreme athletic body ideal (McLean, Paxton, & Wertheim, 2016). Much of the *self-comparison* towards idealized bodies exists through social media. Studies report that it is not necessarily the total exposure time to social media, but the *specific social media content and comparison activities* that affect adolescents' mental health (Viner et al., 2019). Hence, empowering adolescents to recognize their own social media habits, and what related activities that might influence them positively or negatively, might facilitate more constructive exposures. *Communication* outside the social media network with peers also reinforce and put value on everyday factors because of the strong importance friends have on adolescents' perceptions. Hence, the different types of conversations reflect features of the body appearance culture among friends (Jones & Crawford, 2006; Jones, Vigfusdottir, & Lee, 2004). Awareness within adolescents on how they communicate might have a positive influence on the perceived focus and attitudes in a peer context (Steinberg & Morris, 2001).

How adolescents experience their body is strongly related to their *self-esteem* (Van Den Berg, Mond, Eisenberg, Ackard, & Neumark-Sztainer, 2010; Wichstrøm & von Soest, 2016), and individuals with low self-esteem are more prone to *compare* themselves to others (Buunk & Gibbons, 2007). Although social comparison theory describe comparison as a way to develop socially (Festinger, 1954), frequent and upwards comparison is associated with body image issues in adolescents (Myers & Crowther, 2009). It is reasonable to suggest that self-esteem promotion could strengthen adolescents' body acceptance and make them become less likely to search for social standard to internalize, followed by self-evaluation (Rousseau & Eggermont, 2018).

Promotion of three other constructs might be especially important for adolescents who grow up in a society that is characterized by pressure to change and to become a better version of oneself. *Self-compassion* is described as how we relate to ourselves when we experience failures, inadequacy, or personal suffering. Hence, this might be an important coping mechanism to promote (Neff, 2003). *Self-care* is important in order to engage with the environment and still maintain awareness



of- and act upon physical and emotional cues and needs (Piran, 2019). Relatedly, level of *body image flexibility* describes one's capacity to experience the range of perceptions, feelings, thoughts, and beliefs related to your body, and still act on chosen personal values (Sandoz, Wilson, Merwin, & Kellum, 2013). Together, these personal characteristics have been described as important to adolescents' positive embodiment (Piran, 2019; Rodgers et al., 2018; Seekis, Bradley, & Duffy, 2017) (Figure 2).

Figure 2 presents a modification of the tripartite influence model (sociocultural model) by Thompson, et al. (1999). The model presents the theoretical suggested relationships previously described, between physical and psychosocial factors and body image. The model specifically focuses on how body image and related factors might develop and influence each other during adolescence.

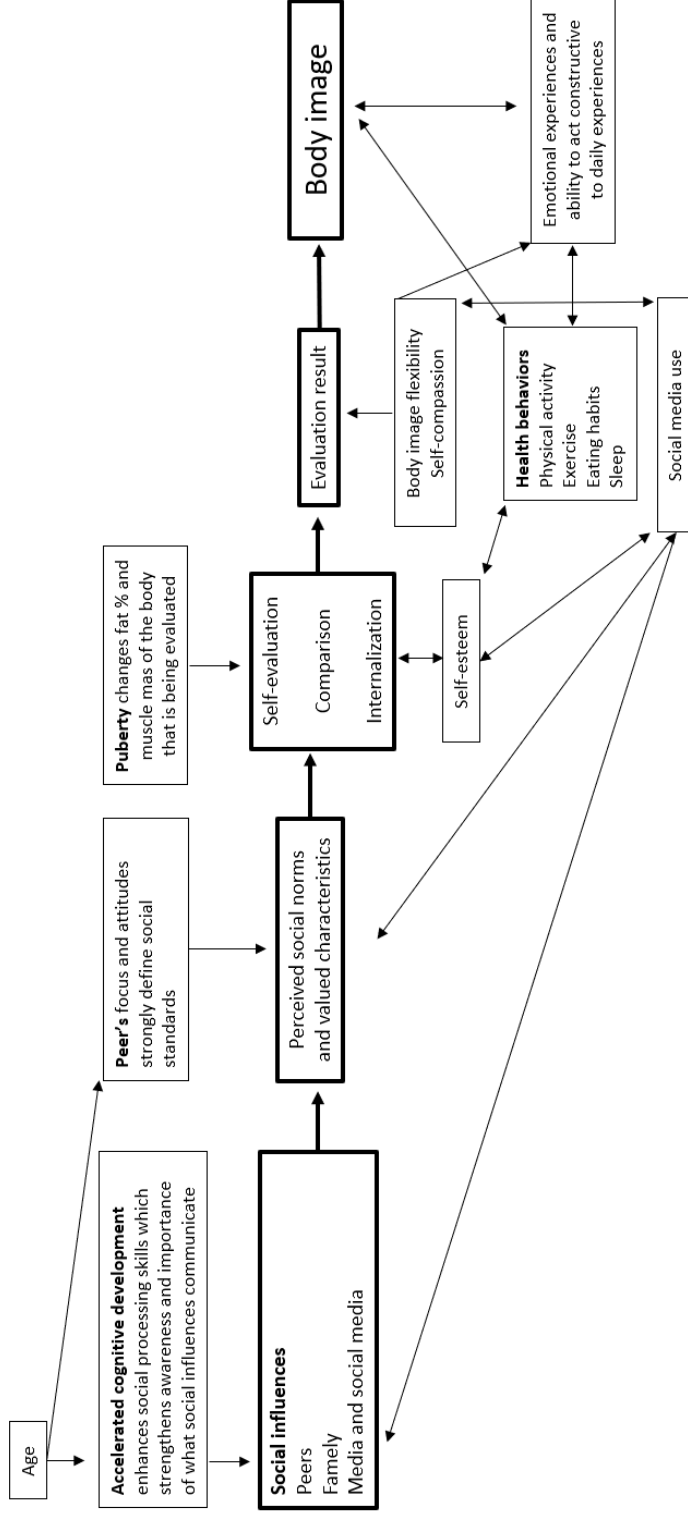


Figure 2. Modified from the original tripartite influence model (sociocultural model) by Thompson, Heinberg, Altabe, & Tantleff-Dunn. (1999). Content is specifically focused on adolescence.

## Theoretical framework for the present study

### The salutogenetic perspective

The salutogenetic perspective suggests that examining people's well-being is even more important than examining their ill-being. Further, the perspective understands health as a continuum, and not just in terms of not being sick. Also, the perspective presents the importance of finding an individual's own health promotive factors and empower them to use these factors to master everyday life experiences and situations (Antonovsky, 1987). Therefore, this perspective relates to health promotion and could guide studies with such a focus.

### The sociocultural perspective

The sociocultural perspective is one of the dominant general theoretical frameworks that have been used for understanding and investigating body image (Tiggemann, 2011). The framework describes how societal ideals of beauty are transmitted and internalized through a variety of channels such as family, peers, and media (Thompson et al. 1999). Furthermore, the psychological development and learning emerges through interpersonal relations and actions with the social environment (Vygotsky, 1978). When internalizing such ideals, satisfaction or dissatisfaction with appearance will depend on whether the individuals experience that they meet the sociocultural ideals. It would be natural for interventions that aim to change attitudes, beliefs, and knowledge related to idealized lifestyles and bodies to guide intervention content and approach through this perspective.

### The Developmental Theory of Embodiment

The multidimensional core construct Experience of Embodiment emerged from qualitative studies on woman and girls, which investigated their experiences of living in their bodies while engaging with the world (Piran, 2017). The construct's five dimensions describe influenceable factors to the quality of embodied lives (Piran, 2019). The construct ranges from positive embodiment, described as "*positive body connection and comfort, embodied agency and passion, and attuned self-care*", to negative embodiment, defined as "*disrupted body connection and discomfort, restricted agency and passion, and self-neglect or harm*" (Piran, 2016, p. 47). The construct describes three main domains representing protective factors that could be targeted to enhance experience of embodiment in health promotive interventions; 1. The physical domain (physical freedom), 2. The mental domain (mental freedom), and 3. The social power and relational connection domain. For more details on the specific protective factors within each domain, see Piran, 2015.

## **Positive embodiment interventions**

Interventions to promote positive embodiment in adolescents are needed (Halliwell, 2015), but a clarification of existing evidence is necessary before moving the field forward. The following overview involves intervention studies with adolescent samples that have measured any promotion of positive body image or embodiment related facets. Even though studies measured several body image domains, only the positive body image or embodiment related outcomes are presented.

### **Characteristics of existing studies**

In total, 21 studies have been located as relevant to describe the status of knowledge. They were located in Australia, Canada, Sweden, USA, Spain, UK, England, and Israel in the time period 2000-2018. The sample sizes ranged from 62 to 1707 where most samples included less than 300 participants (Table 1).

### **Sample characteristics**

The studies included adolescents in the range 10 to 18 years of age. The majority intervened on young adolescents, while only four studies focused on older adolescents (Franko, Cousineau, Rodgers, & Roehrig, 2013; Lindwall & Lindgren, 2005; Neumark-Sztainer et al., 2010; Rodgers et al., 2018). Fifty percent of the studies included a mixed-gender, or a single-gender sample, while one study included boys only (Morgan, Saunders, & Lubans, 2012).

Most samples were universal with no specific characteristics related to diagnoses or defined by cut-offs for mental health variables. As exceptions, the sample of three studies were included based on individuals being defined as having a low physical activity level (Lindwall & Lindgren, 2005; Morgan et al., 2012; Neumark-Sztainer et al., 2010), or as being at high risk for eating disorders (Richardson & Paxton, 2010).

### **Intervention characteristics**

All studies, except the community-based peer support group intervention "Girl talk" (McVey et al., 2003), and the mobile app-based "BodyMojo" (Rodgers et al., 2018), were school-based. This means that the intervention took place during regular school hours, and most often, sessions were held in classrooms.

Most of the effective interventions specifically described their main approach as interactive (Agam-Bitton, Ahmad, & Golan, 2018; Bird, Halliwell, Diedrichs, & Harcourt, 2013; Diedrichs et al., 2015; Espinoza, Penelo, & Raich, 2013; McLean, Wertheim, Masters, & Paxton, 2017; McVey, Davis, Tweed, & Shaw, 2004; Morgan et al., 2012; O'Dea & Abraham, 2000; Richardson & Paxton, 2010;

Richardson, Paxton, & Thomson, 2009). Other studies used physical activity sessions, psychoeducation, intervened through an internet or app program, or were dissonance based. Although authors used somewhat different terms, interventions that resulted in moderate-large effect sizes typically included themes such as media literacy, internalization, comparison, negative appearance talk, empowerment, discussion about physical activity and nutrition, physical activity sessions, and self-esteem (Bird et al., 2013; Espinoza et al., 2013; Halliwell, Jarman, McNamara, Risdon, & Jankowski, 2015; Lindwall & Lindgren, 2005; Richardson & Paxton, 2010; Richardson et al., 2009).

The interventions were spread over several sessions, except the "Dove Confident me: Single Session" by Diedrichs et al. (2015) and the intervention by Halliwell et al. (2015). Total volume of exposure in previous studies ranged from 1 to 48 hours, with intervention periods lasting from one day to 6 months. However, many studies failed to give this information (Table 1). The inconsistency in volume reflects a gap in the literature on what volume is most effective.

### **Study design characteristics**

Fourteen of the 21 studies had RCT designs, where only eight school-based studies used schools as clusters (Table 1). Furthermore, the majority of studies had a short-term follow-up (e.g. three months), while only four studies also measured outcomes at 12 months-follow up (Espinoza et al., 2013; McVey & Davis, 2002; McVey et al., 2004; O'Dea & Abraham, 2000).

### **Measures of positive body image and embodiment**

Only six studies specifically aimed to promote aspects of body image, while other studies aimed to promote and prevent, only prevent, or defined their study as a body image intervention. Study outcomes related to positive body image or embodiment were body satisfaction, body esteem, physical self-perception, and body appreciation. Among these outcomes, only body appreciation measured by the Body Appreciation Scale, has been accepted as an outcome that measure positive body image (Halliwell, 2015; Webb, Wood-Barcalow, & Tylka, 2015). Hence, only one study met this assessment criteria. Therefore, existing evidence are not based on studies measuring positive body image or embodiment effects as suggested in the current literature.

### **Study effects**

The majority of studies found an intervention effect on one or more of the positive embodiment outcome measures, while five studies did not (Cousineau et al., 2010; McVey & Davis, 2002; McVey et al., 2003; McVey, Tweed, & Blackmore, 2007). Effects were found in facets such as body

satisfaction, physical self-perception, body esteem, and body appreciation, where small effect sizes were reported by the majority of these studies (Table 1).

### **Lifestyle habits as secondary outcomes**

Few studies have evaluated the intervention effect on lifestyle habits as a secondary outcome. The majority that included some aspect of eating and/or exercise related outcomes referred to weight modification behaviors (McVey et al., 2007; O'Dea & Abraham, 2000), meal skipping and excessive exercise (Sharpe, Schober, Treasure, & Schmidt, 2013), or dieting and dietary restraint (Bird et al., 2013; Diedrichs et al., 2015; McVey et al., 2003; Richardson & Paxton, 2010; Richardson et al., 2009). Only two studies measured lifestyle habits as secondary outcomes. Neumark-Sztainer et al. (2010) found a small effect of the intervention on sedentary behavior. For physical activity and eating habits, only changes in stages of change were found, but not for actual habits. Lubans et al. (2011) found no intervention effect in physical activity level, but the boys decreased consumption of sugar-containing beverages, without changes in fruit, vegetables, or water intake. To sum up, the current evidence on effects of body image interventions on lifestyle habits is scarce.

Table 1. Description and results of positive embodiment interventions

Author/year/nation	Gender/age(sd)/N	Intervention type, approach, and content	Volume/Setting	Design	Outcome	Effect
O'Dea & Abraham (2000), Australia	Boys and girls Age: 11.1–14.5 N= 470	"Everybody's Different" Type: Promotion program Approach: Group work, teamwork, games, play, drama, and a "content-free" curriculum Content: dealing with stress, building a positive sense of self, stereotypes in our society, positive self-evaluation, involving significant others, relationship skills, communication skills.	9 weeks Weekly 50:80 min per session Classroom	School-based RCT Post-test and 12 months follow-up	Body satisfaction Physical Appearance Ratings (O'Dea, Abraham, & Heald, 1996) Self-Perception Profile for Adolescents (Harter, 1982)	Acute effect in girls and a 12-months follow-up effects on sub-tests of The Physical Appearance Ratings in girls. Acute and 12-months follow-up effects on Physical Appearance sub-scale on the total sample when male and female data was merged.
McVey & Davis (2002), Canada	Girls Mage: 10.88 (0.43) N= 282	Type: Promotion and prevention program Approach: Interactive educational program Content: 1. Media literacy about the dangers associated with the idealization of thinness. 2. The promotion of life skills, including self-esteem enhancement strategies, stress management techniques, and peer relations skills.	6 weeks Weekly session No duration described Classroom	School-based Cluster RCT Post-test, 6- and 12 months follow-up	Body image satisfaction The Self-Image Questionnaire for Young Adolescents (SIOYA) (Petersen, Schulenberg, Abramowitz, Offer, & Jarcho, 1984).	No effect sized were defined. No intervention effect
McVey et al. (2003), Canada	Girls Mage: 12.3 (0.63) N= 282	Type: Promotion and prevention program Approach: Peer Support Group Content: Focusing on life skills, with following content: Media literacy, promotion of positive body image and self-esteem, dieting, lifestyle, stress managing, relationships.	10 weeks 1h/week Outside school ours	Community based CT Post-test and 3 months follow-up	Body esteem The Body-Esteem Scale for Adolescents and Adults (Mandelson, Mandelson, & White, 2001)	No intervention effect
McVey et al. (2004), Canada	Girls Mage: 11.18 (0.38) N= 258	Type: Promotion and prevention program Approach: Interactive Content: Media influence, enhancing self-esteem and body image, body size acceptance, healthy living, stress, management, positive relationships.	6 weeks 50 min per week Classroom	School-based Cluster RCT Post-test, 6, and 12 months follow-up	Body Image Satisfaction Self-Image Questionnaire for Young Adolescents (Petersen et al., 1984)	Acute effect on body satisfaction. No effect sized specified.
Lindvall & Lindgren (2005), Sweden	Girls Mage: 16.35 (1.56) N= 110	"An exercise intervention programme" Type: Promotion program Approach: Physical group sessions and group discussions Content: Physical exercise sessions chosen by participants and discussion about healthy lifestyle.	6 months 60 min per session x 2/week During/after school is not reported	School/sports club-based Cluster RCT Post-test	Physical self-perception profile Self-perception inventory (Fox, 1997, 1998)	Acute small-moderate effect on physical self-perception.
McVey et al. (2007), Canada	Boys and girls Mage: 11.27 (0.67) N= 982	"Healthy Schools-Healthy Kids Program" Type: Promotion and prevention program Approach: Universal Health-Promoting School Framework approach including 1. School staff teaching, 2. Parent education, 3. In-class curriculum, 4. Peer support groups, 5. Play presentation, 6. Focus group for boys, 7. Posters/video presentations Content: Media ideal, peer pressure, healthy eating, active living, problem-solving, relationship issues, weight-based teasing, size acceptance, adult role models, normative stressors triggering body image issues.	8 months Subsample of girls also attended a 12-week Girl Talk peer support group A one session focus group for boys was available	School-based CT Post-test and 6 months follow-up	Body satisfaction Body Satisfaction Scale (Slade, Dewey, Newton, Brodie, & Klemle, 1990)	No intervention effects in general, but improved body satisfaction for the students currently trying to lose weight.
Richardson et al. (2009), Australia	Boys and girls Mage: 12.8 (0.47) N= 277	Type: Body image and self-esteem program Approach: Interactive participant focused program	4 weeks 50 min per week Classroom	School-based CT	Body satisfaction Body Satisfaction Visual Analogue Scale (Durkin & Paxton, 2002)	Acute and 3-months follow-up small-moderate effect on body satisfaction in boys. No effect in girls.

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<b>Richardson &amp; Paxton (2010), Australia</b>	Girls Age: 12.4 (0.34) N= 194	Content: What is body image and self-esteem? Factors that impact on body image and self-esteem, and ways to increase body satisfaction and self-esteem. Type: Body image program Approach: Interactive participant focused	Duration not described 50 min x 3 Classroom	Post-test and 3 months follow-up	School-based CT Post-test, and 3 months follow-up	Body satisfaction Body Satisfaction Visual Analogue Scale (Durkin & Paxton, 2002)	Acute and 3-months follow-up moderate-large effect on body satisfaction.						
<b>Consheuan et al. (2010), USA</b>	Boys and girls Age: 11.7 (0.06) N= 190	Content: Negative consequences of internalization, body comparisons, appearance conversations and appearance teasing, empower strategies to combat these risk factors. "Trouble on the Tightrope" Type: Prevention program Approach: Computer program intervention	Duration not described 3 x 60 minutes School computer labs	School-based RCT Post-test and 3 months follow-up	School-based RCT Post-test and 3 months follow-up	Body esteem The Body Esteem Scale for Adolescents and Adults (Mendelson et al., 2001)	No intervention effect in the general group Acute small-moderate effect in students defined with puberty underway.						
<b>Neumark-Sztainer et al. (2010), USA</b>	Girls Age: 15.8 (1.2) N= 356	Content: Puberty, nutrition, physical activity, self-esteem, and peer relations. "New moves" Type: Prevention program Approach: Physical sessions, support/self-empowerment, individual counseling	16 weeks BeFit: 4 sessions/week BeFueled: 1 session/week BeFab: 1 session/week Physical education class and individual activities	School-based Clustered RCT Post-test and 9 months follow-up	School-based Clustered RCT Post-test and 9 months follow-up	Body image and body parts satisfaction Self-perception profile for adolescents (Harter, 1988) 3-Day Physical Activity Recall (3-DPAR)	3-months follow-up small effect on body satisfaction and perceived athletic competence. 3-months follow-up small effect on sedentary behavior but no effect on physical activity level.						
<b>Morgan et al. (2012), Lubans et al. (2011), Australia</b>	Boys Age: 14.3 (0.6) N= 100	Content: Physical activity sessions and interactive education nutrition handbooks, 5. Leadership sessions and pedometers for self-monitoring. "PALs" Type: Prevention program Approach: Physical activity sessions and interactive education	Duration not described 1. 10 x 90 min 2. 3 x 30 min 4. 9 x 30 min 5. 6 x 30 min Classroom/sport facilities	School-based RCT, prospective two-armed 3- and 6 months follow-up	School-based RCT, prospective two-armed 3- and 6 months follow-up	Physical self-perception, Physical activity and eating habits The Children's Physical Self-Perception (Whitehead, 1995) 5-days of pedometry NSW Schools PA and Nutrition Survey (Booth et al., 2006)	Acute small effect on subtests on physical self-perception. No effects on mean step/day 6-months effect on self-perception subtests. No changes in fruit, vegetables, or water intake						
<b>Espinosa et al. (2013), Spain</b>	Boys and girls Age: 13.4 (0.4) N= 443	Content: Eating, aesthetic feminine models and the media" Type: Prevention program Approach: Interactive participant focused	3 weeks Weekly sessions ML: 2 x 90 min + 1 x 60 min NUT: 1 x 90 min Classroom	School-based Cluster RCT Post-test, 7- and 30 months follow-up	School-based Cluster RCT Post-test, 7- and 30 months follow-up	Body satisfaction Body Image Questionnaire (Penelo, Espinoza, Portell, & Raich, 2012)	7 months follow-up large effect, and 30-months moderate effect for the ML + NUT group on body satisfaction. Data for boys and girls was merged.						
<b>Sharpe et al. (2013), UK</b>	Girls Age: 12-13 N= 448	Content: Media literacy, peer interaction, fat talk, compliments, positive psychology, mood and self-esteem. "Me, You & Us" Type: Prevention program Approach: Psychoeducation	Duration not described 6 x 50 min Classroom	School-based Pilot study, Cluster RCT Clustered at class level Post-test and 3 months follow-up	School-based Pilot study, Cluster RCT Clustered at class level Post-test and 3 months follow-up	Body esteem Body Esteem Scale for Adults and Adolescents (Mendelson et al., 2001)	3-months follow-up small effect on body esteem.						
<b>Framko et al. (2013), USA</b>	Boys and girls Age: 15.2 (not reported) N= 178	Content: Personalized experience, information and feedback, goal setting, specialized body image and related content (e.g., nutrition), interactive games and quizzes, and videos that are specific to this adolescent age group. "BodyMojo" Type: Program to promote positive body image Approach: Internet based program using technology and social engagement	4 weeks 45 min per week x 4 Classroom	School-based RCT Post-test and 3 months follow-up	School-based RCT Post-test and 3 months follow-up	Body esteem Body Esteem Scale for Adolescents and Adults (Mendelson et al., 2001)	Acute small effect on body esteem sub-test in girls. No effects were found in boys						



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<b>Bird et al. (2013), England</b>	Boys and girls AgeR: 10-11 N= 88	"Happy Being Me" Type: Body image program Approach: Interactive, participant focused Content: Media literacy, internalization, appearance and fat talk, body comparison. "Dove Confident Me: Single Session"	3 weeks 1 h per week Classroom	School-based CT Clustered at class level Post-test and 3 months follow-up	Body satisfaction Body Satisfaction Visual Analogue Scale (Durkin & Paxton, 2002) Body-esteem and body satisfaction Body Esteem Scale for adolescents & adults (Mendelson et al., 2001) Body Areas Satisfaction Scale (Neumark-Sztainer et al., 2007) Positive body image The Body Appreciation Scale-2 (Tyka & Wood-Barcalow, 2015a)	Acute and 3-months follow-up large effect on body satisfaction in girls. No intervention effect in boys.
<b>Diedrichs et al. (2015), England</b>	Boys and girls AgeR: 11-13 N= 1707	Type: Body image program Approach: Skill based learning was facilitated through class discussion, small group activities, and video stimuli Content: Appearance ideals and media literacy, and appearance comparison.	1.5 h x 1 Classroom 1. Control, 2. Researcher-led, 3. teacher-led	School-based Cluster RCT Parallel 3-arm Post-test and 4-9.5 weeks follow-up	Body-esteem and body satisfaction Body Esteem Scale for adolescents & adults (Mendelson et al., 2001) Body Areas Satisfaction Scale (Neumark-Sztainer et al., 2007) Positive body image The Body Appreciation Scale-2 (Tyka & Wood-Barcalow, 2015a)	Acute small effect on body esteem in girls receiving the intervention compared to research-led and controls. No intervention effect in boys. No intervention effect on body satisfaction.
<b>Hallwell, et al. (2015), England</b>	Girls Mage: 14.84 (0.37) N= 62	Type: Body image promotion program Approach: Dissonance-based body image intervention Content: Cost of body ideal, challenge negative body talk, body activism, self-affirmation.	1 hour Classroom	School-based Pilot study, RCT Randomization of groups in each school	Positive body image The Body Appreciation Scale-2 (Tyka & Wood-Barcalow, 2015a)	Acute large effect on body satisfaction.
<b>Tomyn et al. (2016), Australia</b>	Boys and girls Mage: 13.62 (0.60) N= 252	"Think Health and Wellbeing" Type: Prevention program Approach: CBT based, psychoeducation, small group activities and whole class discussions Content: 1. recognize and address unhelpful thinking patterns, 2. develop coping skills and learn ways of relaxing, 3. build positive self-esteem, 4. develop a positive body image, 5. develop communication, assertiveness and assertiveness skills and, 6. become more resilient through perspective taking, positive self-talk and self-coping.	Duration not reported 6 x 45 min Classroom	School-based Cluster CT Post-test and 3 months follow-up No control data at follow-up	Body satisfaction Body Image and Body Change inventory (Fuller-Tyszkiewicz et al., 2012; Ricciardelli & McCabe, 2002)	No intervention effect on body satisfaction
<b>McLennan et al. (2017), Australia</b>	Girls Mage: 13.13 (0.33) N= 101	"Boost Body Confidence and Social Media Savvy (Brosst)" Adapted from "Happy Being Me" Type: Prevention program Approach: Interactive social media intervention Content: Advertising, digital manipulation, comparison, peer appearance commenting, reduce appearance focus in social media interaction.	Weekly 3 x 50 minutes Class groups without the boys	School-based Pilot study, Quasi-experimental CT Post-test	Body-esteem Appearance and weight subscales of the Body Esteem Scale (Mendelson et al., 2001)	Acute small effect on body esteem-weight scale.
<b>Azam-Bitton, et al. (2018), Israel</b>	Girls Mage: 13.82 (0.64) N= 259	"In Favour of My-self" Type: Self-esteem, body image and media literacy promoting program Approach: Interactive wellness program with one girls-only and one mixed gender arm Content: Self-esteem, advertising, stereotypical, beauty myth, communication, the self.	9 weekly 90-min sessions Classroom	School-based RCT Cluster at class level Post-test, 2- and 3 months follow-up	Body-esteem Body-esteem scale for adolescents and adults (Mendelson et al., 2001)	3-months follow-up small effect on appearance subscale and body weight subscale, with clear dominance of the mixed-gender group compared to girls-only group.
<b>Rodgers et al. (2018), USA</b>	Boys and girls Mage: 18.36 (1.34) N= 274	"BodiMojo" Type: Body image and self-compassion promoting program Approach: Messages delivered twice daily through the app: mood tracking and emotional regulation, and gratitude journaling. Content: Mindfulness, compassion, humanity, self-kindness, body image (media literacy, fat-talk, teasing), health behaviors (mindful and healthy eating, sleep, physical activity).	6 weeks 3 features and 2 messages/day Internet based	App-based RCT Post-test, and 3 months follow-up	Self-compassion, body acceptance, and Body-esteem Self-Compassion Scale (Neff, 2003) Body Image-Acceptance and Action Questionnaire (Sandor et al., 2013) Body Esteem Scale for Adults and Adolescents (Mendelson et al., 2001)	Acute and 3-months follow-up small effect on self-compassion. No intervention effect on body satisfaction. Acute and 3-months follow-up small effect on appearance esteem. Data for boys and girls was merged.

Note: RCT: randomized controlled trial, CT: controlled trial, MageR: mean age, AgeR: age range, sd: standard deviation, n: sample size, CBT: cognitive behavioral theory.

### Future research directions

Existing studies show promising findings. What seems to be accepted, is that effective studies are school based within a classroom context. Also, an interactive approach with a multicomponent intervention might be important for effect. Intervention components such as media literacy, internalization, comparison, negative appearance talk, empowerment, physical activity and nutrition, physical activity sessions, and self-esteem represent the content of studies that report intervention effects.

However, it is difficult to compare existing studies based on their design, and methodological issues reduce the validity of existing evidence specifically related to positive body image and embodiment as outcomes. Hence, there are gaps in the literature that need to be filled.

Future study designs might need to be guided by a clear aim of promoting positive body image or embodiment. If this aim is set, positive body image or embodiment specific measures should be chosen to evaluate an intervention effect on these specific constructs. Furthermore, there is a need for studies to include lifestyle habits as a secondary outcome.

To reduce risk of statistical type II error, studies should stress large sample sizes allowing for drop-out and sub-group analyses. Also, future school-based interventions should aim to have RCT designs that cluster the sample at school level.

To understand how to promote positive embodiment in older adolescence, future studies should aim to intervene on adolescents aged 15-19 years. Most schools are mixed-gender, and the opposite gender is an ever-present influence on the peer environment (Austin, 2000; Wade, Davidson, & O'Dea, 2003). Hence, it is important to investigate the suggested benefits from a mixed-gender groups. The inconsistency in intervention volume results in uncertainty regarding what exposure is enough for an intervention effect. To better understand which of the suggested intervention components that are important to target, mediation analyses that capture pathways between exposure and effect are needed. Long-term follow-up should be prioritized in future study designs to evaluate the intervention's ability to produce sustainability of existing short-term intervention effect, and to capture effects that might mature over a longer period of time.

The development of the Healthy Body Image (HBI) intervention was a response to the lack of evidence in this field and to the reported gaps related to methodological quality.

### Aims of the thesis

The overall aim of this Ph.D. thesis was to evaluate the effects of a new universal, school-based body image intervention with a health promotive perspective. The thesis presents the protocol of the Norwegian Healthy Body Image (HBI) intervention and the effects on Norwegian High school boys and girls. The specific aims of the four research papers were the following:

1. To outline the HBI intervention protocol in terms of the program content, the study design, the procedures for randomization, recruitment and data collection **(Paper I)**.
2. To examine the short- and long-term effects of the HBI intervention on positive embodiment and health-related quality of life among Norwegian high school students **(Paper II)**.
3. To examine whether the HBI intervention would bring about favorable changes in lifestyle habits as physical activity, eating habits, and sleep among Norwegian high school students, and whether these changes sustained over time **(Paper III)**.
4. To examine whether reduced internalization and time spent on body appearance related content in social media, and improved media literacy, self-compassion, self-esteem, and body image flexibility, would mediate the effects of the HBI intervention on positive embodiment in boys and girls **(Paper IV)**.

## **Methods**

### **Study design**

The HBI intervention study had a cluster-randomized controlled design. Schools were used as the clustering factor to minimize contamination biases within schools. Schools were randomly allocated to either the HBI intervention or the control group at a 1:1 ratio to equalize sample size, and the effect of socioeconomic and demographic variables, notably related to ethnicity and the urban-rural dimension. The randomization was conducted by a professional not affiliated with the study. During the intervention period, students at the control schools followed their regular school curriculum. Figure 3 presents a diagram of the inclusion and randomization process of schools and students, respectively.

### **Power calculation**

The statistical power estimation was based on two comparison groups ( $\alpha = .05$  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  $\times$  2 groups  $\times$  70 students  $\sim$  1400 students.

### **Recruitment procedure**

In the recruitment process, high schools from all districts in Oslo and Akershus county were included. The study included all 12th grade high school classes following a general study program. School classes and students following a vocational study program were excluded, but 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. The school principals were sent a short version of the study description and asked if they wanted their school to take part in the study. When accepting to participate, the principals were sent thorough study information, and planned for the researchers to visit the school to provide oral information. Thus, both oral and written study information was provided to students and staff.

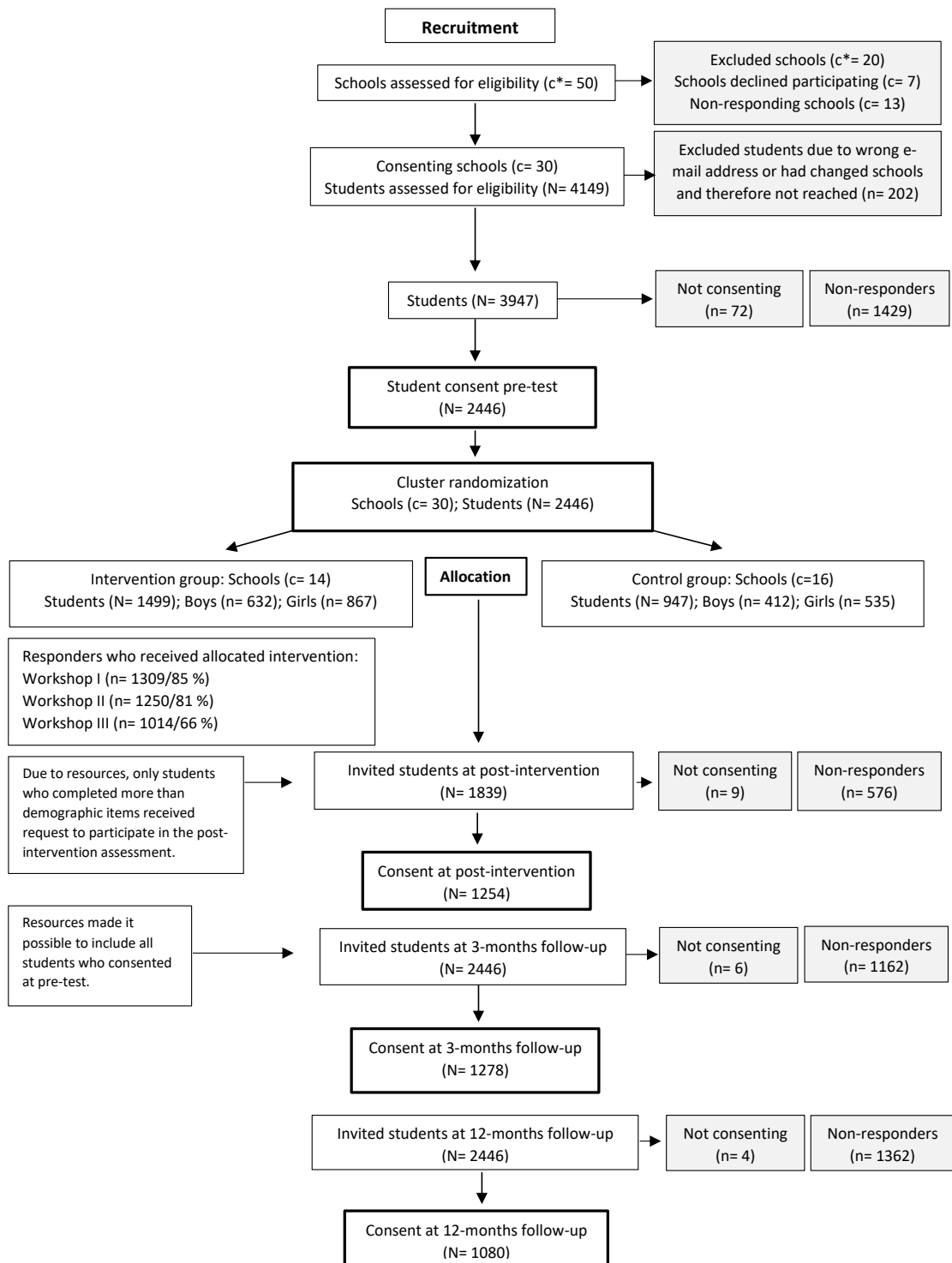
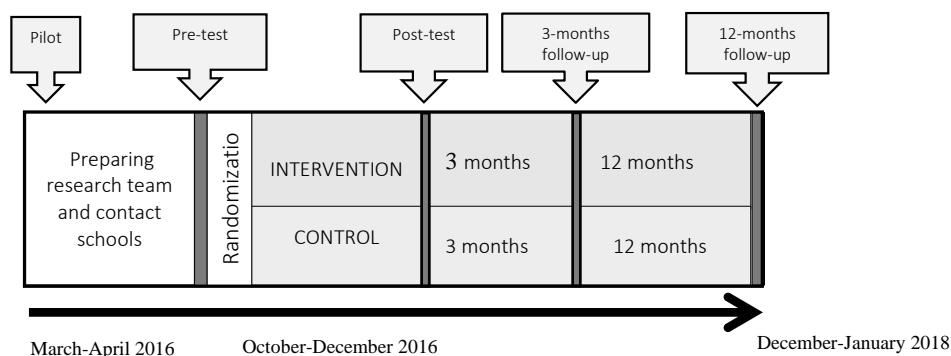


Figure 3. Schools (c\*), students (N), and response rate of participating students.

### Study flow

The study period lasted from March 2016 until January 2018. After ethical approval the study was piloted, followed by necessary adjustments before the baseline test was conducted. After the three months intervention period, students were assessed at three post-tests (Figure 4).



**Figure 4.** Study flow of the HBI intervention study.

### Data collection method

Data were based on the participants' completion of standardized self-report questionnaires, which were collected at all the four measurement points (Figure 4). To collect data, a questionnaire package was developed in the online survey system SurveyXact 8.2 offered by Ramböll, Aarhus, Denmark. Through the online system the students could complete the package at any time outside regular school hours. The system automatically adjusted the survey setup for computer screens, tablets and smart phones. This minimized practical obstacles and increased feasibility. Students who responded to the questionnaire were in the draw for gift cards with a value of 500 NOK.

### Ethics approval and written informed consent

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) (Appendix I). The study was enrolled in the international database of controlled trials [www.clinicaltrials.gov](http://www.clinicaltrials.gov) (ID: PRSNCT02901457) (Appendix II).

The Norwegian Health Research Act permits adolescents  $\geq 16$  years to give their informed consent without any additional parental consent. Students were therefore sent an e-mail with study information, including a brief summary of the study, possible benefits and drawbacks of taking part

in the study, what would happen to the test results, that participation was voluntary, and that they could withdraw their consent without any explanation.

In addition to the study information the students were presented a link to the web-based questionnaire. After having consented electronically the students could move on to the study questionnaire. If the students wanted to withdraw their consent, they could use the link sent on e-mail to change their answer on the question about consent, and their information would be unavailable. Ethical approval of the study required that the students completed the questionnaires outside regular school hours. Students at consenting schools had the prerogative to decline participation after consenting to take part in the study. In such cases, students at intervention schools were allowed to follow the HBI workshops, as these workshops were held during regular school hours, but without completing the questionnaires. After the final 12-month follow-up, control schools were offered one lecture where the program highlights were compressed.

## The intervention

### Pilot study

A pilot test of the intervention workshops, measurement package, and the participation request was as previously mentioned, conducted during March and April 2016 among 120 12th grade male and female high school students. The piloted intervention had the same characteristics as the HBI intervention. It was interactive, multicomponent, and included the main topics body image, media literacy, and lifestyle. Each main topic was presented in 2 x 45 minutes. The piloting resulted in a deletion of some questionnaire items about body perception and nutrition to reduce the risk of error variance due to acquiescence bias. Also, the amount of workshop assignments was reduced to allow for more time allocated to discuss mood and body satisfaction issues. Lastly, teachers and students were concerned about the total workload, and homework was excluded from the intervention.

### Intervention framework

There is no consensus as to which theoretical orientation may provide the most effective approach when developing a health promotion intervention aiming to promote positive embodiment (Alleva, Sheeran, Webb, Martijn, & Miles, 2015). However, a *sociocultural perspective* (Thompson et al., 1999) was natural to consider when aiming to change attitudes, beliefs, and knowledge in a mixed-gender school-based setting. Also, *the developmental theory of embodiment* (Piran, 2017; Teall & Piran, 2012)

within the realm of positive psychology and the *salutogenic perspective* (Antonovsky, 1987), were important in the intervention development.

### Intervention method

The intervention method is based on the *Elaboration Likelihood Model*. According to this model repeated exposure to a message facilitates cognitive elaboration of this message and increases the likelihood that the message is processed through a central, rather than a peripheral cognitive route (Petty & Briño, 2012; Petty & Cacioppo, 1986). In the HBI intervention elaboration was facilitated by a high level of student activity around issues of common interest to them, i.e. how to promote a positive body experience, self-esteem and a healthy lifestyle. In addition, and in accordance with previous findings (Alleva et al., 2015; Stice, Becker, & Yokum, 2013; Stice, Shaw, & Marti, 2007) elaboration is facilitated by the multiple session approach.

### Intervention structure

Two female Ph.D. students facilitated the intervention. They were specialized in physical activity and health, sports nutrition, motivational interviewing, disordered eating and body dissatisfaction among adolescents. School teachers were allowed to be present in the classroom, however, without participating. To account for program attendance, each student's participation was registered at all intervention workshops. The intervention comprised three interactive workshops with a duration of 90 minutes each, i.e. two school hours. Each workshop was adapted to suit adolescents 16 years of age with respect to their cognitive development and ability to abstract reasoning. The three workshops were arranged in a classroom during regular school hours, and about 60 boys and girls (i.e. two school classes) participated. Three weeks interval between the workshops resulted in a three months intervention period.

The workshops comprised the main themes body image, media literacy, and lifestyle. Table 2 provides an overview of the intervention content and targets. Parts of the school curriculum echoes themes from the workshops, however without a comparable angulation, amount of focus, presentation methods, and learning techniques.



Table 2. Outline of content and targets of Workshops #1 - #3 in the Healthy Body Image Intervention.

<b>#1 Body image</b>	
<b>Main content</b>	<b>Targets</b>
Project introduction	Experience of meaningfulness and motivation
Influencing factors on body perception. What promotes and reduces positive body image 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? Are there potential health consequences from striving for the idealized body?	Psychoeducation to prevent idealization and internalization of body ideals
Fat talk and focus on lifestyle only related to appearance in everyday communication. To what degree do we participate in such communication? How does this focus, and way of communication make us feel? Can we reduce the negative focus and communication?	Reduce fat talk and negative body talk
Introduction to self-talk and self-esteem in Workshop #2	Stimulate motivation for next workshop
<b>#2 Media literacy</b>	
<b>Main content</b>	<b>Targets</b>
Social media perception and use. Empower yourself to choose mood enhancing over mood destructive content	Enhance media literacy
Extreme exposure to sources without filter A need to be more critical to sources of information and awareness of retouching	Enhance media literacy
The nature of comparison How to recognize and reduce destructive comparison in everyday life	Reduce amount of comparison
Strengthen acceptance and love for individual differences Defining characteristics of oneself and among friends Students write down compliments to a friend and him/herself unrelated to appearance	Improve positive self-talk Improve self-compassion Improve self-esteem
Experiences and benefits of positive self-talk	Improve skills to strengthen self-esteem
<b>#3 Lifestyle</b>	
<b>Main content</b>	<b>Targets</b>
Benefits on body experience and function from listening to bodily needs such as physical activity and healthy eating	Improve experience of embodiment
Truths and myth about lifestyle products and lifestyle literacy	Improve ability to reject exercise and nutritional myths Improve healthy lifestyle literacy
From aesthetic to functional focus How can changes in focus promote body experience and healthy lifestyle How might such changes benefit well-being?	Redefining the meaning of lifestyle variables from focusing on appearance effect to functionality and wellness effects.
Exercise and smart nutrition can promote positive body image What are the basic recommendations and how can we easily meet them?	Body experience enhancing attitudes and behaviors

*Note.* Retrieved from Sundgot-Borgen, C., Bratland-Sanda, S., Engen, K. M. E., Pettersen, G., Friberg, 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).

## Measurements

### Demographic variables

The demographic variables were collected at all measurement time-points, including age, gender, body weight (kg) and height (cm). Body mass index (BMI) was calculated as body weight (kg) divided by the height squared (m<sup>2</sup>). Categorization of weight status was based on international age- and gender-adjusted cut-off scores (Cole, Bellizzi, Flegal, & Dietz, 2000). Students rated their parents' total income by 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). They also rated their parents' educational level by choosing 1-*primary school*, 2-*high school*, 3-*college/university* or 4-*do not know*. Immigration was probed for with the questions (*Yes, I have immigrated*, *Yes, both my parents have immigrated*, *No, neither me nor my parents*).

### Outcome variables

#### *Positive embodiment (Paper II and IV)*

Positive embodiment was measured using the Experience of Embodiment Scale (EES) (Teall & Piran, 2012). The 34 items measure 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. Total score ranges from 34-170. The items had a Likert-format ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), and the 17 negatively framed items were reversed so that the sum score reflected higher levels of positive embodiment. 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, Tolman, & Bowman, 2018; Holmqvist, Frisén, & Piran, 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). 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 ( $r_s = .76-.79$ ) and men ( $r = .69$ ), body responsiveness ( $r = .73$ ), body connection ( $r = .60$ ), well-being ( $r_s = .55-.80$ ), and life satisfaction in men ( $r = .68$ ) and women ( $r = .66$ ). Further, the EES correlated negatively with measures of objectified body consciousness ( $r_s = -.55, -.73$ ), eating problems ( $r_s = -.43, -.70$ ), alexithymia ( $r_s = -.51, -.54$ ), and depression ( $r = -.63$ ) (Chmielewski et al., 2018; Holmqvist et al., 2018; Piran, 2019; Teall, 2006, 2014). Since the present investigation included older adolescents, 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).

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 = .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.

### *Health-related quality of life (Paper II)*

HRQoL was measured by the KIDSCREEN-10. The scale consists of 10-items, and the sum score provides a general HRQoL index ranging from 10-50. A separate item included in the KIDSCREEN-10 measured perceived General Health, 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 had a 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 HRQoL. 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 HRQoL, while scores  $\geq 38$  indicate preferable reported HRQoL (Ravens-Sieberer, 2006). The KIDSCREEN-10 is a widely used and validated self-report tool and has been validated in Norwegian adolescents (Haraldstad & Richter, 2014). 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).

### *Physical activity (Paper III)*

Students rated in hours and minutes how physically active they had been during the last week. In the questionnaire, physical activity was defined as "all bodily movement that lead to an increase in body temperature, and light-heavy shortness of breath". Activities such as walking, cycling (incl. back and forth to school), skating, dancing, resistance training, hiking, and doing sports (including physical education, leisure time organized- or unorganized activities, family activities) were given as examples (Caspersen, Powell, & Christenson, 1985). The questionnaire also explained that exercise was one way of being physically active, defined as physical activity that is planned, structured, and repetitive and has a final or an intermediate objective to improve or maintain physical fitness (Caspersen et al., 1985). Students who reported being physically active seven hours or more per week, were defined as meeting the current physical activity recommendations for

adolescents (The Norwegian Directorate of Health, 2019). Self-report was chosen due to available resources. It is an accepted method that balances validity with time and cost effectiveness and is in contrast to assessment of individuals and small groups, appropriate when assessing a large sample (Prince et al., 2008).

### *Eating habits (Paper III)*

The students rated on a food frequency questionnaire how many days per week they consumed the different meals (breakfast, lunch, dinner, evening meal, and snack meal). Students responded on a Likert scale, from 1 (*never*) to 5 (*every day*). Eating all meals every day was defined as an optimal meal frequency (Stea & Torstveit, 2014). In addition, breakfast was analyzed as an individual variable because regular breakfast consumption is positively associated with positive body image (Ramseyer et al., 2019). For effect analyzes, categorical data (*Never, 1-2, 3-4, 5-6, 7 times per week*) were restructured to ordinal data (*e.g. 0, 1.5, 3.5, 5.5, 7*). The questionnaire also asked about consumed portions of fruits, berries, vegetables and salads (further on presented as fruits and vegetables). The Likert-scale included categories from *less than one per day* to *more than five per day*. The number of fruit and vegetable servings per day were merged and resulted in a total number of servings per day. Values for physical activity, meal frequency, breakfast and intake of fruit and vegetable were also dichotomized into meeting the recommendations (1) or not (0), to present percentage of students who meet current recommendations at baseline (Nordic council of Ministers, 2014).

### *Sleep (Paper III)*

Students rated their total sleep time (TST) by indicating hours of nightly sleep on school and weekend days, separately. They were instructed to avoid including wake time in the bed. The categorical response options were: <4, 4-5, 6-7, 8-9, 10-11, 12, >12 hours of sleep, which was recoded as 3.5, 4.5, 6.5, 8.5, 10.5, 12.0 and 12.5). Accumulation of sleep debt during school days was calculated by subtracting average school days TST from weekend days TST. Larger positive discrepancies indicated more sleep debt accumulation (Hysing, Pallesen, Stormark, Lundervold, & Sivertsen, 2013).

## **Mediating variables (paper IV)**

### *Self-esteem*

The Rosenberg Self-Esteem Scale (RSES) (Rosenberg, 1965) is a 10-item scale which measures global self-worth. The scale scores both negative and positive worded items on a Likert-scale ranging from 1 (*strongly agree*) to 4 (*strongly disagree*). The total score ranges from 10 to 40 where a

higher score represents a higher global self-worth. Negative worded items were reversed. The Cronbach's alpha in the present study represented an internal consistency of 0.90 and 0.92 for boys and girls respectively, which was better than the 0.86 reported in the Norwegian validation study of the RSES (von Soest, 2005).

### *Body image flexibility*

The Body Image Acceptance and Action Questionnaire (BIAAQ) measures body image flexibility (Sandoz et al., 2013) and consists of 12 items scored on a Likert scale ranging from 1 (*never true*) to 7 (*always true*). A total score ranges from 12 to 84. Negative worded items were reversed so that a higher score reflects a higher level of body image flexibility. The internal consistency in the original study was  $\alpha$  0.93 (Sandoz et al., 2013), which was similar to girls ( $\alpha$  0.92), and slightly higher than for boys ( $\alpha$  0.85) in our sample.

### *Social media use*

A social media scale measuring impression management, social capital, time spent on body appearance related content in social media social comparisons of body experience and physical appearance, and social media literacy was used (Appendix IV). The scale contains in total twenty items (in submission process). The students answered to the scale on a Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*). For this current study, the two subscales Media Literacy (four items) and Time Spent on Body Appearance Related Content in Social Media (five items) were used. A higher score on both subscales was preferable, as the latter scale items in this study were reversed. The Cronbach's alpha for the Media Literacy subscale was .80 and .78 for boys and girls respectively. For the subscale Time Spent on Body Appearance Related Content in Social Media, the Cronbach's alpha was .78 and .79 for boys and girls respectively.

### *Self-compassion*

The Self-Compassion Scale - Short Form (Raes, Pommier, Neff, & van Gucht, 2011) measures an individual's ability to maintain warm, kind, caring, comforting towards themselves, and to maintain connected to themselves, when they experience personal failings. The scale more specifically measures the six components suggested to describe self-compassion; self-kindness, self-judgement, common humanity, isolation, mindfulness, and over-identification. The 12-items are responded to on a Likert scale ranging from 1 (*almost never*) to 5 (*almost always*), and total score ranges from 12-60. All negative worded items were reversed, and a mean score was calculated. In the original validation study on adults, the scale demonstrated adequate internal consistency (Cronbach's alpha  $\geq$  0.86)

and a near-perfect correlation with the long form SCS ( $r \geq 0.97$ ). The Cronbach's alpha was somewhat lower when the 26-item version was validated on an adolescent sample ( $\alpha = .88$ ) (Cunha, Xavier, & Castilho, 2016). For the current sample, reported Cronbach's alpha was lower than for the original adult sample, with 0.57 and 0.76 for boys and girls respectively.

### *Internalization of body ideals and pressure from media*

The Sociocultural Attitudes Towards Appearance Questionnaire 4 (SATAQ-4) (Schaefer et al., 2015) was used to assess societal and interpersonal aspects of appearance ideals. The questionnaire consists of five individual subscales, where only the three subscales Thin/Low Body Fat Internalization, Athletic/Muscular Internalization, and Perceived Pressure from Media, were measured in this study. Students answered on a Likert-scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), where a higher score indicated higher degree of internalization or perceived pressure from media. Cronbach's Alpha in the present sample was between 0.85 and 0.94 for boys, and between 0.91 and 0.95 for girls. This was slightly higher than in the original study (Schaefer et al., 2015).

## Statistics

### Study II and III

In study II, the software program Mplus, version 8.0, was used to carry out factor analyses on the EES. For both study II and III, statistics were analyzed 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. 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. Both in study II and III, baseline scores were used as covariates to adjust for imperfections in the randomization procedure and to increase the statistical power in both studies. 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  $group \times time$  (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 in Paper I and II, *workshop attendance* ( $WA$ -number of workshops) was added as a linear covariate, as well as interaction terms examining if  $WA$  influenced the outcome particularly at certain time points ( $WA \times time$ ) or additionally within just one of the groups ( $WA \times time \times group$ ). The restricted maximum likelihood procedure and Type III  $F$ -tests were preferred. The analyses were stratified for gender. Effects were deemed statistically significant if  $< .05$ , including the  $p$ -values for the 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  $d$ , Hedges'  $g$ , and phi-coefficients.

#### Study IV

The analyses were conducted in Mplus version 8.3 (Muthén & Muthén, 1998-2017). We used path analysis and mediation models to examine direct effects ( $a$ ,  $b$ , and  $c'$ ), total indirect effects (i.e., the sum of specific indirect effects), and specific indirect effects ( $ab$ ) of the intervention on positive embodiment. Following recommendations in the literature (e.g., Preacher & Hayes, 2008) we relied on non-symmetric bootstrap confidence intervals (CI) to assess mediation. The bootstrap CIs were based on 10000 bootstrap samples. Together these bootstrap samples provide an empirical representation of the sampling distribution of the indirect effect ( $ab$ ) and non-symmetric CIs for the indirect effect. Evidence of mediation is supported if the 95% CI does not include zero (Hayes & Rockwood, 2017). We calculated the partially standardized indirect effect ( $ab_{ps}$ ) as an effect-size measure for the indirect effects (Miočević, O'Rourke, MacKinnon, & Brown, 2018). This effect-size measure captures the size of the indirect effect in terms of standard deviations of the dependent variable for a one-unit change in the independent variable. In the case of a binary X variable (e.g., representing intervention and control group) it is the change in standard deviation units of Y between the two groups. The predictor was a dichotomous variable representing intervention (1) and control (0) group. The mediators were assessed at time point 3 (T3) and the outcome was assessed at time point 4 (T4). This particular mediation sequence was chosen because it was considered most relevant in order to explore longitudinal effects. We controlled for baseline scores of the mediators and the outcome in all models (cf. Vickers & Altman, 2001).

## Methods

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To account for the nested data structure (students nested in classrooms) we used the aggregated analysis method outlined by Muthén and Satorra (1995), which computes the usual parameter estimates but adjusts the standard errors and goodness-of-fit model testing. In terms of model fit indices, only standardized root mean square residual (SRMR) is provided when combining bootstrap with aggregated analysis. The chi-square test of model fit (and model fit indices based on the chi-square test) is not available. A SRMR value of .08 or less is generally considered as an indication of good fit (e.g. Hu & Bentler, 1999). Missing data were handled by the full information maximum likelihood (FIML) estimator (Enders, 2010), which includes all available data in the analyses. A case was recorded as dropout if all post-intervention and follow-up data were missing. We estimated models including multigroup models to examine gender-specific effects. A  $p$ -value below .05 and a 95% CI that did not include zero indicated statistically significant effect.



## **Results**

### **Participant demographics**

Participant demographics for each group are presented in Table 3. At baseline, all 2,446 students were 16-17 years of age, with a mean BMI within the normal weight range for youths (Cole et al., 2000). Some differences between intervention and control group were found for both boys and girls. 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. Based on parents' total income and education level, girls in the intervention group were more likely to be defined with a higher socioeconomic status compared to girls in the control group. No differences in outcome measures were found for boys, but intervention boys had higher scores on the suggested mediating variables SATA-Q 4 Thin/Low Body Fat, BIAAS, and Media literacy. Intervention girls had higher scores on the outcome measures EES, KIDSCREEN-10, General health, consumption of breakfast and fruit and vegetables, and showed higher scores for the suggested mediator RSES (Table 3).

Table 3. Participation characteristics at baseline with group differences between intervention and control students. Variables are presented as mean (SD) or total number (%).

	Boys (N = 1044)			Girls (N = 1402)		
	Intervention (n = 632)	Control (n = 412)	p-value (g/φ)	Intervention (n = 867)	Control (n = 535)	p-value (g/φ)
Age	16.84 (0.57)	16.78 (0.64)	.117	16.80 (0.54)	16.78 (0.53)	.426
BMI, kg/m <sup>2</sup>	21.85 (3.45)	21.77 (3.26)	.741	21.41 (2.82)	21.43 (3.65)	.946
Immigrants <sup>d</sup>	62 (9.8%)	71 (17.2%)	<b>.001</b> (0.11 <sup>φ</sup> )	109 (12.5%)	87 (16.2%)	.057
Parents' income ≥ INOK million <sup>b</sup>	319 (49.9%)	186 (44.6%)	.101	324 (36.8%)	143 (26.3%)	< <b>.001</b> (-.11 <sup>φ</sup> )
Parents' educational level <sup>c</sup>	544 (86.5%)	314 (76.6%)	< <b>.001</b> (-.13 <sup>φ</sup> )	745 (85.1%)	416 (77.5%)	< <b>.001</b> (-.10 <sup>φ</sup> )
EES	130.15 (20.91)	126.73 (22.18)	.054	117.31 (22.70)	114.03 (24.31)	<b>.023</b> (0.15 <sup>φ</sup> )
KIDSCREEN-10	38.29 (6.10)	38.00 (6.43)	.580	35.78 (6.01)	34.53 (5.92)	<b>.001</b> (0.21 <sup>φ</sup> )
KIDSCREEN-10 T-score	53.10 (9.76)	52.55 (10.30)	.580	48.99 (9.64)	46.98 (9.48)	<b>.001</b> (0.21 <sup>φ</sup> )
General Health	3.70 (1.07)	3.59 (1.17)	.254	3.30 (1.05)	3.05 (1.10)	< <b>.001</b> (0.23 <sup>φ</sup> )
PA h/week	8.27 (5.88)	8.29 (5.27)	.961	6.89 (4.93)	6.44 (4.86)	.150
Meet PA recommendations	209 (50.7 %)	118 (56.2 %)	.197	270 (39.2 %)	123 (34.1 %)	.104
Breakfast	272 (64.3 %)	129 (60.3 %)	.340	488 (66.0 %)	195 (53.3 %)	< <b>.001</b> (16.38 <sup>φ</sup> )
Regular meal intake	80 (18.9 %)	42 (19.6 %)	.832	84 (12.1 %)	34 (9.3 %)	.182
Fruit and vegetable	138 (32.7 %)	67 (31.3 %)	.788	292 (42.1 %)	130 (35.5 %)	<b>.041</b> (4.30 <sup>φ</sup> )
Sleep h/school day	7.10 (1.33)	6.92 (1.32)	.094	6.96 (1.21)	6.85 (1.36)	.176

## Results

Sleep h/weekend day	9.27 (1.61)	9.07 (1.93)	.174	9.09 (1.56)	9.09 (1.73)	.968
RSES	33.07 (5.59)	32.36 (6.52)	.179	29.41 (5.95)	28.53 (6.43)	<b>.025</b> (0.15 <sup>§</sup> )
SCS	3.26 (0.55)	3.26 (0.55)	.877	2.99 (0.65)	2.96 (0.66)	.492
SATAQ-4 Thin	2.48 (0.97)	2.64 (0.92)	<b>.039</b> (0.17 <sup>§</sup> )	3.32 (1.08)	3.39 (1.13)	.291
SATAQ-4 Athletic	3.20 (1.12)	3.29 (1.03)	.304	3.03 (1.10)	3.01 (1.05)	.820
SATAQ-4 Pressure	2.10 (1.16)	2.26 (1.16)	.114	3.19 (1.23)	3.21 (1.26)	.775
BIAAS	70.55 (9.27)	68.81 (11.21)	<b>.011</b> (0.17 <sup>§</sup> )	58.28 (15.58)	57.84 (16.32)	.627
Media Literacy	18.31 (4.80)	17.43 (5.18)	<b>.020</b> (0.18 <sup>§</sup> )	20.83 (3.86)	20.36 (4.06)	.052
Time spent on appearance content	21.42 (3.89)	20.89 (4.00)	.069	18.42 (4.55)	18.08 (4.53)	.213

*Note.* BMI: Body mass index. <sup>a</sup>Immigrants: both parents are immigrants. <sup>b</sup>Parents' income: parents with total income  $\geq$  1 million NOK. <sup>c</sup>Parents' educational level: one or two parents with college or university education. PA: physical activity. h: hours. EES: The Experience of Embodiment Scale. RSES: Rosenberg Self-Esteem Scale. SCS: Self-Compassion Scale. SATAQ-4: social attitudes towards appearance questionnaire revised version 4 with the Thin, Athletic, and Pressure from media subscales. BIAAS: body image acceptance and action scale. Time spent on appearance content: time spent on body appearance related content in social media. Significance level at  $p$ -value  $< .05$ .  $g$ : Hedges'  $g$  and  $\phi$ : phi-coefficient are presented for significant difference.

More students in the control group ( $p = .001, \varphi = 10.61$ ), and more boys ( $p < .001, \varphi = 52.48$ ) 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 ( $p = .014, d = 0.17$ ). Dropout boys ( $p < .02$ - $.010$ ) and girls ( $p < .03$ - $.001$ ) had a lower meal frequency compared to non-dropout students. No other dropout differences were observed for outcome-, mediation-, or demographic measures, such as age, parents' total income, immigration status, or parents' education level.

Most students were present at all three workshops, with similar attendance for boys and girls. The attendance was somewhat lower at the third workshop compared to the two first (Table 4).

*Table 4.* Total number (%) of responding boys and girls (n=1541) who we registered at each workshop.

	<b>Boys</b>	<b>Girls</b>	<b>Total</b>
<b>Workshop 1</b>	533 (84)	776 (86)	1309 (85)
<b>Workshop 2</b>	519 (81)	731 (81)	1250 (81)
<b>Workshop 3</b>	442 (69)	572 (63)	1014 (66)

## Paper II

Paper II presents the effects of the HBI intervention on positive embodiment and HRQoL. The study evaluated differences in estimated mean score between intervention and control group at all time points, and the moderating effect of workshop attendance on the intervention effects.

### Intervention effects on positive embodiment

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 small short-term effect. However, this positive effect was lost at the 3- and 12-month follow-ups. There was a significant and favorable effect of the intervention on positive embodiment for girls in the intervention group. This effect was maintained at both 3- and 12-months follow-up. For girls, the effect size increased slightly over time and was strongest at the last follow-up assessment (Paper II, Table 2).

### **Intervention effects on health-related quality of life**

The planned comparison analyses showed that the mean differences in HRQoL between boys in the intervention and control group increased across the assessment time-points. However, the observed differences were not statistically significant, and no intervention effects on HRQoL were therefore found for boys. For the general health outcome in boys, a favorable and significant post-intervention improvement was found for the intervention group compared to the control group. The effect was however, not maintained at follow-ups (Paper II, Table 3).

For girls, there were no significant differences in HRQoL between intervention and control girls at post-intervention or 3-months follow-up. However, a small “sleeping effect” was evident, as girls in the intervention group had a significantly higher HRQoL at the 12-months follow-up compared to girls in the control group. For the general health outcome, the analyses showed that girls in the intervention group had significantly more favorable scores at post-intervention compared to girls in the control group. The small effect was also maintained at follow-up (Paper II, Table 3).

### **Dose-response effects**

A noteworthy finding was that boys and girls needed to attend at least three and two workshops, respectively, in order to benefit on positive embodiment from the HBI intervention. This moderation effect was lost among boys at follow-ups, but not among girls. All effect sizes were small (Paper II, Table 4). Number of workshop attendances did not significantly moderate intervention effects on HRQoL and the general health outcome in neither boys nor girls.

## **Paper III**

Paper III presents the effects of the HBI intervention on the lifestyle habits physical activity level, regularity of breakfast consumption, meal frequency, consumption of fruits and vegetables, and sleep. The study evaluated differences in estimated mean score between intervention and control group at all time points, and the moderating effect of workshop attendance on the intervention effects.

### **Intervention effect on physical activity**

The planned comparison analyses showed no intervention effects on physical activity level in boys at post-intervention or at 3-months follow-up. However, a small reduction in physical activity level in intervention compared to control boys was observed at 12-months follow-up. No significant

effect of the intervention on girls was found at any time point for physical activity level (Paper III, Table 2).

### **Intervention effect on eating habits**

The intervention had no effect on breakfast consumption among boys. However, in girls, the analyses showed that intervention girls reported a small increase in breakfast consumption compared to control girls at post-intervention. This effect vanished at follow-ups. With regards to meal frequency, no significant effects were seen in neither boys nor girls (Paper III, Table 3).

The analyses showed a minor increase in intake of fruits and vegetables in boys and girls at both post-intervention and 3-months follow-up compared to the control groups. The effects were not sustained at 12-months follow-up (Paper III, Table 3).

### **Intervention effect on sleep**

There was a moderate increase in sleep duration on school days in intervention boys compared to control boys at 12-months follow-up. Also, there was a small increase in sleep duration on school days among intervention girls compared to control girls at post intervention, but the effect was not sustained at follow-ups. No significant group differences in sleep duration on weekend days were evident for neither boys nor girls (Paper III, Table 4).

When looking at accumulation of sleep debt, no effect was found in boys at any time-point. However, in girls, at 12-months follow-up the intervention girls had a small reduction in sleep debt accumulation compared to control girls (Paper III, Table 4).

### **Dose-response effects**

The number of workshops attended to was not found to moderate the intervention effects on any of the lifestyle habits variables, neither for boys nor girls.

## **Paper IV**

Through path analysis and mediation models paper IV examined whether the intervention effected positive embodiment through any of the hypothesized mediators; internalization of the athletic and thin body, media literacy, time spent on body appearance related content in social media, experienced pressure from media, self-compassion, self-esteem, and body image flexibility. As

previously described, time spent on body appearance related content in social media was excluded from the final model.

### **Direct effects**

The path analyses showed that constructs changed by the HBI intervention were partly gender specific. Furthermore, self-esteem predicted positive embodiment in both boys and girls, while body image flexibility in girls, and media literacy in boys, also predicted positive embodiment (Paper IV, Table 2, Figure 3 a-b).

### **Indirect effects**

The mediation analyses found that there was an indirect effect of the HBI intervention on positive embodiment at 12-months follow-up through improved self-esteem at 3-months follow-up for both boys and girls. No indirect effect was found for the other hypothesized mediators in neither boys nor girls (Paper IV, Table 3).

## **Discussion**

The HBI intervention aimed to 1) respond to the request for school-based initiatives that promote positive embodiment in adolescents; 2) fill gaps in literature by evaluating the effects of an intervention with the purpose of promoting positive embodiment in a mixed gender sample of adolescents; and 3) search for possible mediators.

### **Effects**

The HBI intervention caused an immediate intervention effect on positive embodiment and HRQoL among intervention boys and girls, which was maintained at follow-up only for the girls. Our findings are in line with previous studies in which mostly small intervention effect sizes on positive embodiment facets have been reported (Table 1, p. 16). Four studies, however, have presented moderate – large effect sizes (Bird et al., 2013; Espinoza et al., 2013; Halliwell et al., 2015; Richardson & Paxton, 2010). To our knowledge, no other study has reported on HRQoL as an additional outcome measure. Evaluations across previous studies have shown that there is a great variation in terms of exposure volume, outcome measures, and age of the sample. Additionally, the samples of previous studies are smaller than in our study. These variations challenge meaningful comparisons. Nevertheless, the studies describe comparable intervention contexts, strategies, and content.

Only five previous studies were identified as having more than a six-month follow-up. O’Dea et al. (2000) reported a 12-month follow-up effect on girls, but no effect on boys, which reflects our findings. Espinoza et al. (2013) also found a long-term effect at their 30-month follow-up, but due to their collapsed sample, they could not show whether this effect was gender specific (Table 1). Importantly, in contrast to previous studies, our study additionally found that the effect size reported in girls increased over time. Interestingly, this finding may indicate that parts of the HBI intervention effects mature more slowly. Knowing whether an intervention only results in a temporary effect or manages to sustain or improve outcomes over time is essential because spending resources on short-term effect interventions might be ethically questionable, as well as untenable in a cost-benefit perspective. However, the evidence for a sustained effect remains scarce. Awaiting further studies, it is difficult to conclude whether such interventions, in general, have long-term effects.



In our study, we found that boys and girls needed two, 90-minute workshops out of three to achieve the best effect on positive embodiment (Paper II, Table 4). None of the previous studies reported on such dose-response effects. However, our finding is in line with previous meta-analyses on prevention studies, which state that more than one exposure session is needed (Stice & Shaw, 2004; Stice et al., 2007). One could argue that if a study was to follow the suggestions of a multicomponent intervention, one session would most likely not provide enough time to present the content that is expected to have an overall effect. It should be mentioned that Halliwell et al. (2015) demonstrated a large effect from a program with only one session containing fewer topics. Whether more sessions would have further improved the effect is unknown. However, according to an elaboration likelihood approach to learning, the overarching principle is to adjust the number of sessions or workshops to the number of intervention components in order to make room for elaboration and thereby internalize the learning outcomes of the intervention (Petty & Briño, 2012). Hence, as shown in our study, more than one session should have contributed to stronger intervention effect. However, several sessions demand more resources, and this dose-response relationship requires further investigation to justify the number of sessions in future studies.

A peer context is defined as an essential cultural context that strongly influences adolescents' norms (Jones et al., 2004). Therefore, we consistently met the students in their own classrooms to provide a learning environment conducive to changing beliefs, knowledge, social norms, and attitudes among the groups of students (Jones & Crawford, 2006). Similarly, the majority of previous studies that achieved effects intervened in this context (Table 1), while two out of the four studies with no effect on embodiment facets were conducted outside school hours (McVey et al., 2003) or in a computer lab (Cousineau et al., 2010). The findings support the suggested benefits of a classroom-based intervention.

Within this social context, we also used an interactive approach in which we strived to involve the students in the learning process. This was done by presenting topics, and then asking the students open questions that they discussed and reflected upon before the questions were discussed in plenary. Notably, we allowed students to present their own opinions and experiences related to each topic, and within a certain leeway, they chose the direction of the discussions. The idea was that such approaches would make the students more easily relate to the subject matter governing the discussions and take more interest in the workshops (Deci & Ryan, 2002). Furthermore, if students felt that activities were voluntarily, and they presented their attitudes in front of an audience (e.g. in classroom), then their words would gain significance not only for themselves, but

also for the other students listening (Green, Scott, Diyankova, & Gasser, 2005). The nature of such interactive activities could have increased the likelihood of the messages presented in our study being elaborated upon, which is important for changing adolescents' attitudes. This assumption is supported by the fact that the effective studies, including those with moderate–large effect sizes (Bird et al., 2013; Espinoza et al., 2013; Richardson & Paxton, 2010), were interactive.

In addition to the interactive activities and multiple sessions, the HBI intervention might have benefitted from even more facilitation of content elaboration to produce a stronger effect than what we found. One approach could be the inclusion of homework between workshops. In this case, participants would be asked to practice skills or behaviors consistent with, or as a consequence of, workshop discussions, and thereby generalize or adopt these skills for their everyday lives and individual experiences (Kazantzis & Lampropoulos, 2002). In the original HBI study protocol, homework activities were included, but were omitted after the pilot study, in which both school staff and students were oppositional to anything that increased workload. In retrospect, the negative attitudes towards homework might have been prevented if we had launched the possibility of a larger benefit for the students through homework, and if assignments reflected existing school subjects more clearly.

### Gender differences

More than 50% of previous studies found an effect on girls. It is important to mention that there are twice as many female samples compared to male samples. With this in mind, only small short-term effects have been reported in boys (Morgan et al., 2012; Richardson et al., 2009), and the findings in our study contribute to an overall suggestion that existing health promotion interventions that focus on body image and embodiment are unable to produce the same effect for boys as for girls (Paper II).

A smaller improvement potential could partially account for such findings, since boys generally tend to display higher scores on positive body image and embodiment-related variables at baseline (Paper II, and Bird et al., 2013; Diedrichs et al., 2015; Franko et al., 2013; Lobera & Ríos, 2011). However, there is still room for improvement in the boys. In addition to the previous assumption, it is necessary to discuss the degree to which the HBI intervention was appropriately tailored to a mixed-gender group.

Scholars have discussed whether a lack of gender-specific content in interventions might play a role in the effect differences between boys and girls (Hargreaves & Tiggemann, 2006). This might have become less relevant in the last few years, as it is tempting to suggest that body image threats, idealized body types, and advertised body modification methods, are becoming increasingly similar

for boys and girls (Novella et al., 2015). Hence, important gender-specific targets in an intervention might not be as different for boys and girls as they previously needed to be. Another aspect that should be taken into consideration in this evaluation is male characteristics and whether the specific activities that were chosen for the HBI workshops and the ways in which elaboration of the content was facilitated, were as appropriate for boys as they were for girls.

One perspective considers the brain development of boys. At 17 years of age, the average boy's emotional intelligence and perspective-taking is not fully developed (Sax, 2006). This might have had an impact on the effectiveness of the workshops presented in our study (and others) that focused on working with thoughts, feelings, and attitudes. Secondly, in contrast to girls, boys might need to learn one key topic at a time (Wahistrom, 2002). Again, this does not reflect the HBI intervention or other typical body image interventions that include several related topics in one session (Table 1 and Table 2). Thirdly, males tend to avoid talking about body image (Adams, Turner, & Bucks, 2005) and describe body image as "a girl thing" (Hargreaves & Tiggemann, 2006). Therefore, even with a positive perspective, discussing their own feelings and attitudes, and how to improve things like embodiment, might be more challenging and unfamiliar to adolescent boys than girls. Accordingly, such activities might not reflect the typical standards of masculinity (Bennett & Gough, 2013; Lee & Owens, 2002). As a possible consequence, our intervention boys might not have consumed and processed the workshop content as planned, thereby reducing the likelihood that elaboration of content and the ability to change attitudes influenced positive embodiment.

A fourth perspective that should be discussed is how the facilitators' gender might have played a role in how body image workshops were received by the boys. It has been reported that young male participants prefer male facilitators if an intervention is experienced as personal (Yager, Diedrichs, & Drummond, 2013). This could indicate that interactive parts of the intervention related to feelings, attitudes, and habits in the HBI workshops and previous studies, could benefit from having both genders represented to enhance the feeling of relevance and relatedness for boys as well as for girls. Female facilitators might not have been able to create the same comradery and connection with the boys and provided enough masculine points of reference as a male facilitator could have provided. Developing an intervention that includes these masculine characteristics has been described as helpful in engaging males in an intervention setting (Seaton et al., 2017). When designing the HBI intervention, practical considerations were the reason two female Ph.D. students were chosen to facilitate the workshops.

It is important to recognize that although weak effects have been observed in boys, evidence does not document that a single-gender intervention should be preferred over a mixed-gender

intervention in future studies. One study reported that a mixed-gender group was significantly dominant in its effect on girls compared to a girls-only group (Agam-Bitton et al., 2018), which supports the notion that a mixed-gender group might facilitate more positive interactions and communication between boys and girls, and they might need to change their attitudes together for the social environment to change (Weigel et al., 2015).

### Pathways of intervention effect

Through mediation analyses in our study, we were able to determine how the HBI intervention affected positive embodiment through specific mechanisms in boys and girls. Although specific constructs have been suggested as important to target for the promotion of positive body image and embodiment (Halliwell, 2015; Tylka & Piran, 2019a), only one other previous study on girls examined such mechanisms (Agam-Bitton, Ahmad, & Golan, 2018). The novel findings from our study indicate that the HBI intervention needs to improve self-esteem in order to produce long-term changes in positive embodiment for both boys and girls (Paper IV). Our findings contradict findings by Agam-Bitton et al. 2018, who did not find an effect of their intervention on the body image outcome through self-esteem, but through media literacy. As discussed further in Paper IV, methodological difference made it difficult to compare the studies.

Activities in the HBI workshops aimed to build awareness among students on how to become better at maintaining a positive attitude and self-evaluation, as well as how to help others do the same. Becoming more comfortable with individual characteristics and strengths is thought to have reduced adolescents' need and desire to self-evaluate and compare themselves to other people's standards. This could have promoted the ability to reject unhealthy exposures and facilitated the growth of embodied experiences (Piran, 2019; Rousseau & Eggermont, 2018). Improved self-esteem might have led to ripple effects on students' psychological well-being, and facilitated inclinations towards embodiment-promoting exposures, such as people with positive attitudes, positive social media content, healthy lifestyle choices and positive self-communication, which then could have improved positive embodiment (Piran, 2017).

The HBI intervention effects were highly gender specific, where only a small transient intervention effect was found in boys, while a sustained effect was found in girls (Paper II). Although boys and girls improved their self-esteem scores as a result of the intervention, short-term effects in boys could potentially indicate that not enough boys sustained a strong enough effect on self-esteem over time to also sustain changes in positive embodiment. Therefore, in addition to previous modifications suggested for the workshops, more time spent on self-esteem might be needed. Moreover, the global self-esteem measure might have been insufficient to capture specific domains

of self-esteem that could be gender specific (von Soest, Wichstrøm, & Kvalem, 2016). It is possible that the inclusion of physical activity sessions might have promoted the athletic competence domain. This domain has been described as more important for boys' global self-esteem (von Soest et al., 2016) and, therefore, could have further developed the physical domain of the experience of embodiment, especially in boys who did not show a high positive embodiment at baseline (Piran, 2017).

No further variables that represent the workshop content was found to mediate the intervention effect on either boys or girls. The true mechanisms might be more complex than what we were able to capture through parallel mediation modelling. Serial mediation modeling could provide additional information, indicating whether the intervention impacted the outcome through a longer chain of mediators. Based on the findings from the current study, self-esteem scores are likely to play an important role in this chain of mediators.

### Lifestyle

No previous studies with the aim of improving body image have reported short- or long-term intervention effects with respect to physical activity levels and dietary habits, such as meal frequency and the consumption of fruits and vegetables (Lubans et al., 2011; Neumark-Sztainer et al., 2010). Beyond small and transient intervention effects in the present study (Paper III), our 12-month assessments indicated no sleeping effects. Our findings, as well as previous ones, do not reflect studies that show that positive embodiment correlates or even predicts lifestyle habits, (Altıntaş & Aşçi, 2008; Andrew et al., 2016; Kololo et al., 2012; Neumark-Sztainer et al., 2006; Ramseyer et al., 2019), and do not support the notion that studies aiming to promote positive embodiment facets should also promote lifestyle habits. It is unclear as to whether it is more valuable to separate the aims of promoting positive embodiment and lifestyle habits due to these findings. However, the current lifestyle information adolescents are exposed to mainly focuses on body appearance, and the guide towards developing the current body ideal is still associated with unhealthy and extreme physical activity and eating regimes. Thus, lifestyle habits and body image are threatened simultaneously. Therefore, there is still a need to rephrase the meaning of, relationships towards, and habits related to physical activity and eating, as such factors contribute to the total body experience. However, our original study is in need of modifications if future aims remain to promote both positive embodiment and lifestyle-related factors.

The HBI workshops focused on a cognitive approach, which might not have been sufficient in terms of changing lifestyle habits. To change behavior, practical skills and behavior competence

are among important elements (Ryan & Deci, 2000). Therefore, hands-on activities, especially to the lifestyle workshop, could be a modification of our intervention.

When it comes to the physical activity aspect, physical activities that focus on enhancing the feeling of mastery, social belonging, enjoyment, self-efficacy, and an experience of body functionality could redefine the benefits of physical activity for each individual. Such activities could also provide positive experiences of engaging in physical activities (Teixeira, Carraça, Markland, Silva, & Ryan, 2012; Young, Plotnikoff, Collins, Callister, & Morgan, 2014). For eating habits, it is tempting to suggest that group activities could aim at developing tools to more easily consume nutrient dense food and regular meals during a busy school day, provide skills and opportunities for competence improvement, and facilitate mastery and self-efficacy. Specific activities could include learning how to shop for, and make, such meals, and doing this with peers to create a social and joyful approach to eating healthy. Taken together, hands-on activities, compared to only cognitive approaches, might facilitate positive experiences and stronger relationships with physical activity and healthy eating, and establish healthy attitudes within a group, to a larger extent than what the HBI intervention managed.

### Internal validity

#### Study design

The randomization used in this study should have ensured that characteristics that might have affected the relationship between intervention and outcome measures were roughly equal between groups. Nevertheless, as presented in Paper II and III, baseline data for control and intervention students reflected a slightly healthier intervention group compared to the controls, with more favorable scores on the outcome variables in both intervention boys and girls. Studies have shown that adolescents' mental health (McLaughlin, Costello, Leblanc, Sampson, & Kessler, 2012) and eating habits (Xie, Gilliland, Li, & Rockett, 2003) are associated with parental socioeconomic status. Since socioeconomic status was lower in the control group, this might have influenced the additional differences in mental health variables and eating habits between groups. Because effect analyses in Paper II and III were adjusted for baseline scores, it could be argued that the study effects were caused by the intervention and not baseline differences.

#### Attrition

Throughout the four measurement points, there was a significant loss to follow-ups, with a higher dropout rate among boys compared to girls, and among the control group compared to the

intervention students. However, dropout analyses revealed insignificant differences between dropouts and non-dropouts. Still, the significant decrease in follow-ups might have reduced the statistical power and increased the probability of Type II errors in Paper II and III in boys.

### **Measuring positive embodiment**

In contrast to previous studies, our study used an instrument specifically designed to measure positive embodiment, which strengthens the study's validity (Halliwell, 2015). Outcomes used in previous studies depended upon the antiquated operationalization of positive body image, which has a narrow focus on satisfaction and appearance (Webb et al., 2015) and places positive and negative body image on opposite ends of one body image continuum scale.

Although the Experience of Embodiment Scale is the most appropriate measure of positive embodiment in adolescents, the instrument has only been validated on adolescent girls and young women and men, not on adolescent boys or a Norwegian sample. Because the wording used in the questionnaire could be described as erudite, or targeted more towards adults, one could argue that some questions might have been responded to randomly. However, we specifically asked for feedback on these questions during the pilot study, and we received no specific comments regarding the wording of these questions. Thus, this should not be a threat to the validity of the study.

### **Experimenter bias**

Christine Sundgot-Borgen (CSB) contributed to the development of the intervention design, planned the logistics with the schools, held the workshops, and ran the statistical tests on all papers (except Paper IV), and wrote the papers collaboratively. Given her role in the study, blinding her and the other facilitator was considered difficult. In contrast to studies like drug trials, lack of blinding is common in studies where the facilitators need to know the intervention in order to intervene, and where they need to recognize that those who do not get an intervention comprise the control group. Naturally, both CSB and the other facilitator were motivated to deliver the workshops and believed them to be effective. Importantly, the facilitators did not take part in the data collection other than sending out links for the web-based questionnaire, which also was filled out by the participants without the presence of the facilitators. Consequently, the involvement of the facilitators should result in minimal bias and negative impact on study validity. Notably, the workshops were not documented by an observer, nor were they videotaped. Although the same PowerPoint slides, assignments, and topics for discussions were used in each classroom, the study

cannot control for protocol adherence in all workshops throughout the intervention period. This needs to be mentioned as a limitation to the study.

### External validity

#### Generalizability of dissemination

The question remains whether the intervention needed the two Ph.D. students to be effective, or if the HBI intervention would have been equally safe and effective if different facilitators met with the different schools and followed the strict protocol. The two HBI facilitators were professionals and would by many students most likely have been seen as credible due to their background. Such qualities have been described as important for intervention participants (Yager, Diedrichs, & Drummond, 2013). Making the students feel like they were of great importance for the project, part of a group, and seen and heard by both of the facilitators, might have affected students' feelings of belonging, acceptance, and self-worth. These are known as non-specific factors that are not specific to the theoretical framework of the intervention and not measured, but that might, nevertheless, be an effect of the therapeutic relationship between facilitator and student and influence the effect potential (Donovan, Kwekkeboom, Rosenzweig, & Ward, 2009). Such preferences have not been measured in either the current study or previous comparable studies. Dissemination of the intervention by facilitators who do not hold similar background and experience should await further investigation into who could facilitate the HBI intervention safely and obtain similar results.

#### Generalizability of findings

The study included several schools, from different parts of the city and county regions, including areas and schools that represented different suburban and rural areas, with different socioeconomic status. Of the 50 schools invited to participate in the study, 30 (60%) accepted. As a school-based intervention study, the student response rate was acceptable. Therefore, it is reasonable to assume that the results can be generalized to adolescents representing similar areas in Norway.



## **Ethical considerations**

### **Using valuable school hours to conduct a research project**

The HBI intervention asked schools to sacrifice three, 90-minute sessions from their schedules so that students could take part in our project. Teachers were already struggling to cover mandatory curriculum in the regular schedule. For ethical considerations, then, it is crucial to consider the cost-benefit of implementing interventions into the school schedule. Interventions like the HBI should only be implemented into schools if the study might improve students' lives or if changes are needed in the school to maintain or promote health.

In the case of the HBI intervention, both scenarios were relevant. Firstly, the HBI intervention did positively affect girls. Secondly, a parliamentary report in Norway has requested school-based programs that promote life management skills and improve body image (Meld. St., 2015–2016). It was important for both the school staff and the students that the time spent taking part in the workshops would not lead to a lack of academic progress. To reduce the time-related costs of taking part in this study, the workshops were linked to the mandatory curriculum in several subjects. However, modifications to improve the effects on boys might be necessary for the benefits of the intervention to trump the time-related costs in a mixed-gender school.

### **Reflecting on body image**

Body image interventions might in a universal sample enhance awareness of an environment's focus on appearance, idealized bodies and lifestyles, and self-evaluation in students who were not familiar with these experiences prior to the intervention (O'Dea J, 2011; Yager, Diedrichs, Ricciardelli, & Halliwell, 2013). We do believe that the risk of unhealthy focuses was taken into consideration in our study, and that the growing focus on body image related topics within the sessions was mediated to promote an even better body experience. To achieve this health promotion angling, presenters were consistent in how they presented different topics, projected body and oral language, and answered questions, so that the students perceived and understood their angling. Because the intervention was characterized as health promoting, we did not only aim to improve awareness of existing embodiment risk factors. We also aimed to promote skills that would protect against future unhealthy exposures, so that health was maintained or improved over time. Implementing this angling on body image interventions responds to the need for ethical considerations and should have ensured that the benefits of learning how to obtain a stronger embodiment for themselves and for their peers trumped the suggested risks of body image focused workshops (Levine & Smolak, 2016).

### Scientific implications

The study adds to the knowledge about the short-and long-term effects of a positive embodiment intervention on older adolescent boys' and girls' positive embodiment, HRQoL, and lifestyle habits. In addition, the study provides new knowledge about change mechanisms and the number of sessions that might be needed for an effect to take place. Recommendations and suggestions for future studies are listed below;

- Replications are needed.
- Interventions might need to spend more time on self-esteem related content and examine the effects of domain-specific self-esteem activities as a means of enhancing self-esteem and positive embodiment in adolescents.
- Intervention adjustments such as “hands on” activities may be needed to enhance lifestyle habits if it is kept as an outcome measure.
- Investigations should be made into mixed- or single-gender facilitators and gender-neutral or gender-specific intervention content.
- A possible interplay between mediator variables that reflect intervention content should be considered in order to more fully grasp the complexity of change mechanisms.
- “Dose-response” should be investigated in terms of the attendance rate and the number of sessions needed for effect.
- Considering the possible sleeping effects, future studies should adopt a longer follow-up time (>12 months).

## **Societal impacts**

Changes made to positive embodiment, HRQoL, and lifestyle habits by the HBI intervention were small. However, small effect sizes are common in universal interventions and should be expected due to low baseline 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 who have scores within a clinical range (Wilksch, 2014). In contrast to clinical studies, the interpretation of small effect sizes may be more favorable, as small effects on several variables may collectively have an impact on public health (Glasgow, Vogt, & Boles, 1999).

Schools would benefit from the implementation of the intervention; however, some of the modifications discussed earlier would need to be made first. To take into consideration hectic school schedules, workshops and homework could be implemented into existing subjects. Due to the complexity of positive embodiment, several subjects might be appropriate.

*Social science* could include discussions on the concept of the appearance industry, body idealization, communication, and the use of social media literacy. *Language-specific subjects* could discuss sources of information and communication through oral, written, and body language. *Natural sciences* could discuss natural growth and development, the consequences of body modification, and nutrition and exercise with a focus on functionality and well-being. *Food and health* classes could provide hands-on activities and practical experiences that promote positive experiences of, attitudes towards, and knowledge about healthy eating habits. This subject could further improve lifestyle literacy so that students are protected from exposure to unhealthy lifestyle information. Finally, *physical education* is the one subject that might directly affect body experience the most and that could promote self-esteem if the teacher focuses the sessions on body functionality and healthy motives for exercise. In these sessions especially, body appearance culture might be observed, reflected through students' communication, and, as a result, further dealt with.

As presented from the sociocultural perspective, adolescents are influenced by significant others, such as teachers and peers in the social context of the school setting. It is reasonable to suggest that it would be important for teachers to be able to promote a positive embodiment environment in the classroom. Hence, components in the HBI intervention, especially self-esteem, should be stressed as important topics in the education of teachers so that they are more competent and comfortable in taking part in the building of embodiment-safe environments for students.

## Conclusions

### Paper II

The HBI intervention promoted sustained effects on positive embodiment and HRQoL in girls. The intervention cannot be defined as highly effective for boys, where short-term effects were lost during follow-up. The study results indicate that for the intervention to be effective, at least two sessions are needed.

### Paper III

The HBI intervention found that intervention boys were less active than controls at long-term follow-up, while no physical activity effect was found for girls. Only small, short-term positive effects were found for eating habits in boys and girls. Intervention boys and girls slept more during the week at 12-months follow-up and post-intervention, respectively, compared to controls, and girls reported less sleep debt at the 12-month follow-up compared to controls. However, changes were small, and even though strong associations might exist between positive embodiment and lifestyle, the HBI intervention does not promote both factors equally.

### Paper IV

There was an indirect effect of the HBI intervention on positive embodiment through an improved self-esteem score in both boys and girls. Future studies are therefore encouraged to focus on self-esteem enhancing activities in their sessions.

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## Papers and Appendices



**Paper I**





STUDY PROTOCOL

Open Access



# 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

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## Abstract

**Background:** Body dissatisfaction and disordered eating raise the risk for eating disorders. In the prevention of eating disorders, many programmes have proved partly successful in using cognitive techniques to combat such risk factors. However, specific strategies to actively promote a positive body image are rarely used. The present paper outlines a protocol for a programme integrating the promotion of a positive body image and the prevention of disordered eating.

**Methods and design:** Using a cluster randomized controlled mixed methods design, 30 high schools and 2481 12th grade students were allocated to the *Healthy Body Image* programme or to a control condition. The intervention comprised three workshops, each of 90 min with the main themes *body image*, *media literacy*, and *lifestyle*. The intervention was interactive in nature, and were led by trained scientists. The outcome measures include standardized instruments administered pre-post intervention, and at 3 and 12 months follow-ups, respectively. Survey data cover feasibility and implementation issues. Qualitative interviews covers experiential data about students' benefits and satisfaction with the programme.

**Discussion:** The present study is one of the first in the body image and disordered eating literature that integrates a health promotion and a disease prevention approach, as well as integrating standardized outcome measures and experiential findings. Along with mediator and moderator analyses it is expected that the *Healthy Body Image* programme may prove its efficacy. If so, plans are made with respect to further dissemination as well as communicating the findings to regional and national decision makers in the education and health care services.

**Trial registration:** The study was registered and released at [ClinicalTrials.gov](https://clinicaltrials.gov) 21th August 2016 with the Clinical Trial.gov ID: [PRSNCT02901457](https://clinicaltrials.gov/ct2/show/study?term=PRSNCT02901457). In addition, the study is approved by the Regional Committee for Medical and Health Research Ethics.

**Keywords:** Health promotion, Disease prevention, Body image, RCT-protocol, Adolescents

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## Background

Body dissatisfaction (BD) is reported by up to one-third and every other adolescent boy and girl, respectively [1–4]. Quantitative studies have found that marked BD clusters with physical inactivity and weight gain [5–8] lower self-esteem [9], depressed mood [10, 11], social anxiety [12], perfectionistic concerns [13], and disordered eating (DE) [14]. Notably, across studies BD and DE are consistent risk factors for eating disorders (ED) [15], and it has been shown that both BD and perfectionistic concerns moderate high levels of ED symptoms [16]. A number of prevention programmes to combat BD and DE have been developed and tested during the past decades as indicated in reviews and meta-analyses [17–21].

These prevention programmes can be classified along two dimensions. The *first* dimension relates to target *populations*, and may be divided into a universal, indicative, and selective level [22]. The universal level targets the general population or specific demographic strata herein. Public schools have been the preferred arena for implementation of many ED prevention programmes due to high accessibility to adolescents, who are in a learning environment, and at the same time exposed to many risk factors [18, 19, 23]. Prevention programmes at the second (indicative) and third (selective) level addresses only individuals with known risk factors for a given disease, and individuals actually having a particular disease, respectively.

The *second* dimension is related to the *programme content and focus*. In many programmes, a universal approach and a health promotion perspective overlap. Given the prevalence of risk factors for EDs in the general population, notably BD [1–4], universal prevention programmes may also take an indicative approach. Within a disease prevention paradigm, the success of a programme hinges on whether the prevalence of one or more risk factors is reduced, and ultimately, whether the incidence of clinical cases is reduced.

Largely within a disease prevention paradigm several reviews and meta-analyses [15, 17, 20] indicate many beneficial outcomes of programmes targeting BD and DE. In the meta-analysis by Stice et al. [20] 51% of the included programmes were effective in reducing ED risk factors. Moreover, larger effects were found for multisession programmes using a selected (females 15 years or older, and at risk for ED) rather than a universal strategy for programmes targeting risk factors by persuasion approaches, notably cognitive dissonance techniques, compared to programmes with a pure psychoeducational approach. A more disturbing finding was the decline in effect sizes over time. A subsequent meta-analysis [17] found that approaches to increase media literacy to fight internalization of unhealthy body ideals were the only universal interventions that had small to moderate effect sizes of reducing risk factors. Although the methodology

in previous studies have improved over the decades, many studies suffer from limitations like low statistical power [24], lack of long term follow-up [25], and a failure to use standardized measures of positive body image (and not just BD) [26] suitable for both genders [20, 27–29]. A possible floor effect of studying variables with a pathological twist within a relatively healthy population may account for modest effect sizes. In addition, less is known about the feasibility of interventions and experiential data from programme participants about possible programme benefits. Such limitations set standards for future research.

By contrast, a health promotion paradigm focuses on promoting general mental (or physical) health. It has been argued [30, 31] that the presence of a positive body image is not just the negation of a negative body image represented as BD and that at best, a neutral body image is the result of a disease prevention strategy [3, 31]. Hence, a disease prevention perspective may miss several aspects of a positive body image [32–34]. Qualitative studies [31, 32] indicate that a positive body image is multifaceted, including body appreciation [35], embodiment [33], a focus on body functionality rather than physical appearance and attraction as well as self-compassion [36] and acceptance of imperfection. Still, there are some overlap in the sense that a partial or contextually related BD may exist despite an overarching and inner sense of body appreciation [30].

Reviewing mainly health promotion programmes [37] has revealed overall small to medium effect sizes for studies focusing on media literacy, self-esteem and the influence of peers. More recent studies indicate that actively promoting a positive body image increases physical activity level, decreases DE, dieting, alcohol consumption and cigarette use [38, 39] and that a mindful, non-judgmental and compassionate attitude to one's body may protect against self-objectification and a negative body image [40]. Such positive outcomes may then contribute to resiliency towards unhealthy sociocultural body ideals.

Research on how to promote a positive body image may be essential to the future of prevention of DE and ED [3]. Acknowledging the high prevalence of BD [1, 4], it is suggested [34, 41, 42] that prevention programmes in general should encompass both a disease prevention perspective, i.e. targeting and reducing the prevalence of risk factors, as well as a health promotion perspective. Apart from one study [43] joint focus on alleviating BD and reducing DE, as well as promoting a positive body image has been scarcely focused. Therefore, integrating health promotion and disease prevention is the rationale for the development of the Norwegian Healthy Body Image (HBI) programme. The primary outcome measures are to promote a positive body image and to prevent DE. The purpose of the present paper is to outline the HBI-protocol in terms of the programme content,

the study design, the procedures for randomization, recruitment and data collection in order to evaluate the immediate and long-term programme efficacy. Publishing the protocol may address the plea to avoid duplicate efforts, and to aspire for coordinated and strategic approaches needed to increase knowledge about effective school-based body image interventions [21].

#### Aims and research questions

The overall aim of the study is to promote a positive body image, and to prevent DE among adolescents. The following research questions are addressed:

- Do participants in the HBI programme display a more positive body image compared with control students?
- Do participants in the HBI programme display less DE compared with control students?
- Will participants in the HBI programme adopt a healthier lifestyle compared with control students?
- What is the role of mediator and moderator variables?
- How do local programme administrators evaluate the programme feasibility?
- How do the students experience participating in the programme?

#### Design and methods

This study has a mixed method design in which both quantitative and qualitative methods will be applied for data collection. Following the procedure of a randomized controlled study [44] the participants have been allocated to either the HBI programme or a control condition.

Standardized instruments will be used to measure programme efficacy. Understanding the determinants of intervention success or failure, and insight into the nature of the intervention delivery is essential. Therefore, we will perform an evaluation among participating students as well as local programme administrators. The administrators will respond to predefined questions about the feasibility of procedures. A selection of students will be invited to individual, semi-structured interviews. The selection will be made to accomplish maximum variation in experiences from participating in the programme.

A 1:1 ratio for cluster-randomization was conducted by a professional not affiliated with the project team to minimize contamination biases within schools. Schools were the selection units to avoid spillover effects due to communication about the intervention between participants and controls within each school. Figure 1 provides an overview of the study flow and the data collection intervals. During the intervention period students at the control schools continued following their regular school curriculum.

#### Recruitment

Following the recruitment procedure (Fig. 2) 30 schools and 2481 students were finally included.

The HBI programme includes 12th grade high school classes with both genders and with no exclusion criteria. All principals at every public and private high schools in Oslo and Akershus County in Norway were contacted during May–September 2016. At the consenting schools, detailed study information was provided to students and staff. After signing a letter of consent through e-mail, students were given access to a link to a questionnaire package. Through the online SurveyXact survey system students could complete the package at any time outside regular school hours. The system automatically adjusts the survey setup for computer screens, tablets and smart phones. This minimizes practical obstacles and increases feasibility and response rate.

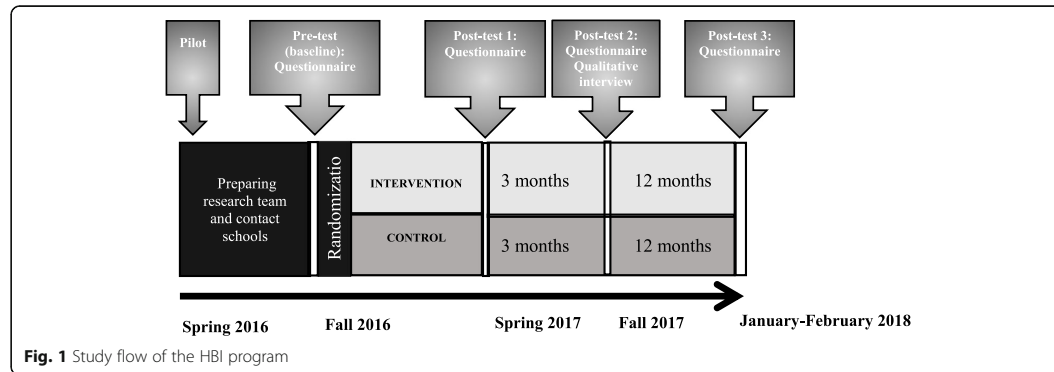
#### Data collection procedures

Quantitative data are collected at all four measure points (Fig. 1). In addition, fixed questions have been given to school staff, focusing on implementation issues. The semi-structured interviews will take place at 3 months follow up. Here 15 randomly selected students from the intervention schools will be invited, and the interviews depart from overall experiences of the HBI programme in terms of satisfaction, benefits and room for programme improvements.

#### Statistical power and data analyses

The statistical power estimation was based on two comparison groups,  $\alpha$  level = 0.05, and average within-cluster sample size of 70 students. In each group, 10 clusters are needed to achieve a statistical power of 81%. This is based on a meta-analysis [45] reporting a standardized weighted effect size (Cohen's  $d$ ) of 0.28 from 35 studies examining intervention effects on body images variables, and assuming a within-cluster dependency of no more than 3% (ICC = 0.03). The expectation of a rather low ICC is fair for variables related to psychological or mental health outcomes as selection factors like socioeconomic status variables affect these variables less than for example academic performance. The total required sample size thus becomes;  $10 \times 2$  groups  $\times$  70 students in each cluster  $\sim$  1400 students.

The outcome data will be analysed using mixed model regression due to several layers of dependency (i.e., correlated data) between students within schools and classes, and between the repeated data collected from the same student. These variables (schools, classes and initial measurements, or intercepts) will be included as separate random factors in order to correctly adjust the error bands. The restricted maximum likelihood procedure also handles missing data more



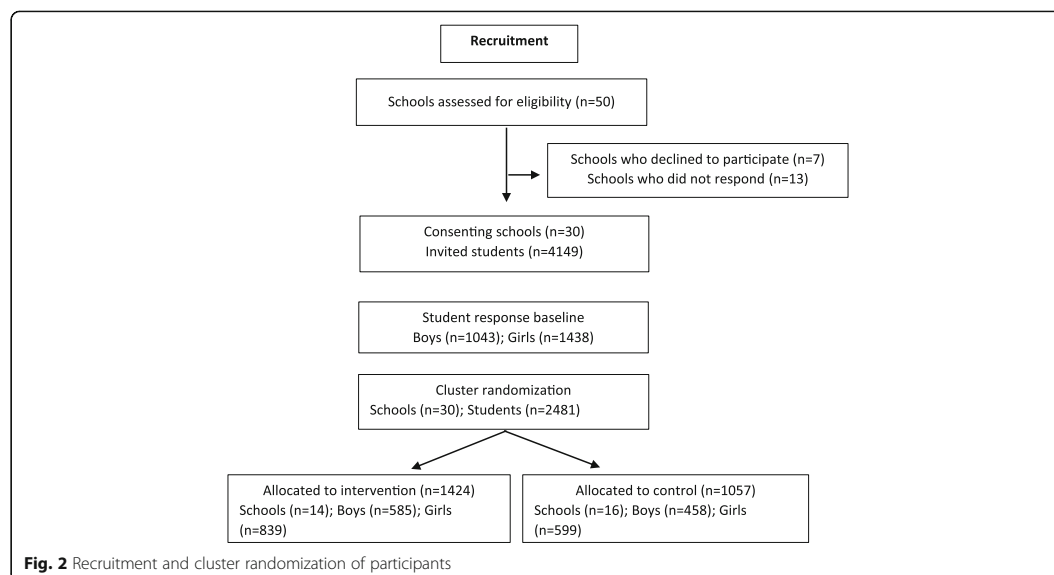
flexibly by estimating unbiased parameter estimates using all the available data given a random missing mechanism may be assumed.

Transcribed qualitative interview data will be organized into QKS N'Vivo 10, and will be analysed according to the principles of systematic text condensation [46]. This involves 1) review of the data to get an overall impression; 2) identifying meaningful units representing different experiences 3) condense the significant units in subgroups and 4) synthesis and developing categories. Two researchers run the analysis separately, and then compare their findings until a point of unified understanding and consensus is

reached. The Consolidated criteria for reporting qualitative research (COREQ) will be used to ensure high quality qualitative research [47].

**Timeline**

The HBI programme was piloted March–April 2016. After minor adjustments, school principals were contacted from May–September 2016, and accepting schools were randomized in September. The intervention was conducted during October–December 2016, followed by a post-test in December 2016–January 2017, a 3 months- and 12-months follow-up in March–April and December 2017–January 2018



respectively (Fig. 1). Data files will be cleaned in February–March 2018, and the data analyses will start in March 2018.

## The intervention

### Framework

The HBI programme aims to change attitudes, beliefs and knowledge related to idealized lives and bodies, to combat the internalization of sociocultural ideas about body shape, as well as strengthen skills that will promote positive body image and prevent DE. It rests on *sociocultural theory* about how societal ideals of beauty are transmitted and internalized through a variety of channels such as family, peers, media, and that psychological development and learning emerges through interpersonal relations and actions with the social environment [48]. When internalizing such

ideals, satisfaction or dissatisfaction with appearance will depend on to what extent individuals meet the sociocultural ideals. The programme also rests on the integrated etiological model of risk and protective factors [34, 42], and theories of embodiment [33] within the realm of positive psychology [49].

The intervention method is based on the *Elaboration Likelihood Model*. According to this model repeated exposure to a message facilitates cognitive elaboration of this message and increases the likelihood that the message is processed through a central, rather a peripheral cognitive route [50, 51]. In the HBI programme elaboration is facilitated by a high level of student activity around issues of common interest to them, i.e. how to promote a positive body experience and self-esteem and a healthy lifestyle. In addition, and in accordance with previous findings [20, 27, 28]

**Table 1** Outline of content and targets of workshops #1 - #3 in the HBI programme

#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 reduce 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 WS#2	Stimulate motivation for next WS
#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

elaboration is facilitated by the multiple session approach.

### Structure and content

The first and third authors, specialized in physical activity and health, sports nutrition, motivational interviewing, DE and BD among adolescents, conducted the programme. School teachers were allowed to be present in the classroom, however, without participating. To account for programme attendance, each student's participation was registered at all intervention sessions. The intervention comprises three interactive workshops with a duration of 90 min each, i.e. two school hours. The three workshops were arranged in a classroom during regular school hours, and about 60 boys and girls (i.e. two school classes) participated. Three weeks interval between the workshops resulted in a 3 months intervention period.

Each workshop was adapted to suit adolescents 15–16 years of age with respect to their cognitive development and ability to abstract reasoning, and they comprised the main themes “body image”, “media literacy”, and “lifestyle”, respectively. Table 1 provides an overview of the programme content and targets. Parts of the school curriculum echo themes from the workshops, however without a comparable amount of focus, presentation methods, and learning techniques. As a result of the pilot study among 120 12th grade high schoolers only minor adjustments were made. Hence, some reiterated questionnaire items related to body perception and nutrition were deleted to reduce the risk of error

variance due to acquiescence bias, and the amount of workshop assignments was reduced to allow for more time allocated to discuss mood and body satisfaction issues.

### Outcome measures and variables

The questionnaire package is outlined in Table 2. Apart from demographic questions this package covers the primary and secondary outcome measures as well as the moderator/mediator variables. Fixed questions to school staff and interview data (students) cover aspects of feasibility. Finally, all students responded to questions regarding demographics as well as academic achievements in their last semester report in the obligatory subjects, i.e. English, Math, Norwegian, and Physical education, respectively.

### Discussion

The present study is one of the first to integrate a health promotion and a disease prevention approach, as well as integrating standardized outcome measures and experiential findings.

In contrast to many previous studies, adherence to the intervention will be presented, thus increasing the validity and credibility of findings. Importantly, themes included in the intervention programme can to some extent be placed under themes in the ordinary schools' curricula. This creates a potential for increased feasibility, but it also creates a test of the programme effects. Skills that are taught through the workshops might need

**Table 2** Overview of the instruments used to evaluate the efficacy of the HBI programme

	Outcome measures	Content
Main outcome variables	Experience of Embodiment Scale [33]	Body image
	EDE-Q-11 [52]	Disordered eating
Secondary outcome variables	The body image acceptance and action scale [53]	Body image
	Sociocultural Attitudes Towards Appearance Questionnaire-4 (SATAQ-4) [54]	Body image
	Drive for Leanness Scale (DLS) [55]	Body image
	The KIDSCREEN-10 [56]	Health related quality of life
	Self-developed Physical activity level/habits questionnaire	Lifestyle behaviours
	Self-developed Food frequency questionnaire	Lifestyle behaviours
	The Bergen Insomnia Scale [57]	Lifestyle behaviours
	Hopkins Symptom Checklist-10 (SCL-10) [58]	Symptoms of anxiety and depression
Self-developed Social media questionnaire (to be published)	Impression management, Body and appearance and looks, Literacy, Social capital, Social media addiction	
Mediator and moderator variables	Frost Multidimensional Perfectionism Scale [59]	Perfectionism
	Rosenberg self-esteem [60]	Self-esteem
	The Self Compassion Scale-12 [61]	Self-compassion
	The Resilience Scale for Adolescents [62]	Mental health protective factors

to mature over time. Hence, a 12-month follow up using the same outcome measures might make it possible to identify both immediate and long-term effects, and to what extent the participants experience that the programme has been useful in their daily life.

Moreover, the integrated health promotion and disease prevention perspective may offer the possibility of empirically evaluating the theoretical relationship between BD and a positive body image. Notably, it will be possible to differentiate between health promoting outcomes and outcome related to DE.

In contrast to most previous studies, the inclusion of mediator/moderator variables and our large sample size allows for sub-group analyses in order to identify those who might or might not benefit from the intervention. Including both genders may be a challenge as BD may be unevenly developed by the age of 15–16 years. However, all students can potentially benefit from healthier attitudes and practices in relation to their own body and to their social responsibilities as peers and family members [34]. Thus, sub-group analyses may also comprise possible gender and cultural differences.

The potential for the generalizability of findings seems satisfactory as the study sample representing both urban and rural parts of a large population area, and comprising both public and private schools.

Some limitations should be mentioned. First, a non-blinded procedure can lead to a potential expectancy bias for the researcher and the participating students in favour of the intervention. A related issue is the fact that those who implemented the HBI programme for practical reasons also interviewed participating students about how they experienced the programme. Secondly, underreporting may be the result of the programme format in which some students might have been reluctant to discuss personal and private issues in large classrooms and during the workshops when teachers were present. A related issue is whether the adjustment of questionnaire items to omit sensitive or unclear items is sufficient to prevent underreporting. Thirdly, completing a large questionnaire at four measure points may introduce the possibility of random responding due to an acquiescence bias, or some “learning effects”. The latter seems unlikely given the considerable time intervals between each measure point.

Despite these limitations, it is expected that the quantitative and qualitative evaluation of the BHI programme will merit larger scale dissemination efforts within the school health system, and possibly within relevant contexts in the primary health care services. Thus, apart from the customary publishing in international high-impact journals, the study’s purpose is to bridge the gap between research and practice. Thus, we aim to communicate findings to regional and national decision makers in the education and health care services.

#### Abbreviations

BD: Body dissatisfaction; DE: Disordered eating; DLS: Drive for Leanness; ED: Eating disorder; EDE-Q: Eating Disorder Examination Questionnaire; HBI: Healthy Body Image; ICC: Intra-class correlation; SATAQ-4: Sociocultural Attitudes Towards Appearance Questionnaire; SCL: Symptom Checklist; WS: Workshops

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#### Availability of data and materials

Data sharing is not applicable to this article as no datasets were generated or analysed.

#### Authors’ contributions

This study is a multidisciplinary cooperation between experts in exercise medicine from the Norwegian School of Sport Sciences, the University College of Southeast Norway and the University of Agder, experts in psychology and health and care science and methodology from the UiT - the Arctic University of Norway, and an expert in embodiment from the University of Toronto. Drs. JSB, JR, and CSB (Ph.D.-student) generated the original research idea, in collaboration with Drs. SBS, MKT, and GP. Drs. JSB, JR, SBS, MKT, GP, OF, EK as well as CSB and KMEE (Ph.D.-students) developed the questionnaire package. Drs GP, CSB and KE developed the interview guide. CSB and KMEE ran the project together including piloting, the ongoing quantitative and qualitative data collection and the intervention. GP, OF and JR are chief responsible for the qualitative and quantitative data analyses, respectively. CSB, JR and JSB wrote the main manuscript with particular assistance regarding the qualitative aspects (GP), statistics (OF) and the description of the intervention (KMEE). All authors have approved the final manuscript.

#### Ethics approval and consent to participate

The study meets the intent and requirements of the Health Research Act and the Helsinki declaration, and has been approved by the Regional Committee for Medical and Health Research Ethics (P-REK 2016/142). It has been enrolled in the international database of controlled trials [www.clinicaltrials.gov](http://www.clinicaltrials.gov) (ID: PRSNCT02901457). Students at consenting schools still have the prerogative to decline participation. In such cases, students are allowed to follow the HBI workshops, however without completing the questionnaires. After the final 12-month follow-up control schools are offered one lecture where the programme highlights are compressed. Personal backup or stop-procedures were not considered relevant due to the nature and focus of the intervention.

#### Consent for publication

Not applicable.

#### Competing interests

The authors declare that they have no competing interests.

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## Paper II





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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 12<sup>th</sup> 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.

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### 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, Agedal-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; Tomy, 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 inter-

personal 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

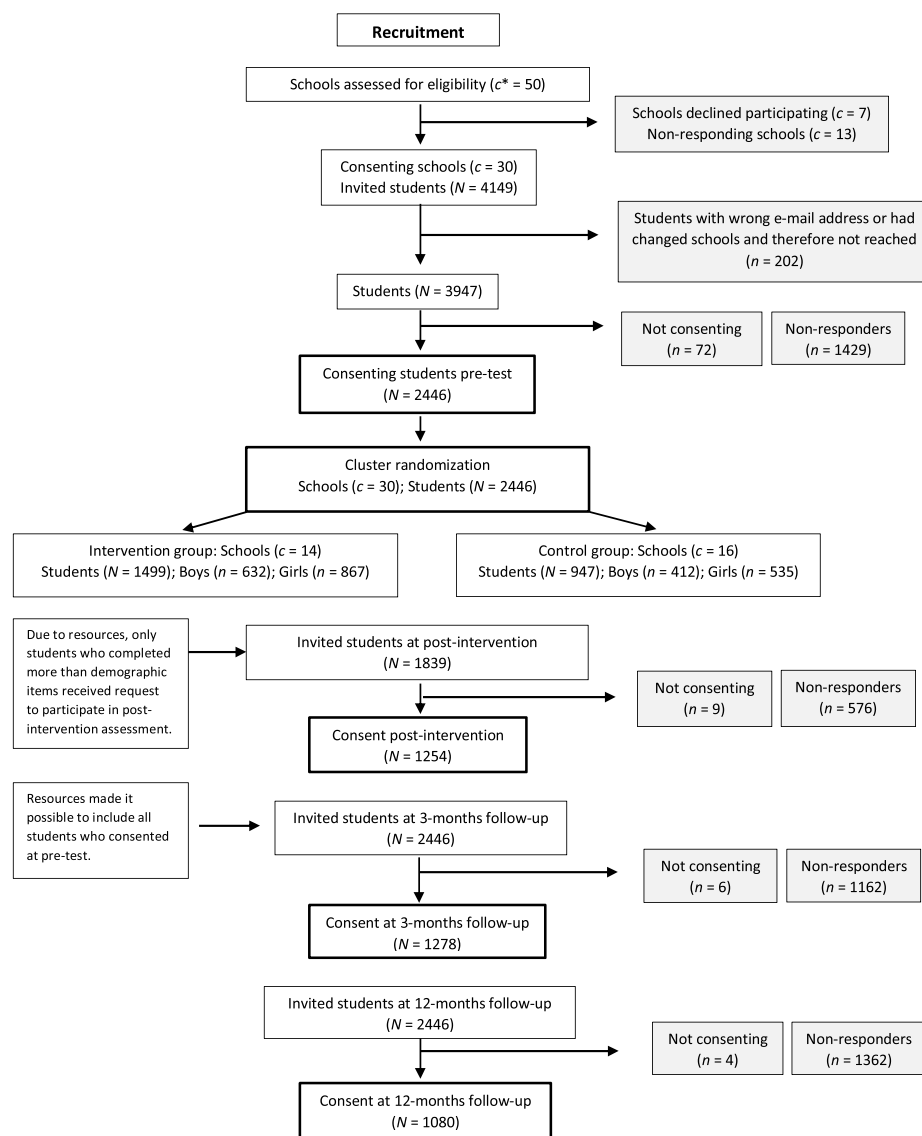


Fig. 1. Recruitment, cluster randomization of schools (c) and students (N), and response rate of participating students.

of controlled trials [www.clinicaltrials.gov](http://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 12<sup>th</sup> 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 12<sup>th</sup> 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 yes to 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., *I am proud of what my body can do and I 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., *I ignore the signs my body sends me and My 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 ( $r = .76-.79$ ) and men ( $r = .69$ ), body responsiveness ( $r = .73$ ), body connection ( $r = .60$ ), well-being ( $r = .55-.80$ ), and life satisfaction in men ( $r = .68$ ) and women ( $r = .66$ ). Further, the EES correlated negatively with measures of objectified body consciousness ( $r = -.55, -.73$ ), eating problems ( $r = -.43, -.70$ ), alexithymia ( $r = -.51, -.54$ ), and depression ( $r = -.63$ ) (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 adoles-

cents, 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., *Have you felt fit and well? and Have 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 (*In 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  $\geq 38$  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 socio-cultural 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 <sup>2</sup>	21.85 (3.45)	21.77 (3.26)	.741	21.41 (2.82)	21.43 (3.65)	.946
Immigration status <sup>a</sup>	62 (9.81%)	71 (17.20%)	.001 (0.11*)	109 (12.50%)	87 (16.20%)	.057
Parents' income ≥ 1NOK million <sup>b</sup>	319 (49.9%)	186 (44.6%)	.101	324 (36.8%)	143 (26.3%)	< .001 (-.11*)
Parents' educational level <sup>c</sup>	544 (86.5%)	314 (76.6%)	< .001 (-.13*)	745 (85.1%)	416 (77.5%)	< .001 (-.10*)
EES <sup>d</sup>	130.15 (20.91)	126.73 (22.18)	.054	117.31 (22.70)	114.03 (24.31)	.023 (0.15)
KIDSCREEN-10 <sup>e</sup>	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 <sup>f</sup>	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. <sup>a</sup> Immigration status: both parents are immigrants. <sup>b</sup> Parents' income: parents with total income ≥ 1 million NOK. <sup>c</sup> 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. <sup>d</sup> EES global score ranges from 34 to 170; <sup>e</sup> KIDSCREEN-10 ranges from 10–50. <sup>f</sup> General Health score ranges from 1–5. *p*-value < .05. *d* = Cohen's *d* and <sup>φ</sup>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 ( $\alpha = .05$  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  $\times$  2 groups  $\times$  70 students = 1400 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*  $\times$  *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  $\times$  time) or additionally within just one of the groups (WA  $\times$  time  $\times$  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 <i>n</i>	Total EES score <sub>[CI 95%]</sub>	Control <i>n</i>	Total EES score <sub>[CI 95%]</sub>	Mean difference <sub>[CI 95%]</sub>	<i>p</i> -value	Cohen's <i>d</i>
<b>Boys</b>							
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	
<b>Girls</b>							
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 <i>n</i>	Total score <sub>[CI 95%]</sub>	Control <i>n</i>	Total score <sub>[CI 95%]</sub>	Mean difference <sub>[CI 95%]</sub>	<i>p</i> -value	Cohen's <i>d</i>
<b>Boys</b>							
KIDSCREEN-10 <sup>a</sup>							
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 <sup>b</sup>							
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	
<b>Girls</b>							
KIDSCREEN-10 <sup>a</sup>							
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 <sup>b</sup>							
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. <sup>a</sup> KIDSCREEN-10 score ranges from 10–50. <sup>b</sup> 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 ( $p = .001$ ,  $\phi = 10.61$ ), and more boys ( $p < .001$ ,  $\phi = 52.48$ ) 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*  $\times$  *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*  $\times$  *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*  $\times$  *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	1 workshop	2 workshops	3 workshops
	$M_{diff}$ CI 95% $p$ (d)	$M_{diff}$ CI 95% $p$ (d)	$M_{diff}$ CI 95% $p$ (d)	$M_{diff}$ CI 95% $p$ (d)
<b>Boys</b>	$n = 508$	$n = 491$	$n = 621$	$n = 829$
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
<b>Girls</b>	$n = 635$	$n = 630$	$n = 838$	$n = 1053$
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*  $\times$  *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*  $\times$  *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*  $\times$  *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*  $\times$  *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*  $\times$  *group*) ( $p = .335$ ) were non-significant. 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., Friberg, 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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## Paper III







# Does the Healthy Body Image program improve lifestyle habits among high school students? A randomized controlled trial with 12-month follow-up

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## Abstract

**Objectives:** Positive embodiment and healthy lifestyle habits seem to be related; therefore, stimulating positive embodiment should promote healthy lifestyle habits. In the current study, we delivered the Healthy Body Image (HBI) intervention among Norwegian high school students and examined the effects on healthy lifestyle habits.

**Methods:** The HBI intervention comprises three interactive workshops, with three overarching themes related to body image, social media literacy, and lifestyle. A total of 2446 boys (43%) and girls in grade 12 (mean age 16.8 years) from 30 high schools participated in this cluster-randomized controlled study. Schools were randomized to the HBI intervention or control study arm. Data on physical activity, eating habits, and sleep were collected at baseline, post intervention, and 3- and 12-month follow-up and analyzed using linear mixed regression models.

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**Results:** The intervention had a minor negative effect on physical activity levels in boys at 12-month follow-up and short-term small-to-moderate positive effects on consumption of breakfast and fruit and vegetables, and sleep duration on school days.

**Conclusions:** In future, the lack of satisfactorily long-term effects might be better addressed using a combination of cognitive and behavioral approaches to more optimally integrate positive embodiment and lifestyle changes in the daily life of adolescents.

**Trial registration:** ClinicalTrials.gov ID: PRSNCT02901457. Approved by the Regional Committee for Medical and Health Research Ethics.

### **Keywords**

Lifestyle, embodiment, adolescents, eating habits, physical activity, sleep

Date received: 14 August 2019; accepted: 28 October 2019

### **List of abbreviations**

BMI: Body mass index

HBI: Healthy Body Image intervention

PA: Physical activity

TST: Total sleep time

### **Introduction**

Promoting and optimizing good lifestyle habits among adolescents is described as essential for physical, mental, and social health from a life course perspective, and adolescents who adopt a healthy lifestyle during their school years are more likely to maintain such behaviors as adults.<sup>1</sup> Considering the numerous future health benefits of adopting healthier lifestyle habits during adolescence, health promotion initiatives are called for.<sup>2,3</sup>

Lifestyle behaviors are strongly connected with several aspects of mental health, such as body image.<sup>4</sup> One protective factor counteracting negative body image perception is positive embodiment. This concept emphasizes body appreciation as well as positive connection with and care for the body.<sup>5</sup> Adolescents who grasp the concept of positive embodiment seem to

become more concerned with the functionality of their body than its appearance.<sup>6</sup> As a consequence, they become more aware of what their body needs to feel healthy and are more likely to engage in health-promoting behaviors.<sup>7</sup>

Successful promotion of positive embodiment has been reported to trigger the evolvment of more healthy lifestyle habits,<sup>8</sup> and such lifestyle habits might be viewed as a tool to care for the body, leading to feelings of emotional contentment and positive well-being.<sup>6</sup> Because favorable changes in positive embodiment predict changes in lifestyle habits like intuitive eating, less dieting, increased fruit and vegetable intake, and higher levels of physical activity,<sup>9-11</sup> we established these factors as outcome variables in the current study. In addition, we included sleep duration as an outcome because sleep influences lifestyle factors<sup>12</sup> and is generally critical for maintaining good cognitive abilities, mental well-being, and physical health in children and adolescents.<sup>13</sup>

To our knowledge, the only two studies that have successfully accomplished the aim of promoting both body image and lifestyle habits are the all-girl body image

intervention study “New Moves”<sup>8</sup> and the all-boy intervention entitled Physical Activity Leaders (PALs).<sup>14</sup> Unfortunately, these studies excluded perspectives related to a mixed-sex sample.

In the present cluster-randomized controlled study, we examined our hypothesis that the Healthy Body Image (HBI) intervention would bring about favorable changes in lifestyle habits such as physical activity, eating habits, and sleep habits among Norwegian high school students and that these changes could be sustained over time.

## Methods

### *Design and randomization*

A cluster-randomized controlled design was used. Clustering at the school level was necessary to minimize contamination biases within schools. A random allocation to the HBI intervention or the control arm in a 1:1 ratio was thought to minimize school differences in terms of socioeconomic and demographic variables, including ethnicity and urban/rural dimensions. Randomization was conducted by a professional not affiliated with the study. During the intervention period, students at the control schools followed their regular school curriculum. Students were informed about their allocation to the intervention or control group after the pre-test. Figure 1 presents a diagram of the recruited and included schools and students, respectively.

### *Procedures*

The study was piloted in March and April 2016 (N = 120 high school students in grade 12), which resulted in minor improvements to the intervention and measurement methods.<sup>15</sup> The HBI intervention included high school students in all 12th grade classes following a general study program, excluding

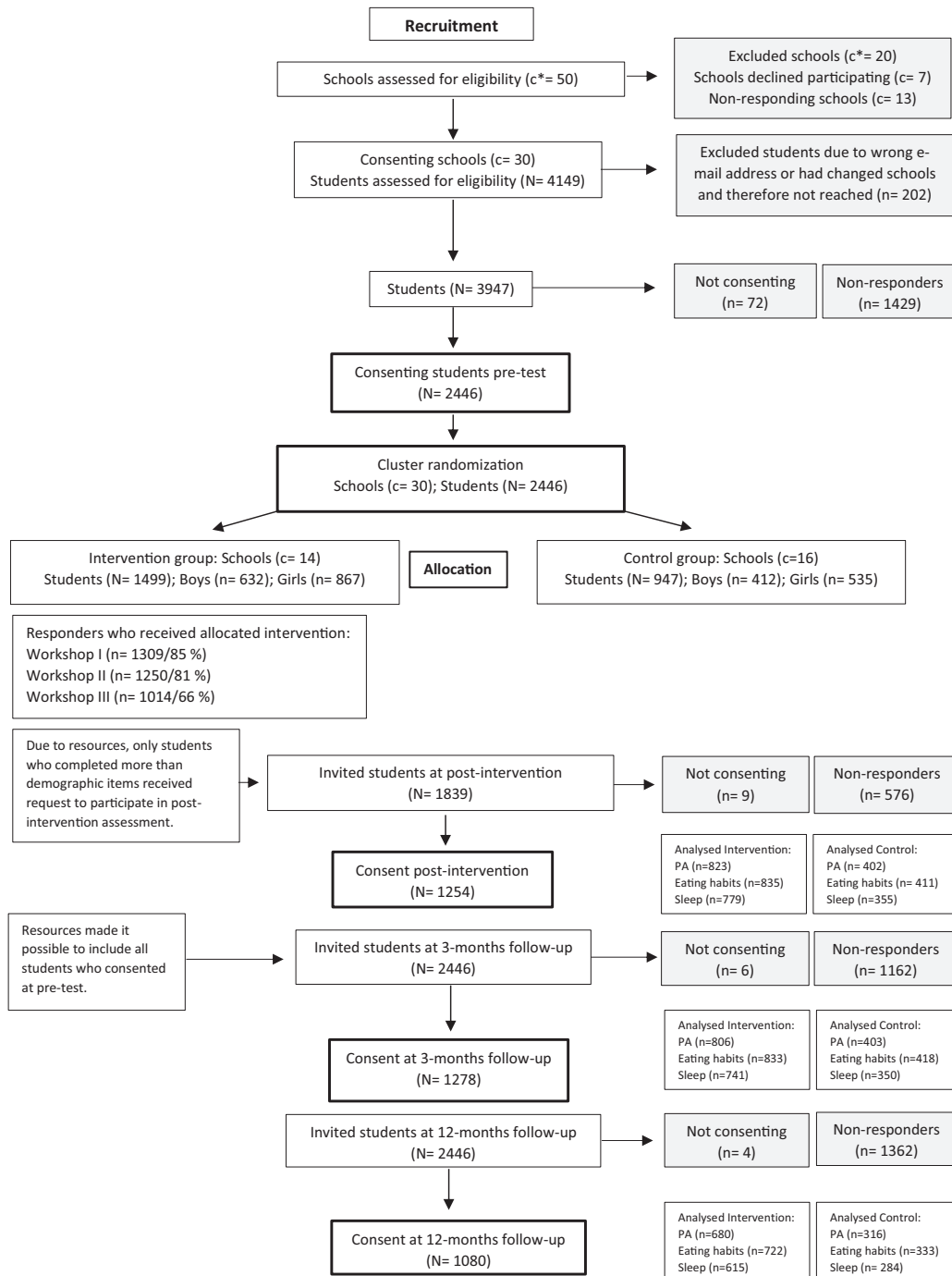
those following a vocational study program. No further exclusion criteria were set. During spring 2016, oral and written study information was provided to students and staff of all public and private high schools in Oslo and Akershus County, with the consent of the school principals. Adolescents gave their consent to participate by responding to an e-mail containing information about the study and an informed consent document. Students consented by responding “yes” to whether they consented to participate in the study, upon which they were redirected to the online questionnaire package SurveyXact 8.2 (Ramböll, Aarhus, Denmark). The Regional Committee for Medical and Health Research Ethics required that students complete the questionnaires outside of regular school hours.

### *Measures*

As described in the study protocol,<sup>15</sup> participants completed standardized self-report questionnaires at baseline, post intervention, and at 3 and 12 months of follow-up, respectively. Post-intervention assessment was unavailable on the day of the last workshop but was completed within 1 week.

### *Demographic variables*

Demographic variables were collected at all measurement points and included age, sex, body weight (kg), and height (cm). Body mass index (BMI) was calculated as body weight (kg) divided by height squared (m<sup>2</sup>). Categorization of weight status was based on international age- and sex-adjusted cutoff scores.<sup>16</sup> Students rated their parents’ total income by selecting one of five options: less than NOK 200,000; NOK 200,000 to 400,00; NOK 500,000 to 800,000; NOK 900,000 to 1 million; and more than NOK 1 million. Students also rated their parents’ educational level as follows: primary school, high school,



**Figure 1.** Schools (c\*), students (n), and response rate of participating students.

college/university, or do not know. Immigration status was assessed via respondents' choices among the following statements: 1) I have immigrated. 2) Both my parents have immigrated. 3) Neither I nor my parents have immigrated.

### *Outcome measures*

The measures of lifestyle habits used in this study, namely, physical activity, meal frequency, frequency of eating breakfast, and amount of fruit and vegetables consumed, were chosen because these are positively associated with and predicted by body image.<sup>10,11,17</sup>

#### *Physical activity*

Students rated in hours and minutes how physically active they had been during the previous week. Physical activity was defined on the questionnaire as "all bodily movement that led to an increase in body temperature and light to heavy shortness of breath". Examples of activities were provided, such as walking, cycling (including back and forth to school), skating, dancing, resistance training, hiking, and engaging in sports activities such as physical education, organized or unorganized leisure-time activities, and family activities.<sup>18</sup> Students who reported being physically active 7 hours or more per week were defined as meeting the current physical activity recommendations for adolescents.<sup>19</sup> Self-reporting was chosen owing to the available resources. In addition, self-reporting is an accepted method that balances validity with time and cost-effectiveness, which can be problematic in studies with large samples.<sup>20</sup>

#### *Eating habits*

Using a food frequency questionnaire, students reported how many days per week they consumed each meal (breakfast, lunch, dinner, evening meal, and snack).

Students responded using a 5-point Likert scale, with 1 = never and 5 = every day. Eating all meals every day was defined as optimal meal frequency.<sup>21</sup> In addition, breakfast was analyzed as an individual variable because regular breakfast consumption is positively associated with positive body image.<sup>17</sup> For effect analyses, categorical data (Never, 1–2, 3–4, 5–6, and 7 times per week) were restructured as ordinal data (e.g., 0, 1.5, 3.5, 5.5, 7). The survey also queried the servings of fruit, berries, vegetables, and salads consumed (hereafter, fruit and vegetables), with response categories ranging from less than one per day to more than five per day, resulting in the total daily servings of fruit and vegetables combined. Values for physical activity, meal frequency, eating breakfast, and intake of fruit and vegetables were also dichotomized into meeting recommendations (1) or not meeting recommendations (0), to yield the percentage of students who met current recommendations at baseline.<sup>22</sup>

#### *Sleep*

Students rated their total sleep time (TST) by indicating the nightly hours of sleep on school and weekend days, separately. Participants were instructed to avoid including awake time in bed. The categorical response options were as follows: < 4, 4 to 5, 6 to 7, 8 to 9, 10 to 11, 12, and > 12 hours of sleep; these were recoded as 3.5, 4.5, 6.5, 8.5, 10.5, 12.0, and 12.5 hours of sleep. The accumulation of sleep debt on school days was calculated by subtracting the average TST on school days from TST on weekend days, with larger positive discrepancies indicating greater sleep debt accumulation.<sup>23</sup>

#### *The intervention*

The HBI intervention comprised three overarching themes related to body image,

social media literacy, and lifestyle. These themes have been found to improve physical self-perception, body satisfaction and appreciation, physical competence, and body esteem.<sup>24</sup> A sociocultural perspective<sup>25</sup> was considered, given the objective to change attitudes, beliefs, and knowledge about idealized lifestyles related to, for instance, extreme exercise and diet regimes as well as idealized bodies. Also embedded in the HBI intervention were an etiological model of risk and protective factors<sup>26</sup> as well as the developmental theory of embodiment,<sup>27</sup> within the realm of positive psychology.<sup>28</sup> An outline of the HBI intervention is provided below, and details are provided in the study protocol.<sup>15</sup>

#### ***Lifestyle-related workshop content***

The body image workshop aimed to improve students' awareness of embodiment-enhancing influences (e.g., people, activities, social environments) that already existed in each student's life, to increase their time and resources spent on such positive influences. The media literacy workshop was intended to make students more critical consumers and users of social media, so that they can benefit from social media consumption rather than experience negative consequences of unhealthy exposure.

In the lifestyle workshop, students discussed how physical activity as well as regular sleep and eating habits might promote the experience of a better functioning body and mind. To reduce the risk of internalizing unhealthy ideals, attitudes, goals, or advice, lifestyle literacy was discussed to debunk myths and "truths" communicated via social media (e.g., skipping meals, not eating breakfast, what is a healthy body fat percentage, the need for supplementation) that are clearly in conflict with current safe guidelines and evidence-based recommendations.<sup>22,29</sup>

The intervention followed an interactive educational approach, which fit well within the school setting.<sup>30</sup> The intervention content was adapted to the cognitive developmental level of adolescents with respect to abstract reasoning. According to the elaboration likelihood model, several exposures are important to yield an effect, which are also supported in several studies.<sup>24,31</sup> Therefore, the intervention comprised three 90-minute 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 assess program adherence. Intervals of 3 weeks between each workshop resulted in an intervention period of 3 months.

At the time of the intervention, the first and sixth author were PhD candidates and led the workshops. Both women hold a Master's degree in exercise science and are specialized in physical activity and health, sports nutrition, motivational interviewing, and promoting body image awareness among adolescents. Both facilitators had previous experience with intervention studies conducted in high schools, regularly presented talks to adolescents on relevant topics, and completed piloting of the intervention. The two facilitators took part in development of the questionnaire; the SurveyXact program was then used to distribute and collect the data. A detailed account of the content and targets of the intervention is provided in the study protocol.<sup>15</sup>

#### ***Sample size and power analyses***

Statistical power estimation was based on two comparison groups ( $\alpha = .05$  and  $b = .20$ ) with an average within-cluster sample size of 70 students. The expected effect size was .28 according to a meta-analysis<sup>32</sup> that



included 35 studies examining the effects of intervention on body image variables. Moreover, we assumed that within-cluster dependency related to schools accounted for approximately 3% (intraclass correlation coefficient = .03). This is appropriate for variables related to psychological or mental health outcomes because selection factors such as socioeconomic status variables have less effect on these variables than, for example, academic performance. These considerations required a minimum of 10 clusters within each group and a total sample size of 10 schools  $\times$  2 groups  $\times$  70 students, or approximately 1400 students.

### Statistical analysis

IBM SPSS 24 for Windows (IBM Corp., Armonk, NY, USA) was used to carry out the statistical analyses. The adequacy of the randomization procedure was examined by comparing group differences at baseline using independent *t*-tests or chi-squared tests (Table 1). A participant was recorded as a dropout if all post-intervention and follow-up data were missing. Owing to several layers of dependency in the outcome data, linear mixed regression models were fit, as suggested in comparable studies.<sup>33</sup> Students were nested within schools; hence, dependency within the school clusters was accounted for by adding school as a random factor. The dependency between the repeated measures was accounted for by fitting a compound symmetry matrix to the residual matrices (i.e., equal correlations between the repeated measures, as an autoregressive matrix did not improve fit). 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* (a coefficient for the difference between the intervention and the control group), *time* (a coefficient for each time point except the final one, to detect a

nonlinear change), and *group*  $\times$  *time* (to detect whether intervention effects were particularly pronounced at certain time points). To examine whether the level of participation in workshops influenced the outcomes, *workshop attendance* (*WA*; number of workshops attended) was added as a linear covariate, as well as interaction terms examining whether *WA* influenced the outcome, particularly at certain time points (*WA*  $\times$  *time*) or additionally within just one of the groups (*WA*  $\times$  *time*  $\times$  *group*). Other moderators were similarly examined. The restricted maximum likelihood procedure and type III *F*-tests were used preferentially. The analyses were stratified by sex. Effects were deemed statistically significant if  $p < .05$ , including *p*-values for the planned comparison tests (least significant difference) examining group differences at each follow-up assessment. Results are expressed as absolute number (*n*) and percentage (%) for categorical data and as model-estimated mean including 95% confidence interval (CI) and standard deviation (SD) for continuous data. Effect sizes are presented using Hedges' *g* and the phi coefficient.

### Ethics approval and consent to participate

The present study was conducted in accordance with the national Health Research Act and the internationally adopted Declaration of Helsinki. The study was approved by the Regional Committee for Medical and Health Research Ethics (P-REK 2016/142) and registered in the international database of controlled trials (www.ClinicalTrials.gov ID: PRSNCT02901457). Students could withdraw their consent at any time and without consequences. Because workshops were held during regular school hours, participation was mandatory, as for regular classes. However, students were informed that they could attend the HBI



**Table 1.** Estimated baseline differences in demographics and lifestyle factors between groups, mean (SD) and n (%).

	Boys (n = 1044)		Girls (n = 1400)		p-value (g/ $\rho$ )
	Intervention (n = 632)	Control (n = 412)	Intervention (n = 867)	Control (n = 535)	
Age (years)	16.84 (0.57)	16.78 (0.64)	16.80 (0.54)	16.78 (0.53)	.426
BMI (kg/m <sup>2</sup> )	21.85 (3.45)	21.78 (3.26)	21.41 (2.82)	21.43 (3.65)	.946
Immigration status <sup>a</sup>	62 (9.8%)	71 (17.2%)	109 (12.5%)	87 (16.2%)	.050
Parents' income $\geq$ 1 million NOK <sup>b</sup>	319 (49.30%)	186 (44.6%)	324 (36.5%)	143 (26.3%)	<.001 (-.11 <sup>d</sup> )
Parents' educational level <sup>c</sup>	544 (86.5%)	314 (76.6%)	745 (85.1%)	416 (77.5%)	<.001 (-.10 <sup>d</sup> )
PA (h/week)	8.27 (5.88)	8.29 (5.27)	6.89 (4.93)	6.44 (4.86)	.150
Meets PA recommendations	209 (50.7%)	118 (56.2%)	270 (39.2%)	123 (34.1%)	.104
Eats breakfast	272 (64.3%)	129 (60.3%)	488 (66.0%)	195 (53.3%)	<.001 (16.38 <sup>d</sup> )
Regular meal intake	80 (18.9%)	42 (19.6%)	84 (12.1%)	34 (9.3%)	.182
Consumption of fruit and vegetables	138 (32.7%)	67 (31.3%)	292 (42.1%)	130 (35.5%)	.041 (4.30 <sup>d</sup> )
Sleep (h/school day)	7.10 (1.33)	6.92 (1.32)	6.96 (1.21)	6.85 (1.36)	.176
Sleep (h/weekend day)	9.27 (1.61)	9.07 (1.93)	9.09 (1.56)	9.09 (1.73)	.968

BMI, body mass index; PA, physical activity.

<sup>a</sup>One or both parents with college or university education levels. <sup>b</sup>Hedges' g and phi-coefficient ( $\rho$ ) presented for significant differences. <sup>c</sup>Both parents are immigrants. <sup>d</sup>Parents' total income. <sup>e</sup>One or both parents with college or university education levels. <sup>f</sup>Hedges' g and phi-coefficient ( $\rho$ ) presented for significant differences.

workshops without completing the questionnaires if they preferred. Control schools were offered one condensed lecture that included highlights of the HBI intervention, after they completed the 12-month follow-up.

## Results

### *Sample characteristics and participant demographics*

Baseline data are presented in Table 1. Thirty schools were randomized and 2446 students consented to participate at pre-test. Dropout led to 1254, 1278, and 1080 students participating at post intervention and at 3- and 12-month follow-up, respectively (Figure 1). The included participants were age 16.8 (SD 0.76) years at baseline. Students had a mean BMI within the normal weight range for the current age group, and 11% and 1% were categorized as overweight and obese, respectively. A total 13% were categorized as immigrants, 39% had parents with a total income of  $\geq 1$  million NOK (approximately 100.000 €), and 82% reported that one or both parents had a higher education level. The adolescents showed low adherence to recommendations for physical activity, diet, and sleep (Table 1). Among girls, the intervention and control groups differed significantly with regard to socioeconomic classification and eating habits, whereas differences between groups were found for immigration status and parental income among boys. Dropout differences were also adjusted for in the analyses, but this was only related to meal irregularities in boys ( $p < .02$ – $0.01$ ) and in girls ( $p < .03$ – $.001$ ).

### *Effect of intervention on lifestyle habits*

For physical activity in boys, the main effects of *group* and *time* were not significant whereas the effect of the interaction *group*  $\times$  *time* was significant ( $F_{2,334} = 3.25$ ,

$p = .040$ ). Between-group planned comparison analyses showed a small reduction in physical activity level at post intervention compared with controls at 12-month follow-up in boys. No significant effects were evident in girls (Table 2).

The intervention had no effect on breakfast consumption among boys. However, in girls, the main effects of *group* ( $F_{1,772} = 4.35$ ,  $p = .037$ ) and *time* ( $F_{2,905} = 3.59$ ,  $p = .023$ ) were significant, whereas the interaction *group*  $\times$  *time* was not significant. The between-group planned comparison analyses showed that girls in the intervention group reported a small increase in breakfast consumption compared with girls in the control group post intervention; this increase had disappeared at follow-up assessment (Table 3). With regard to meal frequency, no significant effects were seen among boys or girls (Table 3).

Regarding total intake of fruit and vegetables, a main effect of *group* ( $F_{1,370} = 7.72$ ,  $p = .006$  (boys) and  $F_{1,816} = 12.88$ ,  $p < .001$  (girls)) and *time* ( $F_{2,368} = 5.78$ ,  $p = .003$  (boys), and  $F_{2,955} = 6.29$ ,  $p = .001$  (girls)) was observed. No interaction effect of *group*  $\times$  *time* was found in either boys or girls). In the intervention group, we observed a slight increase in intake of fruit and vegetables among boys and girls at both post intervention and 3-month follow-up, as compared with the control group (Table 3).

With respect to sleep duration on school days among boys and girls, the intervention showed a main effect of *group* ( $F_{1,360} = 7.81$ ,  $p = .005$ , and  $F_{1,755} = 7.30$ ,  $p = .007$ , respectively) and *time* ( $F_{2,352} = 3.67$ ,  $p = .026$ , and  $F_{2,878} = 5.96$ ,  $p = .003$ , respectively) whereas the interaction effect *group*  $\times$  *time* was not significant in either sex. Furthermore, there was a small increase in sleep duration on school days among girls in the intervention group as compared with control girls at post intervention, and a moderate increase among boys who completed the

**Table 2.** Estimated mean scores for the effects of intervention on physical activity.

	Intervention group		Control group		Mean difference [95% CI]	p-value (g)
	n	PA h/week [95% CI]	n	PA h/week [95% CI]		
<b>Boys</b>						
Baseline*	412	8.27 [7.71, 8.85]	210	8.29 [7.57, 9.01]	-0.02 [-0.97, 0.92]	.961
Post intervention	280	8.10 [7.65, 8.54]	136	7.92 [7.30, 8.55]	0.18 [-0.59, 0.95]	.646
Follow-up at 3 months	257	7.84 [7.30, 8.37]	136	8.21 [7.42, 8.99]	-0.37 [-1.32, 0.57]	.438
Follow-up at 12 months	201	7.50 [6.80, 8.21]	99	8.99 [7.94, 10.05]	-1.49 [-2.76, -0.23]	<b>.021</b> (0.22)
<b>Girls</b>						
Baseline*	689	6.89 [6.53, 7.27]	361	6.44 [5.94, 6.94]	0.46 [-0.17, 1.08]	.150
Post intervention	543	6.59 [6.26, 6.91]	266	6.13 [5.67, 6.60]	0.45 [-0.11, 1.01]	.116
Follow-up at 3 months	549	6.65 [6.33, 6.98]	267	6.56 [6.09, 7.04]	0.09 [-0.49, 0.66]	.762
Follow-up at 12 months	479	6.55 [6.14, 6.95]	217	6.52 [5.91, 7.14]	0.02 [-0.72, 0.76]	.953

PA, physical activity; CI, confidence interval.

All estimations were adjusted for school as a random factor, immigration status, parents' income, and parents' education as fixed covariates. When these variables were non-significant, they were excluded from the final model; only immigration remained a significant covariate for boys.

\*Baseline scores are reported as unadjusted observed scores. Baseline PA h/week was included as a covariate. Hedges' g presented for significant differences.

intervention compared with control boys at 12 months of follow-up (Table 4).

No significant group differences in sleep duration on weekend days were evident. Accumulation of sleep debt was not observed in boys. Among girls, the main effect of *group* ( $F_{1,744} = 7.53, p = .006$ ) was significant whereas *time* and *group*  $\times$  *time* were not. At post intervention and at 12-month follow-up, girls in the intervention group showed a small reduction in sleep debt accumulation in comparison with girls in the control group (Table 4).

### Workshop attendance

Among all students in the intervention group who were requested to take part in the workshops, 85%, 81%, and 66% were registered in workshops I, II, and III, respectively. Attendance did not moderate the intervention effect on any of the investigated lifestyle habits.

### Discussion

Our hypothesis was partly supported because short-term positive changes in

eating habits and sleep duration among both boys and girls were observed after the HBI intervention; however, long-term positive effects of the intervention were lacking.

Our findings regarding a lack of effects owing to the HBI intervention on physical activity are similar to those of the body image study New Moves<sup>8</sup> and PALs.<sup>14</sup> Girls attending the New Moves intervention positively changed their physical activity stages of change, but not their actual activity levels. No changes in mean steps per day were found for boys who participated in PALs. Findings from other studies show that time spent engaged in physical activity normally decreases during adolescence in both sexes.<sup>34</sup> Thus, maintaining rather than improving physical activity level might be a more realistic outcome to target during this period of life.

The PALs study findings showed a small reduction in the consumption of sugar-containing beverages, but no change in fruit and vegetable consumption.<sup>14</sup> In the New Moves study, girls had improved

**Table 3.** Estimated mean scores for the effects of intervention on breakfast, meal frequency, and fruit and vegetables intake.

	Boys						Girls								
	Intervention			Control			Intervention			Control					
	n	Mean	Mean [95% CI]	n	Mean	Mean [95% CI]	n	Mean	Mean [95% CI]	n	Mean	Mean [95% CI]	p-value (g)		
<b>Breakfast</b>															
Baseline*	423	5.75	(5.39, 6.11)	214	5.44	(4.78, 6.10)	694	5.70	(5.54, 5.86)	366	5.03	(4.78, 5.29)	0.12	(0.06, 0.18)	<.001 (0.30)
Post intervention	285	5.67	(5.50, 5.84)	138	5.45	(5.20, 5.70)	550	5.61	(5.49, 5.73)	273	5.33	(5.15, 5.50)	0.29	(0.08, 0.50)	.008 (0.33)
Follow-up at 3 months	268	5.56	(5.37, 5.75)	144	5.56	(5.28, 5.84)	565	5.67	(5.54, 5.79)	274	5.50	(5.32, 5.70)	0.16	(-0.06, 0.38)	.161
Follow-up at 12 months	213	5.50	(5.20, 5.70)	102	5.48	(5.18, 5.79)	509	5.48	(5.33, 5.63)	231	5.34	(5.11, 5.57)	0.14	(-0.14, 0.41)	.327
<b>Meal frequency</b>															
Baseline*	423	5.36	(5.17, 5.55)	214	5.18	(4.75, 5.60)	694	5.30	(5.19, 5.42)	366	4.76	(4.61, 4.91)	0.42	(0.26, 0.59)	<.001 (0.30)
Post intervention	285	5.41	(5.31, 5.52)	138	5.32	(5.17, 5.46)	550	5.15	(5.08, 5.22)	273	5.02	(4.92, 5.13)	0.13	(-2.32, 0.25)	.050
Follow-up at 3 months	268	5.34	(5.22, 5.45)	144	5.35	(5.19, 5.52)	565	5.20	(5.13, 5.27)	274	5.10	(4.99, 5.21)	0.10	(-0.02, 0.23)	.129
Follow-up at 12 months	213	5.55	(5.10, 5.35)	102	5.24	(5.05, 5.43)	509	5.02	(4.94, 5.09)	231	4.98	(4.86, 5.10)	0.04	(-0.10, 0.18)	.586
<b>Fruit &amp; vegetables</b>															
Baseline*	422	3.67	(3.22, 4.11)	214	2.67	(2.08, 3.25)	694	4.37	(4.18, 4.57)	366	3.98	(3.72, 4.24)	0.39	(0.06, 0.72)	.323
Post intervention	281	3.69	(3.47, 3.92)	136	3.14	(2.82, 3.47)	548	4.31	(4.16, 4.46)	268	3.78	(3.57, 4.00)	0.53	(0.26, 0.79)	<.001 (0.35)
Follow-up at 3 months	263	3.55	(3.32, 3.78)	139	3.11	(2.78, 3.45)	562	4.42	(4.24, 4.59)	272	3.97	(3.72, 4.22)	0.45	(0.15, 0.75)	.004 (0.28)
Follow-up at 12 months	208	3.16	(2.90, 3.43)	102	2.80	(2.40, 3.20)	498	4.03	(3.85, 4.21)	227	3.72	(3.44, 4.00)	0.31	(-0.2, 0.64)	.065

CI, confidence interval.

All estimations were adjusted for school as a random factor, immigration status, parents' income, and parents' education as fixed covariates. When these variables were non-significant, they were excluded from the final model.

\*Baseline scores are reported as unadjusted observed scores. Baseline dietary scores were included as a covariate. Hedges' g is presented for significant differences.

**Table 4.** Estimated mean scores for the effects of intervention on total sleep time (TST) and sleep debt during school days and weekend days.<sup>a</sup>

	Intervention		Control		Mean difference [95% CI]	p-value (g)
	n	Hours [95% CI]	n	Hours [95% CI]		
<b>Boys TST, school days</b>						
Baseline*	448	7.08 [6.96, 7.21]	228	6.93 [6.75, 7.11]	0.18 [-0.03, 0.39]	.094
Post intervention	258	6.87 [6.74, 7.01]	122	6.72 [6.52, 6.91]	0.16 [-0.08, 0.39]	.195
Follow-up at 3 months	235	6.95 [6.81, 7.09]	116	6.74 [6.53, 6.95]	0.22 [-0.04, 0.47]	.096
Follow-up at 12 months	182	6.85 [6.68, 7.02]	87	6.40 [6.14, 6.65]	0.46 [0.15, 0.76]	<b>.003 (0.45)</b>
<b>Boys TST, weekend days</b>						
Baseline*	448	9.28 [9.12, 9.43]	228	9.07 [8.80, 9.33]	0.20 [-0.07, 0.48]	.174
Post intervention	258	9.28 [9.12, 9.44]	122	9.28 [9.04, 9.51]	0.00 [-0.28, 0.29]	.976
Follow-up at 3 months	235	9.18 [8.98, 9.39]	116	9.19 [8.88, 9.50]	-0.01 [-0.38, 0.36]	.959
Follow-up at 12 months	182	9.28 [9.08, 9.47]	87	9.08 [8.79, 9.37]	0.20 [-0.15, 0.54]	.264
<b>Boys, sleep debt</b>						
Baseline*	448	2.17 [1.98, 2.36]	228	2.15 [1.85, 2.45]	0.02 [-0.32, 0.36]	.906
Post intervention	258	2.36 [2.16, 2.57]	122	2.60 [2.30, 2.90]	-0.24 [-0.60, 0.13]	.201
Follow-up at 3 months	235	2.30 [2.09, 2.58]	116	2.54 [2.21, 2.86]	-0.23 [-0.62, 0.16]	.239
Follow-up at 12 months	182	2.38 [2.12, 2.65]	87	2.61 [2.21, 3.02]	-0.23 [-0.72, 0.25]	.349
<b>Girls TST, school days</b>						
Baseline*	711	6.96 [6.87, 7.05]	387	6.85 [6.71, 6.99]	0.11 [-0.05, 0.27]	.176
Post intervention	521	6.99 [6.90, 7.08]	233	6.76 [6.63, 6.89]	0.23 [0.07, 0.39]	<b>.004 (0.25)</b>
Follow-up at 3 months	506	6.91 [6.81, 7.00]	234	6.75 [6.61, 6.89]	0.16 [-0.01, 0.33]	.070
Follow-up at 12 months	433	6.78 [6.68, 6.88]	197	6.63 [6.47, 6.79]	0.15 [-0.04, 0.34]	.111
<b>Girls TST, weekend days</b>						
Baseline*	711	9.11 [8.99, 9.23]	387	9.08 [8.90, 9.26]	-0.00 [-0.21, 0.19]	.968
Post intervention	521	9.04 [8.93, 9.15]	233	9.09 [8.92, 9.26]	-0.05 [-0.24, 0.15]	.629
Follow-up at 3 months	506	8.95 [8.83, 9.07]	234	8.97 [8.79, 9.16]	-0.02 [-0.24, 0.20]	.833
Follow-up at 12 months	433	8.92 [8.79, 9.05]	197	8.99 [8.78, 9.19]	-0.06 [-0.30, 0.18]	.619
<b>Girls, sleep debt</b>						
Baseline*	711	2.13 [2.00, 2.26]	387	2.24 [2.05, 2.44]	-0.11 [-0.35, 0.12]	.350
Post intervention	521	2.05 [1.93, 2.17]	233	2.32 [2.14, 2.51]	-0.28 [-0.50, -0.06]	<b>.013 (0.15)</b>
Follow-up at 3 months	506	2.11 [1.97, 2.25]	234	2.19 [1.98, 2.40]	-0.08 [-0.33, 0.17]	.537
Follow-up at 12 months	433	2.05 [1.89, 2.21]	197	2.47 [2.23, 2.71]	-0.42 [-0.70, -0.13]	<b>.004 (0.12)</b>

CI, confidence interval.

All estimations were adjusted for school as a random factor, immigration status, parents' income, and parents' education as fixed covariates in the first model. When these variables were non-significant, they were excluded from the final model.

\*Baseline scores are reported as unadjusted observed scores. Baseline TST and sleep debt score were included as covariates.

<sup>a</sup>TST scores ranged from 3.5–12.5.

Hedges' g presented for significant differences.

their stages of change for consumption of fruit and vegetables at short-term follow-up.<sup>8</sup> The present study results support these findings as we collected self-reported consumption information from both boys and girls; the non-significant differences at 12 months of follow-up showed that the HBI intervention effects were transient. Generally, there is a change in levels of fruit and vegetable intake as adolescents grow older and have increased freedom of

food choices.<sup>35</sup> The HBI intervention might have increased support for consuming fruit and vegetables during the intervention. When the intervention ended, the experience of support might have faded, making it difficult to maintain improved consumption levels over time. Regular, sustained support and encouragement could be important to implement post intervention, to maintain the effects of intervention over time.

At 12-month follow-up, boys in the intervention group slept longer during school days in comparison with boys in the control group; this was the result of a less reduction in sleep time over the long term in the intervention versus the control group for boys. The small reduction in sleep debt among girls at post intervention and at 12 months of follow-up reflects a healthier sleep pattern than that among controls, which has been suggested to be important for both physical and mental health as well as cognitive function.<sup>36</sup>

To promote healthy lifestyle habits through the HBI intervention, the workshops emphasized the benefits of adhering to evidence-based lifestyle recommendations while considering students' busy schedules. At the same time, we emphasized that being preoccupied with healthy living and engaging in extreme lifestyle regimes that are often promoted in social media can be harmful. Further, the importance of autonomy and individual preferences related to lifestyle choices were highlighted. One could speculate that our workshops promoted a relaxed attitude toward lifestyle habits and promoted positive embodiment but at the same time reduced students' interest in lifestyle changes.

In the HBI intervention, the lack of strong and sustained effects on lifestyle behaviors could be explained by the use of a solely cognitive approach in the workshops. A cognitive approach was chosen because this has been described as the most effective for change in body image outcomes, which was the main aim of the overall study.<sup>24,37</sup> However, self-monitoring of behaviors, intention formation, specific goal setting, providing feedback on performance, and review of behavior goals are described as effective techniques for changing lifestyle behaviors.<sup>38</sup> Regular booster sessions following the final workshop aimed at motivating, encouraging, and reminding adolescents of the information

taught and skills learned could potentially lead to a more sustained effect. Such methods have been found to be effective in successful body image interventions.<sup>39</sup> In future studies, the interventional approach might need to include both cognitive and behavioral change techniques, such as those in the present study, together with booster sessions aiming to change cognition related to positive embodiment as well as long-term changes in lifestyle habits.<sup>24,37,38</sup>

### *Strengths and limitations*

To our knowledge, this is the first study to investigate lifestyle factors as an outcome in a positive embodiment intervention targeting both boys and girls. Our results contribute to the current literature on positive embodiment and lifestyle habits among adolescents and deepen knowledge and understanding of effective approaches to changing lifestyle habits among adolescents via a body image intervention.<sup>9</sup> The strengths of this study include its randomized controlled design and user involvement through the pilot study. Moreover, student attendance was recorded and long-term follow-up conducted, specific factors that have been highlighted in previous literature.<sup>24</sup>

In the current study, schools were randomized using a 1:1 ratio to minimize differences between intervention and control schools. Still, differences were found for immigration and parental education status in boys and parental income, parental education levels, and consumption of breakfast and fruits and vegetables in girls (Table 1). This reflects an imperfect randomization. Studies have shown that adolescents' eating habits are associated with parental socioeconomic status.<sup>40-42</sup> Because parental education and income were lower in the female control group, this might have influenced the additional differences in eating habits between groups. We believe that the



effects identified were caused by the intervention and not baseline differences because effect analyses were adjusted for baseline scores. In addition, all estimations were adjusted for immigration status, parental income, and parental education as fixed covariates. A main limitation in this study was the considerable number of dropouts, especially for boys and control students. Nevertheless, the dropout rate did not lower the statistical power to such a degree that group comparisons became invalid. There was also a discrepancy between the rate of participation in each workshop and the actual questionnaire response rate. Therefore, we were unable to capture the effects of intervention among all students who participated in all workshops, which could potentially influence the reported effect. Objective measures of physical activity levels would have been more appropriate; however, self-reporting remains an accepted method that balances validity with time and cost-effectiveness.<sup>20</sup> Finally, the limitation of recall bias is generic in all studies using self-reporting;<sup>43</sup> however, this bias is addressed by the present study design.

## Conclusion

Overall, the HBI intervention resulted in only minor, short-term effects on certain lifestyle habits among our high school students. This conclusion might appear disappointing, yet it can be informative when evaluating positive findings of previous or future studies with a shorter follow-up and fewer measurement points than in the present study.

## Submission declaration

This article is not under consideration for publication elsewhere. If accepted by the journal, the article will not be published

elsewhere. Publication of this article has been approved by all authors.

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## Author's contributions

This study was a multidisciplinary cooperative effort between experts in exercise medicine from the Norwegian School of Sport Sciences, the University College of Southeast Norway, and the University of Agder, involving experts in psychology and health care sciences and methodology from UiT – The Arctic University of Norway. Drs JSB, JR, and CSB (doctoral candidate) developed the original research idea, in collaboration with Drs SBS, MKT, and GP. Drs JSB, JR, SBS, MKT, GP, OF, EK as well as CSB and KMEE (doctoral candidates) developed the questionnaire. CSB and KMEE managed the project together, including piloting, intervention, and data collection. OF was chiefly responsible for the data analyses. CSB, OF, and SBS wrote the main manuscript, with important contributions from all co-authors. All authors have approved the final manuscript.

## Declaration of conflicting interest


The authors declare that there is no conflict of interest.


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## Paper IV





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42           The Norwegian Healthy Body Image Intervention promotes Positive  
43                           Embodiment Through Improved Self-Esteem

44   **Abstract**

45   We examined the indirect effects of the Healthy Body Image (HBI) intervention on positive  
46   embodiment among Norwegian high school students. In total, 2,446 12<sup>th</sup> grade boys (43%) and  
47   girls (mean age 16.8 years) from 30 schools participated in a cluster-randomized controlled  
48   study with the HBI intervention and a control condition as the study arms. Using path analysis  
49   and mediation models we found that among several hypothesized mediators, only self-esteem  
50   mediated a positive intervention effect on positive embodiment for both boys and girls. The  
51   study provides novel findings indicating that health promotion interventions to address positive  
52   body image or a positive embodiment should focus on enhancing adolescent’s self-esteem.  
53   Serial mediation modeling might reveal more complex explanations of change mechanisms and  
54   could further evolve current knowledge.

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58   **Key words:** Health promotion, embodiment, adolescence, randomized controlled study,  
59   mediation.

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## 1. Introduction

66 Positive embodiment is defined as positive body connection and comfort, embodied  
67 agency and passion, and attuned self-care (Piran, 2016). In adolescents, positive embodiment  
68 is associated with important mental and physical health outcomes (Cash & Fleming, 2002;  
69 Santos, Tassitano, do Nascimento, Petribú, & Cabral, 2011; Tylka & Homan, 2015) and  
70 quality of life (Avalos, Tylka, & Wood-Barcalow, 2005; Griffiths et al., 2017; Haraldstad,  
71 Christophersen, Eide, Natvig, & Helseth, 2011). Hence, it is important to design and evaluate  
72 intervention studies specifically tailored to address components of positive embodiment in  
73 this age group (Tylka & Piran, 2019).

74 Several studies indicate that interventions that are multicomponent and include media  
75 literacy, internalization, comparison, negative appearance talk, empowerment, physical  
76 activity and nutrition, and self-esteem are effective (Bird, Halliwell, Diedrichs, & Harcourt,  
77 2013; Espinoza, Penelo, & Raich, 2013; Halliwell, Jarman, McNamara, Risdon, & Jankowski,  
78 2015; Richardson & Paxton, 2010). Such effects have been shown for girls, however, to a  
79 lesser extent among boys (Bird et al., 2013; Diedrichs et al., 2015; Franko, Cousineau,  
80 Rodgers, & Roehrig, 2013; O'Dea & Abraham, 2000; Richardson, Paxton, & Thomson, 2009;  
81 Sundgot-Borgen et al., 2019). It is therefore important to explore possible mediators in order  
82 to understand gender specific mechanisms of change.

83 Eating disorder (ED) prevention studies in women have found that the reduction of thin-  
84 internalization mediated the intervention effect on both body dissatisfaction and ED  
85 symptoms, with body dissatisfaction additionally mediating the intervention effect on ED  
86 symptoms (e.g. Seidel, Presnell, & Rosenfield, 2009; Stice, Marti, Rohde, & Shaw, 2011). In  
87 contrast, mediation analyses were only reported in one study among those aiming to promote  
88 facets of positive embodiment, which found that media literacy mediated the intervention  
89 effect on Current Body Image among the female sample (Agam-Bitton, Ahmad, & Golan,

90 2018). Mediation analyses can contribute with new knowledge by examining how an  
91 intervention effects the outcome through specific mechanisms, and therefore guide future  
92 studies (Hayes, 2017). The Healthy Body Image (HBI) intervention study therefore aimed to  
93 test hypotheses related to mediation of measured constructs, that theoretically account for the  
94 intervention effects on the main outcome positive embodiment.

95       Several mediators have been included in the present study. *Social media* is well-known to  
96 reflect and transmit sociocultural norms and stereotypes about the body. Exposure to and  
97 engagement in appearance and comparison content increase the risk of *internalization* of  
98 unhealthy ideals, and predict negative body image outcomes (Andrew, Tiggemann, & Clark,  
99 2016; Rodgers, McLean, & Paxton, 2015). Therefore, the HBI workshops aimed for the  
100 students to use social media more constructively through the *media literacy* content. It has  
101 been argued that improving media literacy may promote positive embodiment through  
102 reducing internalization (Wilksch, 2019). This improved ability to filter media information  
103 based on what the individual considers as consistent with a positive view of his or her body,  
104 could reduce unhealthy exposure that otherwise might lead to internalization, but also  
105 promote positive embodiment by deliberately choosing embodiment enhancing content  
106 (Wilksch, 2019). This would also reflect enhancement of a self-caring approach to the use of  
107 social media (Tylka & Wood-Barcalow, 2015), which has been reported in adolescent boys  
108 and girls who have a positive body image (Holmqvist & Frisen, 2012; Wood-Barcalow,  
109 Tylka, & Augustus-Horvath, 2010). In addition, one school-based mixed-gender intervention  
110 study found that being exposed to media literacy content improved the adolescents' body  
111 satisfaction (Espinoza et al., 2013).

112       *Self-compassion* may be regarded as a coping style or a focus that protects against feelings  
113 of inadequacy, and personal- and body image challenges (Neff, 2003). As such, promoting  
114 self-compassion might improve the chance of staying self-caring and be positively connected

115 to the body when experiencing threats to the body image (Kelly, Miller, Vimalakanthan,  
116 Dupasquier, & Waring, 2019). *Self-esteem* has also been targeted in the majority of body  
117 image interventions, as it strongly relates to how adolescents experience their body and is  
118 described as important to include in body image promotion (Van Den Berg, Mond, Eisenberg,  
119 Ackard, & Neumark-Sztainer, 2010). More specifically, the physical appearance domain of  
120 self-esteem, meaning how confident they are with their appearance, seems to be the most  
121 stable and important domain for global self-esteem in boys and girls (von Soest, Wichstrøm,  
122 & Kvalem, 2016). A recent study also reported that levels of self-esteem predicted body  
123 appreciation in Danish, Portuguese, and Swedish adolescent boys and girls (Lemoine et al.,  
124 2018). Enhancing self-esteem through intervention sessions could make students accept and  
125 appreciate individual characteristics and more easily stay positively connected to their bodies,  
126 also despite unhealthy exposures.

127 Finally, *body image flexibility* is described as one's capacity to experience the range of  
128 perceptions, feelings, thoughts, and beliefs related to the body, and still act on chosen  
129 personal values (Sandoz, Wilson, Merwin, & Kellum, 2013). The construct has been  
130 suggested as important for positive embodiment. This is because it strongly associates with  
131 body appreciation, compassion, taking care of the body, and a general psychological  
132 flexibility, and distress tolerance (Sandoz, Webb, Rogers, & Squyres, 2019). The HBI  
133 workshops were designed to improve the adolescents' body well-being, and to protect positive  
134 embodiment in a society constantly threatening individual values and standards, effecting  
135 emotions related to their body and lifestyle (Rogers, Webb, & Jafari, 2018; Sandoz et al.,  
136 2019).

137 In sum it may be well argued that the promotion of media literacy, constructive use of  
138 social media, reduced body ideal internalization, as well as improved self-compassion, self-  
139 esteem, and body image flexibility could facilitate positive embodiment. Therefore, we

140 hypothesized that the HBI intervention would promote positive embodiment in boys and girls  
141 through reduced internalization, healthier social media use, and improved media literacy, self-  
142 compassion, self-esteem, and body image flexibility.

## 143 **2. Method**

### 144 **2.1. Sample Characteristics**

145 Thirty schools were randomized in a 1:1 ratio to either the HBI intervention or the control  
146 condition, respectively. In total, 2,446 male and female students consented to participate at  
147 pre-test, while dropout led to 1,254, 1,278, and 1,080 students, respectively, who participated  
148 at the post-intervention tests (Figure 1). Variable specific participation rates are found in  
149 Table 1.

### 150 **2.2. Procedure**

151 The HBI intervention included all Norwegian public and private high schools in Oslo and  
152 Akershus county, and specifically invited all 12<sup>th</sup> grade school classes following a general  
153 study program. Students following a vocational study program were excluded, and no further  
154 exclusion criteria were set. The students consented by responding to an e-mail containing  
155 study information and a letter of informed consent. They accepted by pressing yes to the  
156 question of consent and were redirected to the online questionnaire package SurveyXact 8.2  
157 offered by Ramböll, Aarhus, Denmark.

### 158 **2.3. Ethics Approval and Consent to Participate**

159 The study met the intent and requirements of the Health Research Act and the Helsinki  
160 declaration, and was approved by the Regional Committee for Medical and Health Research  
161 Ethics (P-REK 2016/142). It was enrolled in the international database of controlled trials  
162 [www.clinicaltrials.gov](http://www.clinicaltrials.gov) (ID: PRSNCT02901457). Further details are presented in a previous  
163 publication (Sundgot-Borgen et al., 2019).

### 164 **2.4. Measurements**

165 As described in the study protocol (Sundgot-Borgen et al., 2018), participants completed  
166 standardized questionnaires at baseline, post-intervention, and at 3- and 12-months follow-up.  
167 All baseline assessments were conducted prior to the randomization.

168 **2.4.1. Positive embodiment.** Positive embodiment was measured using the Experience of  
169 Embodiment Scale (EES) (Teall & Piran, 2012). The 34 items covered positive connection  
170 with the body, agency and functionality, experience and expression of desire, body  
171 attunement, self-care vs. harm/neglect, and subjective lens vs. self-objectification. The items  
172 had a Likert-format ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), and the 17  
173 negatively framed items were reversed so that the sum score reflected higher levels of positive  
174 embodiment. The total score ranges from 34-170. Further examination of the instrument has  
175 been described previously (Sundgot-Borgen et al., 2019). The Cronbach's alpha for the  
176 current study was .93 for girls and .92 for boys, similar to other studies with the range of .91-  
177 .94 (Chmielewski, Tolman, & Bowman, 2018; Holmqvist, Frisé, & Piran, 2018; Piran, 2019;  
178 Teall, 2006, 2014).

179 **2.4.2. Self-esteem.** Self-esteem was measured by the Rosenberg Self-Esteem Scale  
180 (RSES) (Rosenberg, 1965) which is a 10-item scale that measures global self-worth by using  
181 both negative and positive worded items scored on a four-point Likert-scale ranging from 1  
182 (*strongly agree*) to 4 (*strongly disagree*). The total score ranges from 10 to 40 where a higher  
183 score represents a higher global self-worth. Negative worded items were reversed. In the  
184 present study the internal consistency of  $\alpha$  .90 and .92 for boys and girls respectively was  
185 better than the  $\alpha$  of .86 reported in the Norwegian validation study of the RSES (von Soest,  
186 2005).

187 **2.4.3. Body image flexibility.** The Body Image Acceptance and Action Questionnaire  
188 (BIAAQ) (Sandoz et al., 2013) was used to measure body image flexibility. The scale consists  
189 of 12 items scored on a seven-point Likert scale ranging from 1 (*never true*) to 7 (*always true*),

190 and total score ranges from 12 to 84. Negative worded items were reversed so that a higher  
191 score reflects a higher degree of body image flexibility. The internal consistency in the original  
192 study was  $\alpha$  .93 (Sandoz et al., 2013), which was similar to girls ( $\alpha$  .92), and slightly higher  
193 than for boys ( $\alpha$  .85) in our sample.

194 **2.4.4. Social media use.** An unpublished social media scale was used, which originally  
195 measures impression management, social capital, social comparisons of body experience and  
196 physical appearance, and social media literacy (in submission process). The scale contains 20  
197 items, and students respond on a standard Likert response format (*1-strongly disagree, 5-*  
198 *strongly agree*). For this current study, the two subscales Media Literacy (four items) and  
199 Time Spent on Body Appearance Related Content in Social Media (five items) were used as  
200 these concepts were specifically targeted in the HBI intervention. A higher score on both  
201 subscales was preferable, as the latter scale items in this study were reversed. The Cronbach's  
202 alpha for the Media Literacy sub-scale was .80 and .78 for boys and girls respectively. For the  
203 subscale Time Spent on Body Appearance Related Content in Social Media, the Cronbach's  
204 alpha was .78 and .79 for boys and girls respectively.

205 **2.4.5. Self-compassion.** The Self-Compassion Scale – Short Form (Raes, Pommier, Neff,  
206 & van Gucht, 2011) measures an individual's ability to maintain warm, kind, caring,  
207 comforting towards themselves, and to maintain connected to themselves, when they  
208 experience personal failings. The 12-items are responded to on a Likert scale ranging from 1  
209 (*almost never*) to 5 (*almost always*). All negative worded items were reversed, and a mean  
210 score was calculated. For the current sample, reported Cronbach's alpha was lower than for  
211 the original adult sample, with .57 and .76 for boys and girls respectively. This was slightly  
212 lower than previously found in adolescents ( $\alpha$  = .88) (Cunha, Xavier, & Castilho, 2016).

213 **2.4.6. Internalization and pressure.** The Sociocultural Attitudes Towards Appearance  
214 Questionnaire-4 (SATAQ-4) (Schaefer et al., 2015) was used to assess societal and

215 interpersonal aspects of appearance ideals. From the five individual subscales, the Thin/Low  
216 Body Fat Internalization, Athletic/Muscular Internalization, and Perceived Pressure from  
217 Media, were used. Participants answered on a five-point Likert-scale ranging from 1 (*strongly*  
218 *disagree*) to 5 (*strongly agree*), where a higher score indicates higher degree of internalization  
219 or perceived pressure. Cronbach's Alpha in the present sample was for boys between .85 and  
220 .94, and between .91 and .95 for girls, slightly higher than in the original study (Schaefer et al.,  
221 2015).

## 222 **2.5. The intervention**

223 The HBI intervention comprised three overarching themes related to body image, media  
224 literacy, and lifestyle, and it rested on a sociocultural perspective (Thompson, Heinberg,  
225 Altabe, & Tantleff-Dunn, 1999), an etiological model of risk and body image protective  
226 factors (Piran, 2015), the developmental theory of embodiment (Teall & Piran, 2012), positive  
227 psychology (Seligman & Csikszentmihalyi, 2000), and the salutogenic perspective  
228 (Antonovsky, 1987).

229 The intervention had an interactive educational approach, and following the elaboration  
230 likelihood model, it contained three 90-min interactive workshops (Petty & Briño, 2012). All  
231 workshops were arranged in classrooms during regular school hours. Three weeks interval  
232 between each workshop resulted in a three month intervention period. The first and ninth  
233 author were Ph.D. students and led the workshops. Both are specialized in physical activity  
234 and health, sports nutrition, motivational interviewing, and body image among adolescents. A  
235 detailed account of the content and targets of the intervention is provided in previous  
236 publications (Sundgot-Borgen et al., 2018; Sundgot-Borgen et al., 2019).

## 237 **2.6. Sample size and power analyses**

238 The statistical power estimation was based on two comparison groups ( $\alpha = .05$  and  $b =$   
239  $.20$ ) with an average within-cluster sample size of 70 students. The expected effect size was  
240  $.28$  according to a meta-analysis (Hausenblas & Fallon, 2006) of 35 studies examining  
241 intervention effects on body images variables. Moreover, we assumed that the within-cluster  
242 dependency related to schools accounted for approximately 3% ( $ICC = .03$ ). This is fair for  
243 variables related to psychological or mental health outcomes as selection factors like  
244 socioeconomic status variables affect these variables less than for example academic  
245 performance. These considerations required a minimum of 10 clusters within each group,  
246 requiring a total sample size of 10 schools  $\times$  2 groups  $\times$  70 students  $\sim$  1,400 students.

## 247 **2.7. Statistical analyses**

248 The analyses were conducted in Mplus version 8.3 (Muthén & Muthén, 1998-2017). We  
249 used path analysis and mediation models to examine direct effects ( $a$ ,  $b$ , and  $c'$ ), total indirect  
250 effects (i.e., the sum of specific indirect effects), and specific indirect effects ( $ab$ ) of the  
251 intervention on positive embodiment. Following recommendations in the literature (e.g.,  
252 Preacher & Hayes, 2008) we relied on non-symmetric bootstrap confidence intervals (CI) to  
253 assess mediation. The bootstrap CIs were based on 10000 bootstrap samples. Together these  
254 bootstrap samples provide an empirical representation of the sampling distribution of the  
255 indirect effect ( $ab$ ) and non-symmetric CIs for the indirect effect. Evidence of mediation is  
256 supported if the 95% CI does not include zero (Hayes & Rockwood, 2017). We calculated the  
257 partially standardized indirect effect ( $ab_{ps}$ ) as an effect-size measure for the indirect effects  
258 (Miočević, O'Rourke, MacKinnon, & Brown, 2018). This effect-size measure captures the  
259 size of the indirect effect in terms of standard deviations of the dependent variable for a one-  
260 unit change in the independent variable. In the case of a binary X variable (e.g., representing  
261 intervention and control group) it is the change in standard deviation units of Y between the  
262 two groups. The predictor was a dichotomous variable representing intervention (1) and



263 control (0) group. The mediators were assessed at time point 3 (T3) and the outcome was  
264 assessed at time point 4 (T4). This particular mediation sequence was chosen because it was  
265 considered most relevant in order to explore longitudinal effects.

266 We controlled for baseline scores of the mediators and the outcome in all models (cf.  
267 Vickers & Altman, 2001). To account for the nested data structure (students nested in  
268 classrooms) we used the aggregated analysis method outlined by Muthén and Satorra (1995),  
269 which computes the usual parameter estimates but adjusts the standard errors and goodness-  
270 of-fit model testing. In terms of model fit indices, only standardized root mean square residual  
271 (SRMR) is provided when combining bootstrap with aggregated analysis. The chi-square test  
272 of model fit (and model fit indices based on the chi-square test) is not available. A SRMR  
273 value of .08 or less is generally considered as an indication of good fit (e.g. Hu & Bentler,  
274 1999). Missing data were handled by the full information maximum likelihood (FIML)  
275 estimator (Enders, 2010), which includes all available data in the analyses. A case was  
276 recorded as dropout if all post-intervention and follow-up data were missing. We estimated  
277 models including multigroup models to examine gender-specific effects. A *p*-value below .05  
278 and a 95% CI that did not include zero indicated statistically significant effect.

### 279 **3.0. Results**

280 Table 1 presents descriptive statistics of the study variables. Included as possible  
281 mediators in the estimated models were 1. internalization of the athletic body, 2.  
282 internalization of the thin body, 3. perceived pressure from media, 4. media literacy, 5. time  
283 spent on body appearance related content in social media, 6. self-compassion, 7. self-esteem,  
284 and 8. body image flexibility. However, the variable time spent on body appearance related  
285 content in social media had approximately 88% missing data at T3 and was excluded from the  
286 analysis due to the uncertainty in the FIML estimation (Muthén, Muthén, & Asparouhov,  
287 2017).

### 288 3.1. Path Analysis

289 The mediation model examined is displayed in Figure 2 and the direct effects are presented  
290 in Table 2 and Figure 3. For boys the direct effect ( $c'$ ) of the intervention on positive  
291 embodiment was not statistically significant. The  $a$  paths (i.e.,  $X_{\text{Intervention/control}} \rightarrow M_{T3}$ )  
292 indicated that the intervention increased self-esteem and body-image flexibility, whereas it  
293 reduced scores on athletic and thin internalization, compared to controls. The  $b$  paths (i.e.,  
294  $M_{T3} \rightarrow Y_{T4}$ ) showed that self-esteem and media literacy were positive and statistically  
295 significant predictors of positive embodiment (Figure 3 a).

296 For girls the direct effect ( $c'$ ) of the intervention on positive embodiment was positive and  
297 statistically significant. The  $a$  paths (i.e.,  $X_{\text{Intervention/control}} \rightarrow M_{T3}$ ) indicated that the  
298 intervention increased self-esteem, whereas it reduced scores on thin internalization and  
299 pressure from media. The  $b$  paths (i.e.,  $M_{T3} \rightarrow Y_{T4}$ ) showed that self-esteem and body image  
300 flexibility were positive and statistically significant predictors of positive embodiment (Figure  
301 3 b). The SRMR was 0.08 in the multigroup model.

302

### 303 3.2. Mediation Models

304 As seen in Table 3, there was a positive and statistically significant total indirect effect  
305 ( $ab_{\text{boys}} = 2.16, 95\% \text{ CI } [0.14, 4.44]; ab_{\text{girls}} = 2.14, 95\% \text{ CI } [0.78, 3.58]$ ) and a specific indirect  
306 effect of the intervention on positive embodiment through self-esteem ( $ab_{\text{boys}} = 1.14, 95\% \text{ CI } [0.16, 2.49]; ab_{\text{girls}} = 1.26, 95\% \text{ CI } [0.38, 2.29]$ ) for boys and girls (see Figure 3). None of the  
307 other indirect effects were statistically significant.

309

## 310 4.0 Discussion

311 The main finding of this study was that the HBI intervention promoted self-esteem, which  
312 in return, facilitated the direct intervention effects on positive embodiment in both adolescent  
313 boys and girls.

314 **4.1. Indirect effects**

315 A previous study (Agam-Bitton et al., 2018) did not find an indirect effect of their  
316 intervention on Current Body Image via self-esteem. However, they used only three months  
317 follow-up time. In contrast, the 12-months follow-up in the HBI intervention found a long-  
318 term effect. Thus, workshop activities aiming to improve students' ability to develop positive  
319 attitudes and evaluation of themselves, might affect self-esteem over time. Such development  
320 over time may have made it easier to become comfortable with one's individual  
321 characteristics and lower the desire to adopt and adhere to social standards. As a result, it may  
322 have become easier for the adolescents to reject unhealthy exposures and rather focus on  
323 growth of embodied experiences (Piran, 2019; Rousseau & Eggermont, 2018). Additionally,  
324 improving a student's self-esteem might have ripple effects on psychological well-being, and  
325 might facilitate healthier exposure choices such as people with positive attitudes, positive and  
326 constructive social media content, healthy lifestyle choices and positive self-communication.  
327 This might further improve positive embodiment subdomains described in the developmental  
328 theory of embodiment (Piran, 2017).

329 Notably, however, the intervention effects in the present study were highly gender specific.  
330 As shown in a previous publication, only a small transient intervention effect was found in  
331 boys, while a sustained effect was found in girls (Sundgot-Borgen et al., 2019). This could  
332 potentially indicate that not enough boys sustained a strong enough effect on self-esteem over  
333 time to also sustain changes in positive embodiment. Therefore, to improve the effect in boys,  
334 future interventions might need to spend more time on self-esteem activities to elicit  
335 mediation effects. Moreover, the present global measure of self-esteem may have been  
336 insufficient to capture specific domains of self-esteem that could be gender specific (von  
337 Soest et al. 2016). One may speculate whether an inclusion of physical activity sessions could

338 have promoted the athletic competence domain, which has been described as more important  
339 for boys' global self-esteem compared to girls (von Soest et al. 2016).

#### 340 **4.2. Non-mediating variables**

341 We did not observe hypothesized indirect effects of the intervention on positive  
342 embodiment through media literacy, self-compassion, internalization, perceived pressure from  
343 media, and body image flexibility in neither boys nor girls. The lack of identifying media  
344 literacy as a mediator contradicts findings from Agam-Bitton et al. (2018). However, the  
345 choice of questions to measure media literacy in our study provides an uncertainty to whether  
346 true intervention effects on this variable could be assessed. This is because workshop content  
347 was more focused on students becoming critical to strategies used by profiles and advertisers,  
348 retouching, and how these techniques influenced attitudes, beliefs and emotions, compared  
349 to what the study questionnaire asked about. Another difference to Agam-Bitton et al. (2018),  
350 was their use of Current Body Image as one body image outcome. In contrast to the EES used  
351 in our study, their outcome did not capture the complex domain of positive embodiment as  
352 suggested in the literature (Webb, Wood-Barcalow, & Tylka, 2015), leaving the two studies to  
353 measure mediation effects from two different outcomes. Therefore, methodological  
354 differences could contribute to the explanation of various findings.

355 A possible explanation for the lack of mediation effects through both self-compassion and  
356 body image flexibility in the present study, could be that these constructs protect against  
357 destructive consequences to body image threats and poor body image, but might not have a  
358 direct ability to improve scores on positive embodiment alone (Neff, 2003; Rogers et al.,  
359 2018). Further, a reduction in internalization and pressure has been described as helpful to  
360 reduce unhealthy influences and comparison activities in adolescents (e.g. McLean, Paxton, &  
361 Wertheim, 2016; Rousseau & Eggermont, 2018; Viner et al., 2019). Self-compassion, body  
362 image flexibility, internalization and pressure from media, might still be considered important

363 intervention components. This could possibly be through enhancing constructive coping  
364 mechanisms and as protective factors against body image threats (Braun, Park, & Gorin,  
365 2016; Levine & Smolak, 2016). However, probably not as the main components that need to  
366 be enhanced in an intervention for the specific variable positive embodiment to change over  
367 time.

368 The parallel modeling made it possible to analyze whether any hypothesized variables alone  
369 mediated the intervention effect. The true mechanisms might be more complex than this study  
370 was able to capture through parallel mediation modelling. Serial mediation modeling is one  
371 example of additional methods that could provide supplemental information, indicating  
372 whether the intervention impacts the outcome through a longer chain of mediators. Based on  
373 the findings from the current study self-esteem scores are likely to play an important role in  
374 this chain of mediators. Further, our study tested one specific mediation sequence because it  
375 was considered most relevant in order to explore longitudinal effects. This means that we do  
376 not know whether mediation effects were present at other measured sequences.

### 377 **4.3. Strengths and limitations**

378 The current study is to our knowledge the first one to report mediated effects of an  
379 intervention on a positive embodiment outcome using a mixed-gender sample with a unique  
380 sample size. Also, the analyses were based on a cluster RCT with four measurement time-  
381 points, including the 12-months follow-up. All analyses were adjusted for nested data, and  
382 models estimated several mediators in boys and girls separately.

383 The main limitations were the exclusion of the variable Time Spent on Body Appearance  
384 Related Content in Social Media from the path analysis and mediation models due to high  
385 dropout. Ethical committee did not allow for students to fill out questionnaires during school  
386 hours, which most likely affected the response rate. Limitations might also be the less optimal

387 congruence between the measure of media literacy and the workshop content, and that  
388 specific domains of self-esteem were not captured.

#### 389 **4.4. Research implications**

390 The findings clearly show that although boys and girls were equally exposed through an  
391 intervention, targeted constructs might be differently affected. Also, the prediction effect of  
392 constructs on positive embodiment differ between genders, which emphasize the need for  
393 gender specific analyses in future studies. The study provides novel evidence that intervention  
394 components that improve self-esteem might be especially important to target. Future studies  
395 should evaluate whether more time and additional focus on other domain-specific self-esteem  
396 content could result in long-term intervention effects in boys.

397 Serial modeling might provide more complex explanations to indirect effects of an  
398 intervention on the main outcome and could provide additional guidance to the design of  
399 future interventions. Additionally, more comparable research needs to be conducted to further  
400 contribute to fill gaps in the knowledge of mediated effects within a mixed-gender positive  
401 embodiment intervention. As a conclusion, the HBI intervention resulted in positive  
402 embodiment in boys and girls through self-esteem, and future interventions are guided  
403 towards especially focus on self-esteem content to change adolescent boys' and girls' positive  
404 embodiment.

#### 405 **Declarations**

406 Declarations of interest: none

#### 407 **Competing interests**

408 The authors declare that they have no competing interests.

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Table 1  
*Descriptive Statistics for the Intervention and Control Groups among both boys and girls*

	Boys (N = 551)						Girls (N = 1010)						
	Intervention			Control			Intervention			Control			
	N	M	SD	N	M	SD	N	M	SD	N	M	SD	P
Positive embodiment (T1)	283	131.58	20.05	136	127.46	22.83	582	117.92	22.39	282	114.14	24.93	<b>.025</b>
Positive embodiment (T4)	192	137.15	19.59	94	131.54	24.43	459	127.71	22.58	210	116.65	26.44	< <b>.001</b>
Body image flexibility (T1)	342	70.30	9.01	183	68.39	11.66	649	58.48	15.37	334	57.47	16.67	.356
Body image flexibility (T3)	234	73.47	12.13	122	68.51	15.78	514	62.41	17.48	241	60.49	19.38	.174
Self-compassion (T1)	328	3.28	0.54	174	3.24	0.61	644	3.02	0.64	324	2.94	0.65	.106
Self-compassion (T3)	242	3.41	0.67	127	3.30	0.64	522	3.16	0.70	247	3.04	0.71	<b>.038</b>
Athletic internalization (T1)	281	3.23	1.11	136	3.37	1.04	582	3.02	1.10	281	2.99	1.04	.653
Athletic internalization (T3)	269	2.89	1.12	135	3.18	1.12	540	2.70	1.05	260	2.80	1.06	.215
Thin internalization (T1)	281	2.48	0.93	136	2.64	0.93	582	3.28	1.07	281	3.40	1.14	.126
Thin internalization (T3)	252	2.45	0.94	136	2.79	0.97	542	2.56	1.01	264	2.84	1.02	< <b>.001</b>
Pressure from media (T1)	281	2.09	1.14	136	2.16	1.17	582	3.15	1.25	281	3.27	1.28	.182
Pressure from media (T3)	252	2.03	1.11	136	2.16	1.06	542	2.94	1.21	264	3.21	1.21	<b>.002</b>
Self-esteem (T1)	276	33.13	5.46	135	32.63	6.47	578	29.49	5.96	279	28.43	6.46	<b>.017</b>
Self-esteem (T3)	234	33.57	5.88	119	31.75	6.36	503	30.64	5.70	237	29.03	6.88	<b>.002</b>
Media literacy (T1)	310	18.87	4.47	153	17.78	5.02	611	20.91	3.85	298	20.57	4.05	.227
Media literacy (T3)	179	19.19	4.83	87	18.38	5.25	429	21.61	4.02	198	21.21	4.20	.247
Time on appearance content (T1)	320	21.70	3.71	155	21.28	3.61	621	18.51	4.53	313	18.14	4.59	.233
Time on appearance content (T3)	46	21.15	4.35	26	18.77	4.89	66	19.18	4.43	29	16.72	4.32	<b>.014</b>

Table 2

*Path Analysis of direct effects in boys and girls*

	Boys ( <i>n</i> = 551)				Girls ( <i>n</i> = 1010)			
	<i>B</i>	<i>SE</i>	<i>p</i>	95% CI LL UL	<i>B</i>	<i>SE</i>	<i>p</i>	95% CI LL UL
<b>X → Y (c' path)</b>								
Intervention → Positive embodiment	2.20	2.04	0.28	-1.90 6.20	5.86	1.12	<.001	3.61 7.97
<b>X → M (a paths)</b>								
Intervention → Self-esteem	1.32	0.56	<b>.017</b>	0.25 2.41	1.21	0.41	<b>.003</b>	0.40 1.99
Intervention → Body-image flexibility	3.27	1.51	<b>.030</b>	0.41 6.29	1.47	0.83	.078	-0.20 3.03
Intervention → Self-compassion	0.09	0.06	.127	-0.03 0.19	0.06	0.05	.213	-0.03 0.14
Intervention → Athletic internalization	-0.22	0.10	<b>.027</b>	-0.41 -0.03	-0.10	0.06	.119	-0.21 0.02
Intervention → Thin internalization	-0.27	0.10	<b>.005</b>	-0.47 -0.08	-0.27	0.07	<.001	-0.40 -0.13
Intervention → Pressure	-0.10	0.10	.304	-0.28 0.09	-0.25	0.08	<b>.001</b>	-0.39 -0.09
Intervention → Media literacy	0.87	0.58	.136	-0.31 1.98	0.12	0.35	.734	-0.56 0.82
<b>M → Y (b paths)</b>								
Self-esteem → Positive embodiment	0.86	0.28	<b>.002</b>	0.33 1.42	1.05	0.15	<.001	0.75 1.33
Body-image flexibility → Positive embodiment	0.14	0.10	.181	-0.06 0.35	0.36	0.05	<.001	0.26 0.45
Self-compassion → Positive embodiment	3.17	2.49	.204	-1.92 7.94	1.01	1.14	.332	-1.19 3.30
Athletic internalization → Positive embodiment	0.26	1.27	.839	-2.29 2.67	0.87	0.85	.307	-0.78 2.55
Thin internalization → Positive embodiment	1.25	1.83	.496	-2.15 4.92	-1.12	0.94	.232	-3.03 0.70
Pressure from media → Positive embodiment	-0.64	1.35	.636	-3.46 1.76	-0.21	0.53	.695	-1.25 0.85
Media literacy → Positive embodiment	0.74	0.25	<b>.003</b>	0.25 1.23	0.20	0.13	.124	-0.07 0.43

*Note.* Mediators were measured at T3 and the outcome was measured at T4. Baseline scores of the mediators and outcome were controlled for in the analysis. The 95% CIs are non-symmetrical bootstrap CIs. LL = lower limit, UL = upper limit. *p*-values below .05 indicate a statistically significant effect and is marked by bold text.

Table 3

*Indirect Effects of the Intervention on Positive Embodiment*

	Boys ( <i>n</i> = 551)						Girls ( <i>n</i> = 1010)					
	95% CI			95% CI			95% CI			95% CI		
	<i>ab</i>	LL	UL	<i>ab<sub>ps</sub></i>	LL	UL	<i>ab</i>	LL	UL	<i>ab<sub>ps</sub></i>	LL	UL
Total indirect effect	<b>2.16*</b>	<b>0.14</b>	<b>4.44</b>	<b>0.10</b>	<b>0.01</b>	<b>0.21</b>	<b>2.14*</b>	<b>0.78</b>	<b>3.58</b>	<b>0.10</b>	<b>0.03</b>	<b>0.16</b>
Intervention → Self-esteem → Positive embodiment	<b>1.14*</b>	<b>0.16</b>	<b>2.49</b>	<b>0.05</b>	<b>0.01</b>	<b>0.12</b>	<b>1.26*</b>	<b>0.38</b>	<b>2.29</b>	<b>0.06</b>	<b>0.02</b>	<b>0.10</b>
Intervention → Body-image flexibility → Positive embodiment	0.45	-0.20	1.56	0.02	-0.01	0.07	0.52	-0.07	1.12	0.02	-0.00	0.05
Intervention → Self-compassion → Positive embodiment	0.27	-0.20	1.00	0.01	-0.01	0.05	0.06	-0.07	0.32	0.00	-0.00	0.01
Intervention → Athletic internalization → Positive embodiment	-0.06	-0.64	0.62	-0.00	-0.03	0.03	-0.08	-0.32	0.09	-0.00	-0.01	0.00
Intervention → Thin internalization → Positive embodiment	-0.34	-1.60	0.63	-0.02	-0.08	0.03	0.30	-0.19	0.86	0.01	-0.01	0.04
Intervention → Pressure from media → Positive embodiment	0.06	-0.27	0.55	0.00	-0.01	0.03	0.05	-0.21	0.34	0.00	-0.01	0.02
Intervention → Media literacy → Positive embodiment	0.64	-0.21	1.77	0.03	-0.01	0.09	0.02	-0.13	0.22	0.00	-0.01	0.01

*Note.* Mediators were measured at T3 and the outcome was measured at T4. Baseline scores of the mediators and outcome were controlled for in the analysis. The 95% CIs are non-symmetrical bootstrap CIs. *ab* = indirect effect, *ab<sub>ps</sub>* = partially standardized indirect effect, LL = lower limit, UL = upper limit. \*95% CI that does not include zero indicates a statistically significant effect.

## FIGURES

*Figure 1.* Schools (c\*) and students (N), and response rate of participating students. Retrieved from Sundgot-Borgen, C., Friborg, O., Kolle, E., Engen, K. M. E., Sundgot-Borgen, J., Rosenvinge, J. H., . . . Bratland-Sanda, S. (2019). The healthy body image (HBI) intervention: Effects of a school-based cluster-randomized controlled trial with 12-months follow-up. *Body Image, 29*, 122-131.

*Figure 2.* Mediation model tested in the current study. Mediators are correlated (not shown for clarity).

*Figure 3.* Results of the mediation model in boys (A) and girls (B). Mediators were measured at T3 and the outcome was measured at T4. Baseline scores of the mediators and outcome were controlled for in the analysis. Correlations between mediators are omitted from the figure of clarity. Solid lines indicate statistically significant effects (+ or – indicate the direction of the effect), dashed lines indicate non-significant effects. The 95% CIs are non-symmetrical bootstrap CIs. ab = indirect effect, LL = lower limit, UL = upper limit. \*95% CI that does not include zero indicate a statistically significant effect.

Figure 1

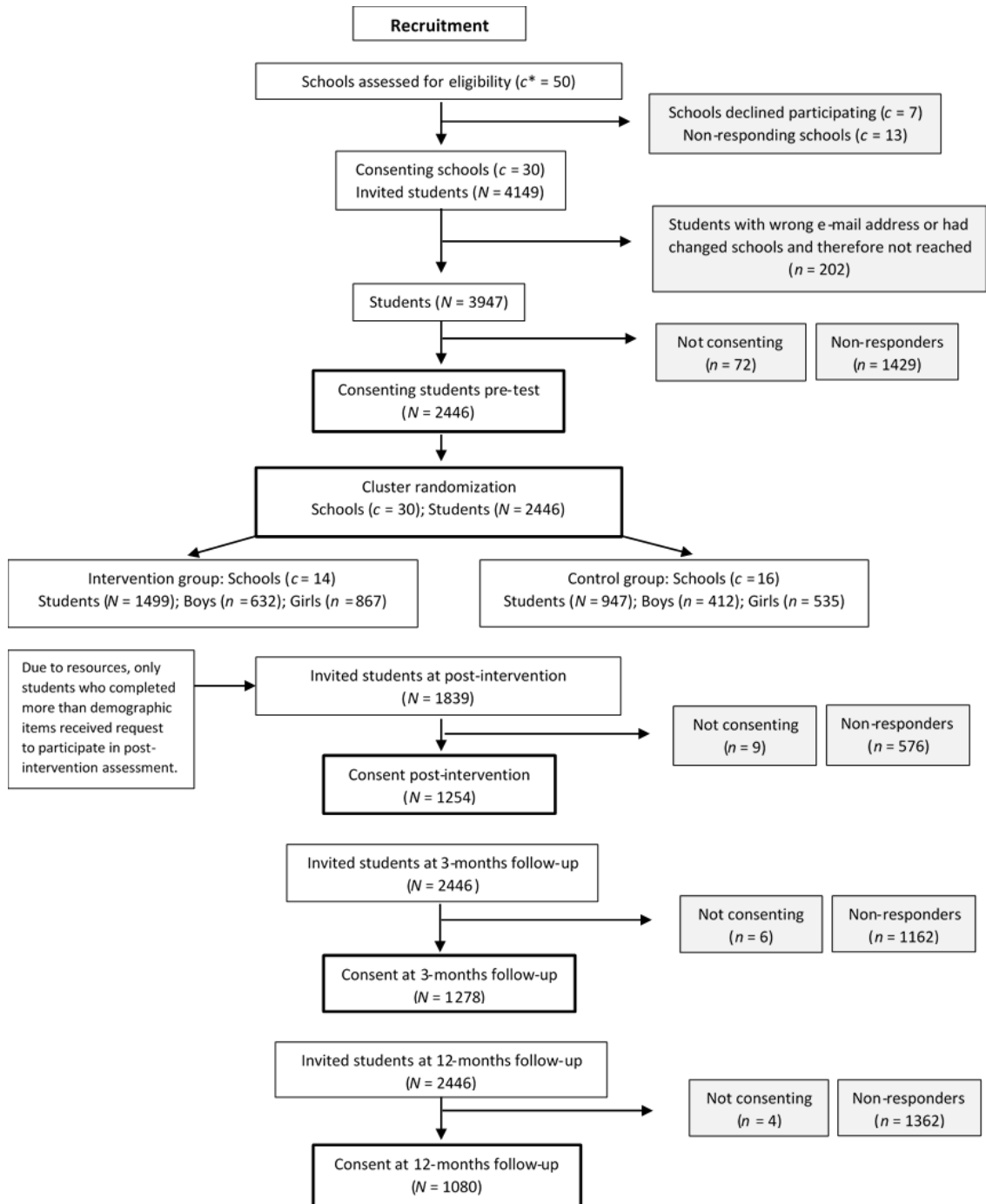


Figure 2

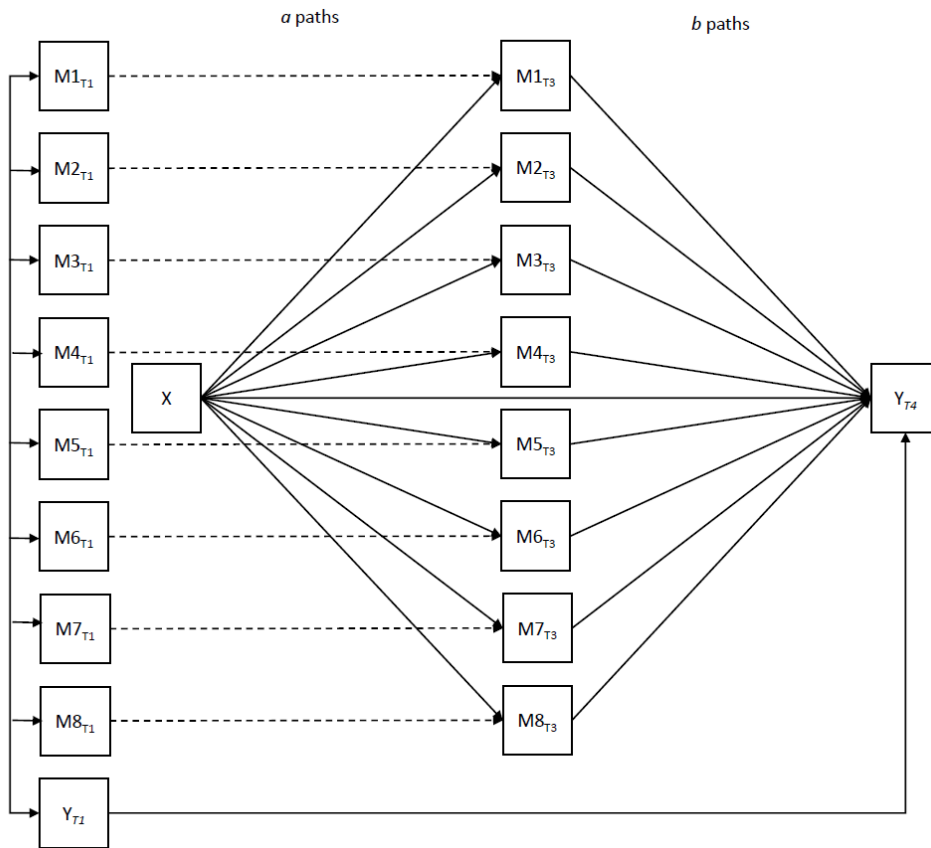




Figure 3 A

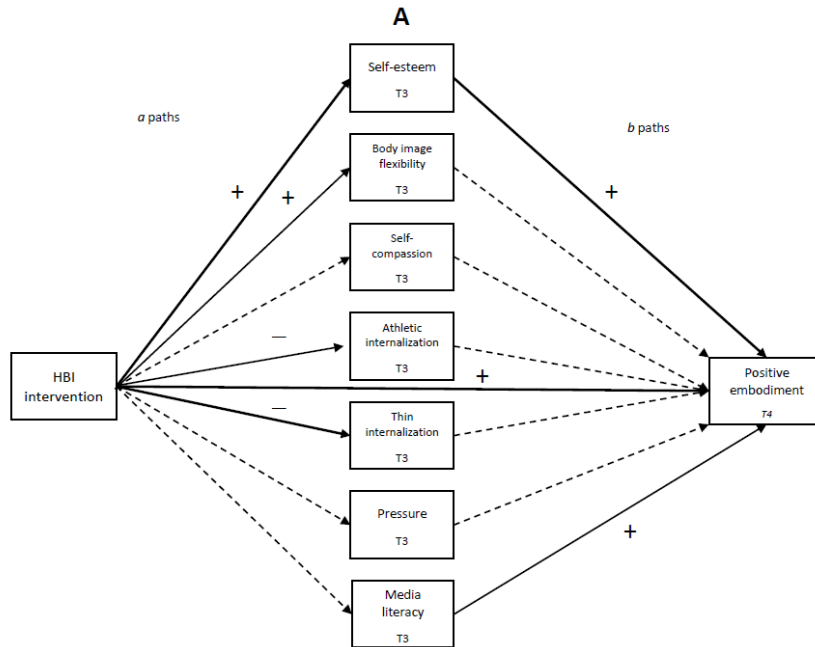
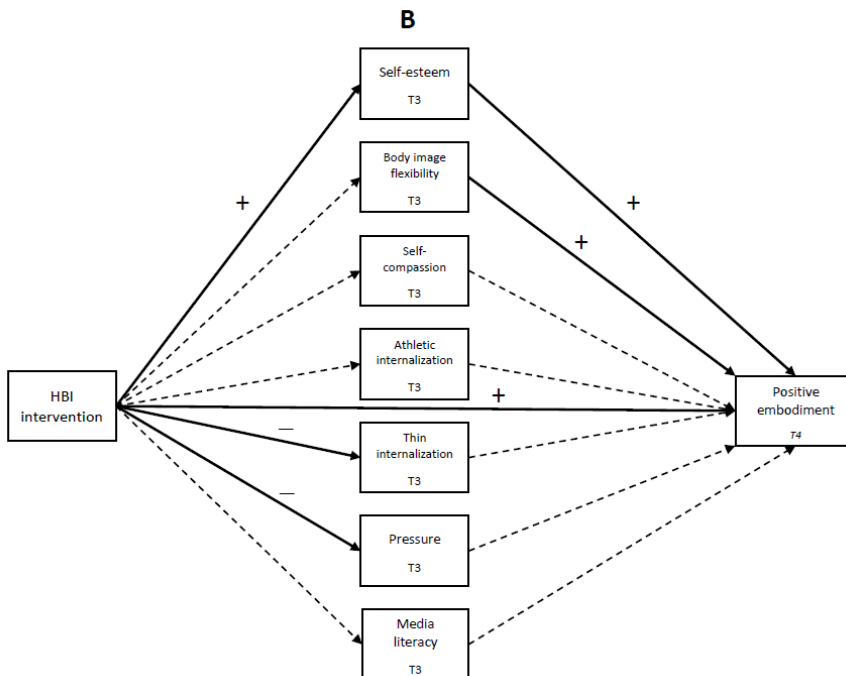


Figure 3 B



## **Appendix I**

Approval letter from the Regional Committees for Medical Research Ethics.



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<b>Region:</b> REK sør-øst	<b>Saksbehandler:</b> Claus Henning Thorsen	<b>Telefon:</b> 22845515	<b>Vår dato:</b> 10.03.2016	<b>Vår referanse:</b> 2016/142/REK sør-øst C
			<b>Deres dato:</b> 12.01.2016	<b>Deres referanse:</b>

Vår referanse må oppgis ved alle henvendelser

Jorunn Sundgot-Borgen  
Norges idrettshøgskole  
Postboks 4014 Ullevål Stadion  
0806 Oslo

## 2016/142 Sunn kroppsopplevelse: et intervensjonsprosjekt

**Forskningsansvarlig:** Norges idrettshøgskole

**Prosjektleder:** Jorunn Sundgot-Borgen

Vi viser til søknad om forhåndsgodkjenning av ovennevnte forskningsprosjekt. Søknaden ble behandlet av Regional komité for medisinsk og helsefaglig forskningsetikk (REK sør-øst) i møtet 18.02.2016. Vurderingen er gjort med hjemmel i helseforskningsloven (hfl.) § 10, jf. forskningsetikkloven § 4.

### Prosjektomtale

*Et sunt kroppsbilde er viktig for både jenter og gutter og fungerer som en prediktor for god livskvalitet. Mange ungdommer har et problematisk kroppsbilde og norske studier viser at opptil 60% av jentene og 45% av guttene i videregående skole er misfornøyd med kroppen sin. Kroppsmisnøye er forbundet med psykiske problemer og lidelser. Betydningen av å utvikle effektive programmer for å fremme en sunn kroppsopplevelse blant ungdom er åpenbar. Den planlagte RCT-studien har et helsefremmende formål, ved det at programmet skal fremme et positivt forhold til egen kropp og dermed til å redusere forekomsten av de negative konsekvensene av en dårlig kroppsopplevelse blant ungdom på norske videregående skoler. Prosjektet søker å oppnå dette ved å undersøke effekten og aksept av et nytt skolebasert intervensjonsprogram rettet mot selvfølelse, sunn livsstil (spise- og fysisk aktivitet vaner og søvnkvalitet), dysfunksjonell perfeksjonisme og mediekunnskap hos elever i videregående skole i Norge*

### Vurdering

Man skal i prosjektet undersøke effekt og aksept av et nytt skolebasert intervensjonsprogram rettet mot selvfølelse, sunn livsstil (spise- og fysisk aktivitetsvaner og søvnkvalitet), dysfunksjonell perfeksjonisme og mediekunnskap hos elever i videregående skole i Norge.

Det legges i søknaden betydelig vekt på at programmet har en helsefremmende tilnærming, samtidig som det erkjennes at det kan argumenteres for at intervensjonsprogrammet kan bidra til et uheldig fokus på de forhold som programmet forsøker å forhindre, noe som foranlediger behov for back up og personlig oppfølging. Komiteen mener at prosjektgruppen har reflektert godt omkring dette, og forutsetter at den i søknaden skisserte prosedyre for oppfølging av elever med behov for støtte blir en realitet.

Komiteen har generelt vært skeptisk til skoleforskning hvor klasseromsettingen benyttes ved besvarelse av sensitive spørreskjemaer. I denne studien har man forlatt klasseromsettingen, elevene besvarer spørsmålene i hjemmemiljø uten risiko for påvirkning fra medelever, noe komiteen anser som en tilstrekkelig betryggende løsning.

Det er lagt opp til elektronisk samtykke via mail. Forutsatt at samtykket kun gjelder det de svarer på, og ikke oppkobling til helseopplysninger (journal), mener komiteen at løsningen kan aksepteres. Komiteen kan imidlertid ikke akseptere at man aktivt må si nei til deltakelse, og kan for øvrig heller ikke se at skulle være behov for en slik fremgangsmåte.

Komiteen vil i den forbindelse påpeke at man selvfølgelig står fritt til å trekke seg fra studien (ved gjenkjenning via IP-adresse) også etter at man har besvart og sendt inn spørreskjemaene.

Prosjektet skal benytte et stort antall spørreskjemaer. Disse er navngitt i en oversikt, men komiteen ber for ordens skyld om at skjemaene oversendes.

#### Informasjonsskrivene

Komiteen har merket seg at det i informasjonsskrivet til elevene fremgår følgende: «*Vi vil også innhente karakterer på alle elevene fra et eget register.*» Komiteen kan ikke se at innhenting av karakterer er omtalt eller begrunnet i søknad eller protokoll, og komiteen forutsetter derfor at dette tas ut.

Komiteen mener videre at det bør tydeliggjøres at det er frivillig å delta. Det er naturlig at dette tas inn i informasjonsskrivets første avsnitt **Bakgrunn og hensikt**. Videre bør det opplyses om antallet spørreskjemaer, og at noen av disse berører psykisk helse.

I informasjonsskrivet til rektor er man i teksten ikke tydelig nok på å spørre om deltakelse. Skrivet er også upresist og generelt forhold til hvilke data som skal samles inn.

For begge informasjonsskrivs vedkommende mangler informasjon om retten til å trekke seg fra studien, og at man kreve innsamlede opplysninger slettet dersom dette blir aktuelt. Videre bør det opplyses at deltakerne i henhold til helseforskningsloven § 50 er dekket av pasientskadeloven (NPE-ordningen).

Komiteen ber om at informasjonsskrivene revideres, og anbefaler at man ved revisjonen ser hen til malen for informasjonsskriv som ligger på REKs hjemmesider.

Ut fra dette setter komiteen følgende vilkår for prosjektet:

1. Spørreskjemaene som skal benyttes i prosjektet oversendes komiteen til orientering
2. Informasjonsskrivene revideres i henhold til ovennevnte og sendes komiteen til orientering.

#### **Vedtak**

Prosjektet godkjennes under forutsetning av at ovennevnte vilkår oppfylles, jf. helseforskningslovens §§ 9 og 33.

I tillegg til vilkår som fremgår av dette vedtaket, er tillatelsen gitt under forutsetning av at prosjektet gjennomføres slik det er beskrevet i søknaden og protokollen, og de bestemmelser som følger av helseforskningsloven med forskrifter.

Tillatelsen gjelder til 01.03.2019. Av dokumentasjons- og oppfølgingshensyn skal opplysningene likevel bevares inntil 01.03.2024. Opplysningene skal lagres avidentifisert, dvs. atskilt i en nøkkel- og en opplysningsfil. Opplysningene skal deretter slettes eller anonymiseres, senest innen et halvt år fra denne dato.

Komiteens avgjørelse var enstemmig.

#### *Sluttmelding og søknad om prosjektendring*

Dersom det skal gjøres endringer i prosjektet i forhold til de opplysninger som er gitt i søknaden, må prosjektleder sende endringsmelding til REK. Prosjektet skal sende sluttmelding på eget skjema, se helseforskningsloven § 12, senest et halvt år etter prosjektslutt.

*Klageadgang*

Du kan klage på komiteens vedtak, jf. forvaltningslovens § 28 flg. Klagen sendes til REK sør-øst C. Klagefristen er tre uker fra du mottar dette brevet. Dersom vedtaket opprettholdes av REK sør-øst C, sendes klagen videre til Den nasjonale forskningsetiske komité for medisin og helsefag for endelig vurdering.

Med vennlig hilsen

Britt-Ingjerd Nesheim  
prof.dr.med.  
leder REK sør-øst C

Claus Henning Thorsen  
Rådgiver

**Kopi til:** *turid.sjostedt@nih.no; Norges idrettshøgskole: postmottak@nih.no*



## **Appendix II**

Registration by the international Clinical Trial Registration.





**ClinicalTrials.gov Protocol Registration and Results System (PRS) Receipt**  
Release Date: February 23, 2018

**ClinicalTrials.gov ID: NCT02901457**

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### Study Identification

Unique Protocol ID: JCSB  
Brief Title: "The Healthy Body Image" (HBI) Program: A Program to Promote a Positive Body Image  
Official Title: "The Healthy Body Image" (HBI) Program: A Program to Promote a Positive Body Image. A School-based Randomized Controlled Trial  
Secondary IDs:

### Study Status

Record Verification: February 2018  
Overall Status: Completed  
Study Start: August 2016 []  
Primary Completion: February 2018 [Actual]  
Study Completion: February 2018 [Actual]

### Sponsor/Collaborators

Sponsor: Norwegian School of Sport Sciences  
Responsible Party: Principal Investigator  
Investigator: Professor Jorunn Sundgot-Borgen [jsundgot-borgen]  
Official Title: Professor  
Affiliation: Norwegian School of Sport Sciences  
Collaborators: The Norwegian Women's Public Health Association  
Norwegian Extra Foundation for Health and Rehabilitation  
University of Tromso  
University College of Southeast Norway  
University of Agder

### Oversight

U.S. FDA-regulated Drug:  
U.S. FDA-regulated Device:  
U.S. FDA IND/IDE: No  
Human Subjects Review: Board Status: Approved  
Approval Number: 2016/142  
Board Name: Regional Committees for Medical and Health Research Ethics  
Board Affiliation: Regional Committees for Medical and Health Research Ethics

Phone: 22845515  
Email: post@helseforskning.etikkom.no  
Address:

Gullhaugveien 1-3  
0484 Oslo  
Norway

Data Monitoring: No

FDA Regulated Intervention: No

## Study Description

**Brief Summary:** Too many Norwegian adolescents experience severe body dissatisfaction (40-70 %), and strive to accomplish the “perfect body”. At the same time, only 50 % meet the government’s recommendations on physical activity and intake of fruits and vegetables. Also, 14-24 % has unhealthy sleeping habits. Optimizing these lifestyle factors is associated with physical and psychological health. These factors, along with the pressure to obtain the “perfect” body, are threatening the adolescent’s physical and psychological health, jfr. Meld St nr 19. It is now a need for knowledge on how the investigators can contribute to promote positive body experience among the adolescents.

It has recently, through a controlled study on elite youth athletes at Norwegian sports high schools, been shown that it is possible to change eating habits, improve body image and reduce new cases of eating disorder. It is now desirable to test an adapted program through a school-based program at regular Norwegian high school students (12th grade). Today, no controlled, school-based intervention studies with long-term follow-up have been conducted.

The main aim of this project is to investigate if it is possible, through a school-based intervention program (Healthy Body Intervention), to promote positive body image, increase physical activity level, and healthy eating and sleeping habits in both boys and girls at Norwegian high schools.

The intervention program will contribute with new evidence-based knowledge on the effect of an adapted health-promoting program.

**Detailed Description:** The design is a school-based randomized controlled trial (RCT) intervention, using the methods questionnaire and interview to obtain data. Based on statistical power analyses, all high schools in Oslo and Akershus County will be asked to participate in the study. After the schools have responded, consenting schools will be stratified (by size and geographical affiliation) and randomized to the intervention or the control condition. To minimize contamination biases within schools, the investigators prepare a cluster-randomized design. The population should contain 17-20 schools (1400 students at 2nd year). Data collection is conducted through pre-test and post-test 1, 2, and 3 (acute, 3, and 12 month post-intervention). At post-test 1, a selection is invited to participate in an interview about feasibility in addition to the questionnaire. It is an intervention for students containing interactive lecturers with discussion, team work, discussions and home assignments.

## Conditions

Conditions: Quality of Life  
Eating Behaviors  
Physical Activity

Keywords: Body Image

## Study Design

Study Type: Interventional  
Primary Purpose: Other  
Study Phase: N/A  
Interventional Study Model: Parallel Assignment  
Number of Arms: 2  
Masking: None (Open Label)  
Allocation: Randomized  
Enrollment: 4193 [Actual]

## Arms and Interventions

Arms	Assigned Interventions
Experimental: Healthy Body Image Students receive the Healthy Body Image intervention containing 3x90 minutes of interactive workshops with the addition of related homework after each workshop.	The "Healthy Body Image" intervention Interactive workshops (3 x 90 minutes) include training techniques to increase media literacy, enhance self-esteem, positive body image, awareness of perfectionism, and include discussions related to truths and myths related to life style factors. Homework is an extension of each workshop that is simple and not time-consuming tasks to increase reflection and awareness of how all the mentioned factors are a part of their lives.  Other Names: <ul style="list-style-type: none"><li>• Healthy Body Image</li></ul>
No Intervention: Control group Students do not receive the intervention program.	

## Outcome Measures

Primary Outcome Measure:

1. Proximal and distal effect of the "Healthy Body Intervention" (HBI) program on change in positive body image  
Participants are asked to respond to questions by choosing from different responses presented on a likert scale.  
Positive body image is assessed by the Experience of Embodiment Scale.

[Time Frame: Participants are asked to complete the questionnaire at post-tests planned at week 1, 3 months and 12 months after intervention]

Secondary Outcome Measure:

2. Proximal and distal effect of the HBI program on change in self-esteem  
Participants are asked to respond to questions by choosing from different responses presented on a likert scale. The scale used is the Rosenberg Self-esteem scale.

[Time Frame: Participants are asked to complete the questionnaire at post-tests planned at week 1, 3 months and 12 months after intervention]

3. Proximal and distal effect of the "Healthy Body Intervention" (HBI) program on change in the prevalence of students meeting the recommendations for health promoting physical activity.

The outcome will be measured through a self-developed Physical Activity level/habit questionnaire, including choosing a specific response on a likert scale and response through open ended questions.

[Time Frame: Participants are asked to complete the questionnaire at post-tests planned at week 1, 3 months and 12 months after intervention]

4. Experience of the intervention program and the feasibility of running the HBI program in schools.  
To measure the outcome, a self-developed interview guide in addition to a self-developed questionnaire asking students and school staff about the experience of the intervention program and the feasibility of the intervention. When answering the questionnaire, participants are asked to respond by choosing a response on a likert scale.

[Time Frame: Post-test is planned within first week after intervention]

5. Proximal and distal effect of the HBI program on change in eating behavior (nutrition intake)  
The outcome will be measured through a self-developed Food frequency questionnaire where responses are chosen from a likert scale.

[Time Frame: Participants are asked to complete the questionnaire at post-tests planned at week 1, 3 months and 12 months after intervention]

6. Proximal and distal effect of the HBI program on change in sleeping quality and sleep patterns  
The outcome is measured through The Bergen Insomnia Scale, 6 items and 3 items assessing delayed sleep phase and by asking the participants (using a likert scale) how many hours of sleep they usually get per night during a normal weekday and a weekend day.

[Time Frame: Participants are asked to complete the questionnaire at post-tests planned at week 1, 3 months and 12 months after intervention]

7. Proximal and distal effect of the HBI program on change in academic achievements  
Participants are asked to choose the correct grade they received on their last report card, from a scale presenting the possible grades.

[Time Frame: Participants are asked to complete the questions included in the questionnaire package at post-tests planned at week 1, 3 months and 12 months after intervention]

8. Proximal and distal effect of the "Healthy Body Intervention" (HBI) program on change in health related quality of life  
Participants are asked to respond to questions by choosing from different responses presented on a likert scale. Health related quality of life will be assessed through the "Screening for and Promotion of Health Related Quality of Life in Children and Adolescents - a European Public Health Perspective - 10" (KIDSKREEN-10).

[Time Frame: Participants are asked to complete the questionnaire containing all the below presented measures at post-tests planned at week 1, 3 months and 12 months after intervention]

9. Proximal and distal effect of the HBI program on change in symptoms of eating disorders  
Symptoms of eating disorders is assessed by the Eating Disorder Examination Questionnaire - 11 (EDE-Q 11)

[Time Frame: Participants are asked to complete the questionnaire at post-tests planned at week 1, 3 months and 12 months after intervention]

## Eligibility

Minimum Age: 16 Years

Maximum Age: 19 Years

Sex: All

Gender Based:

Accepts Healthy Volunteers: Yes

Criteria: Inclusion Criteria:

- Norwegian high schools
- High schools located in either Oslo or Akershus County
- Students in the 2nd grade fall 2016
- Students within academic specialization education programs
- Teachers teaching included students in Norwegian, Social studies, Physical education, and contact teachers

- School nurses working at the randomly selected schools
- School administrators at randomly selected schools

Exclusion Criteria:

- Schools that follow foreign school systems
- Students within vocational education programs
- School departments connected to prison

## Contacts/Locations

Central Contact Person: Christine Sundgot-Borgen, MS  
 Telephone: 90754948 Ext. +47  
 Email: christine.sundgot.borgen@gmail.com

Central Contact Backup:

Study Officials: Jorunn Sundgot-Borgen, Phd  
 Study Chair  
 Norwegian School of Sports Sciences

Locations: **Norway**

Norwegian School of Sports Sciences  
 Oslo, Norway, 0806  
 Contact: Jorunn Sundgot-Borgen, Phd 92241745 Ext. +47 jorunn.sundgot-borgen@nih.no

## IPDSharing

Plan to Share IPD: Undecided

## References

Citations: Strand BH, Dalgard OS, Tambs K, Rognerud M. Measuring the mental health status of the Norwegian population: a comparison of the instruments SCL-25, SCL-10, SCL-5 and MHI-5 (SF-36). *Nord J Psychiatry*. 2003;57(2):113-8. PubMed 12745773

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Links:

Available IPD/Information:

### **Appendix III**

Informed consent letter to students.





## Forespørsel om deltakelse i forskningsprosjektet til elever ved x videregående skole

### *”Sunn kroppsopplevelse”*

#### **Bakgrunn og hensikt**

Dette er et spørsmål til deg om å delta i en forskningsstudie der hensikten er å undersøke om det er mulig å fremme et godt forhold til egen kropp, forebygge kroppsmisnøye og redusert livskvalitet blant både jenter og gutter i videregående skole. Forskningsprosjektet du inviteres inn i gjennomføres på vegne av Norges Idrettshøgskole, og i samarbeid med Universitetet i Tromsø, Universitetet i Agder og Høgskolen i Sørøst-Norge. Det er selvfølgelig helt frivillig å delta i denne undersøkelsen. Du kan også trekke deg fra studien etter at du har sendt inn spørreskjemaet, eller si nei til senere spørreskjemaundersøkelser eller et eventuelt intervju selv om du nå samtykker til deltagelse.

#### **Hva innebærer studien?**

Dersom din skole, i en tilfeldig uttrekning, blir trukket som intervensjonsskole, vil det bli gjennomført et undervisningsopplegg som inngår i ordinær skoletid og går over en tre måneders periode. I løpet av denne tiden vil det gjennomføres 3 x 90 minutters undervisningsbolker med tema som selvfølelse, perfektjonisme, kropp, media, kosthold og fysisk aktivitet. Det vil også være noen små individuelle hjemmeoppgaver som tar minimalt med tid. Dersom din skole blir trukket til å delta i en såkalt kontrollgruppe, betyr det at dere ikke får noen annen undervisning enn det som er planlagt fra skolens side når det gjelder de temaene som er nevnt ovenfor. Skolen vil allikevel bli tilbudt en fagdag i etterkant av intervensjonsperioden, hvor ovenfor nevnte tema inngår. Dersom du sier ja til å delta i studien (uavhengig av om din skole havner i intervensjonsgruppa eller i kontrollgruppen), vil du via en lenke i denne e-posten bli forespurt om du kan tenke deg å svare på et spørreskjema før, rett etter, ved 3, 6 og 12 måneder etter dette 3-mnd programmet (for forsøksgruppa) er gjennomført. På de skolene som trekkes som intervensjonsskole, vil et tilfeldig utvalg av elevene kunne bli forespurt om å delta i et intervju for å kartlegge hvordan elevene opplevde det å være med i en slik undersøkelse (programmets brukervennlighet). Dersom du sier ja til å delta i spørreskjemaundersøkelsen men ikke skulle ønske å delta i et eventuelt senere intervju er det helt greit, og du kan eventuelt si nei til det dersom du skulle bli en av de som trekkes ut til intervju.

Spørreskjemaet er sammensatt av flere ulike spørreskjema og det er spørsmål knyttet til livsstil (kosthold, aktivitet og søvn), sosiale medier, kroppsbildet, selvfølelse og hvordan du har det. Spørreskjemaet kan gjennomføres på PC, Mac, nettbrett og smarttelefoner. Dersom vi skulle få ytterligere midler til dette forskningsprosjektet vil det også være mulig ved en senere anledning å gjøre noen oppfølgende undersøkelser. Det er imidlertid IKKE det du svarer på nå, men det er til informasjon dersom du ved en senere anledning skulle få en ny

henvendelse fra prosjektgruppen. Det vil ved den potensielle nye forespørselen, selvsagt være mulig å takke nei til deltagelse.

### **Mulige fordeler og ulemper**

Fordelene ved å delta i dette forskningsprosjektet vil kunne være at du lærer noe nytt om de temaene som inngår i undervisningspakken, at du opprettholder eller bedrer dine livsstilsvaner, ditt kroppsbilde og din selvfølelse. I tillegg vil du som deltaker være med i trekningen av et Universal gavekort på kr. 500,-. Vi har gjort denne type forskning i andre videregående skoler (rene toppidrettsgymnas og ved vanlig videregående skoler) UTEN at det har medført/vært meldt inn noen ulemper ved deltagelse i prosjektet. Men, det kan selvfølgelig ikke utelukkes at enkelte kan føle at det blir en uheldig opplevelse ved økt fokus på noen av de ovenfor nevnte tema. Dersom det skulle skje så kan prosjektleder kontaktes og hun har da ansvaret for å svare på dine spørsmål og veilede deg videre slik at du kan få kontakt med en helsesøster eller annen voksenperson som du kan snakke med.

### **Hva skjer med informasjonen om deg?**

Informasjonen som registreres vil bli behandlet uten navn og aidentifisert. Det betyr at de opplysningene du gir i spørreskjemaet vil ikke kunne knyttes til ditt navn når data behandles. Prosjektledelsen vil så ha en liste der ditt nummer (kode) er knyttet til deg slik at, dersom din skole er intervensjonsskole, så kan prosjektleder kontakte deg dersom du er en av de som blir trukket ut og forespurt om et senere intervju. Det er altså kun prosjektleder som har adgang til navnelisten og som kan finne tilbake til deg. De det gjelder har taushetsplikt.

Det vil ikke være mulig å identifisere deg i resultatene av studien når disse publiseres.

### **Frivillig deltagelse**

Det er frivillig å delta i studien.

Du kan når som helst og uten å oppgi noen grunn trekke ditt samtykke til å delta i studien. Du samtykker til deltagelse ved å gå inn på linken som er vedlagt. Om du nå sier ja til å delta, kan du senere trekke tilbake ditt samtykke, og kreve innsamlede opplysninger slettet dersom dette er aktuelt. Videre opplyses det om du i henhold til helseforskningsloven paragraf 50 er dekket av pasientskadeloven (NPE-ordningen).

Dersom du har spørsmål til studien, kan du kontakte prosjektleder og professor Jorunn Sundgot-Borgen på telefon 23262335/jorunn.sundgot-borgen@nih.no

### **Obs!**

Dersom du nå velger å delta i undersøkelsen trykker du på linken og velger alternativ "jeg samtykker" for å gå videre og du vil da få tilgang til spørreskjemaet.

Mvh

Prosjektleder  
Professor Jorunn Sundgot-Borgen

## **Appendix IV**

Questions and questionnaires used to assess moderators, mediators, and outcomes in paper II, III, and IV.



### Demographic questions

1. Gender

- Boy
- Girl

2. Have you or both your parents immigrated to Norway?

- Yes, I have immigrated
- Yes, both my parents have immigrated
- No, neither me nor my parents

3. What educational level does your parent/parents have?

Mother

- Primary school
- High school
- College/university
- Do not know

Father

- Primary school
- High school
- College/university
- Do not know

4. What do you believe your parents' total income is per year?

- 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

5. What is your current weight?

Answer: .....

6. How tall are you (cm)?

Answer: .....

## Positive embodiment

### Experience of Embodiment Scale

Piran, N., & Teall, T. L. (2012). *The Experience of Embodiment Scale – Version 2*

(Unpublished manuscript. For use, contact the author of the questionnaire)

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree
	1	2	3	4	5
1. I feel in tune with my body	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. I feel at one with my body	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I feel “detached” and separate from my body	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I feel depressed/anxious/scared in/about my body	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I care more about how my body feels than about how it looks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I focus more on what my body can do than on its appearance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. My eating habits are a way for me to manage my emotions or how I have felt about myself	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Generally I feel good/comfortable in my body	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I am proud of what my body can do	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I feel dissatisfied, envious and frustrated when I compare my body to other females	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. I feel joy in my body	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. My body reduces my sense of self worth in the world	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. I sometimes tend to blame my body for difficulties I am having	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. I am comfortable with my sexual feelings/desires	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15. I engage in potentially harmful or painful behaviours (e.g., disordered eating, bingeing, purging, denying physical needs, skin cutting, burning, drug use, excessive alcohol consumption)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. I have an eating disorder	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. I take good care of, and am respectful of, my body	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. I ignore the signs my body sends me (e.g., of hunger, stress, fatigue, illness/injury)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. I spend a lot of time/energy/money engaging in activities that I hope make me fit with cultural ideals of beauty (e.g., exercise, clothing, make-up, hair, plastic surgery, skin bleaching)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. I am comfortable voicing my views, opinions and beliefs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. I find it difficult to express my emotions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. I am aware of my needs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. It is hard for me to read/identify my feelings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. I am comfortable with, and proud of, who I am	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. I consider myself to be a powerful woman	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. I am aware of, and confident in, my strengths and abilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. My dissatisfaction with my body/appearance has a negative effect on my social life	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. I feel disconnected from my own sense of sexual desire	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. I express what I want and need sexually	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. I feel that I cannot express what I want or need in a dating/partnership relationship	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. I have difficulty asserting myself with others in the world	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



32. I believe in my ability to accomplish what I desire in the world	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. I put a priority on listening to my body and its needs (e.g., stress, fatigue, hunger)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. I constantly think about the way my body fits with cultural standards of beauty	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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## Health-Related Quality of Life

### KIDSCREEN-10

*Original: Ravens-Sieberer, U. (2006). The Kidscreen questionnaires: quality of life questionnaires for children and adolescents; handbook. Pabst Science Publ.*

*Norwegian version of KIDSCREEN: Haraldstad, K. R., & Richter, J. (2014). Psychometric properties of the Norwegian version of KIDSCREEN. PsykTestBarn, 2(1), 1-10.*

### About Your Health

Thinking about the last week...		not at all	slightly	moderately	very	extremely
1. Have you felt fit and well?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Have you felt full of energy?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Have you felt sad?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Have you felt lonely?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Have you had enough time for yourself?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Have you been able to do the things that you want to do in your free time?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Have your parent(s) treated you fairly?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Have you had fun with your friends?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Have you got on well at school?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Have you been able to pay attention?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In general, how would you say your health is?	
<input type="radio"/>	excellent
<input type="radio"/>	very good
<input type="radio"/>	good
<input type="radio"/>	fair
<input type="radio"/>	poor

### Physical activity level

Physical activity is defined as all bodily movement that lead to an increase in body temperature and light-heavy shortness of breath. Physical activity can therefore be activities such as walking, cycling (incl. back and forth to school), skating, dancing, resistance training, hiking, and doing sports (including physical education, leisure time organized- or unorganized activities, family activities).

1. How many hours per week do you take part in physical activity to the extent that you become warm and experience light-heavy shortness of breath?

Answer: Hours\_\_ \_\_ and \_\_\_\_\_minutes

### Eating habits

1. How often do you eat the following meals during a regular week?

	Never	1-2	3-4	5-6	Every day
Breakfast					
Lunch					
Dinner					
Evening meal					
Snack meal					

2. How many portions of fruits, berries (about one handful) and vegetables (e.g. a vegetable or one portion of salad) every day?

	< 1	1	2	3	4	5	>5 per day
Fruits or berries							
Vegetables or portion of salad							

### Questions about sleep

For how many hours do you sleep at night during a regular school week. Choose the answer which fits you the best. Try not to include time spent awake in bed before you fall asleep.

- >4
- 4-5
- 6-7
- 8-9
- 10-11
- 12
- >12

For how many hours do you sleep at night during a regular weekend. Choose the answer which fits you the best. Try not to include time spent awake in bed before you fall asleep.

- >4
- 4-5
- 6-7
- 8-9
- 10-11
- 12
- >12

## **Self-esteem**

Rosenberg Self-Esteem Scale (Rosenberg, 1965)

*Rosenberg, M. (1965). Society and the adolescent self-image. Princeton, NJ: Princeton University Press.*

Below is a list of statements dealing with your general feelings about yourself. Please respond to all the statements and choose the response that fits your level of agreement; Strongly agree, agree, disagree, strongly disagree.

1. On the whole, I am satisfied with myself.
2. At times, I think I am no good at all.
3. I feel that I have a number of good qualities.
4. I am able to do things as well as most other people.
5. I feel I do not have much to be proud of.
6. I certainly feel useless at times.
7. I feel that I'm a person of worth, at least on an equal plane with others.
8. I wish I could have more respect for myself.
9. All in all, I am inclined to feel that I am a failure.
10. I take a positive attitude toward myself.

## **Body Image Flexibility**

### The Body Image Acceptance and Action Scale

*Sandoz, E.K., Wilson, K.G., Merwin, R.M., Kellum, K.K. (2013). Assessment of body image flexibility: The Body Image-Acceptance and Action Questionnaire. Journal of Contextual Behavioral Science, 39-48.*

Directions: Below you will find a list of statements. Please rate the truth of each statement as it applies to you. Use the following rating scale to make your choices. Never true, Very seldom true, Seldom true, Sometimes true, Frequently true, Almost always true, Always true.

1. Worrying about my weight makes it difficult for me to live a life that I value.
2. I care too much about my weight and body shape.
3. I shut down when I feel bad about my body shape or weight.
4. My thoughts and feelings about my body weight and shape must change before I can take important steps in my life.
5. Worrying about my body takes up too much of my time.
6. If I start to feel fat, I try to think about something else.
7. Before I can make any serious plans, I have to feel better about my body.
8. I will have better control over my life if I can control my negative thoughts about my body.
9. To control my life, I need to control my weight.
10. Feeling fat causes problems in my life.
11. When I start thinking about the size and shape of my body, it's hard to do anything else.
12. My relationships would be better if my body weight and/or shape did not bother me.

## **Social media (unpublished)**

*Rosenvinge et al., (in process). Gender differences in the frequency and purposes of using social networking sites: A survey among 2242 Norwegians aged 16-17 years.*

Respondents answer on a Likert scale from 1 (strongly disagree) to 5 (strongly agree).

### **Subtest Time Spent on Body Appearance Related Content in Social Media**

1. I spend most of my time on social media on things about physical outlook
2. I spend most time on social media about body and physical appearance
3. I spend most of my time on social media on things about nutrition and diets that can give me or help me to maintain a good physical appearance
4. On social media check others' profiles in order to improve by body outlook
5. I feel miserable when people I know personally publish fake pictures of themselves to look good to others

### **Subtest Media literacy**

1. I don't trust everything that is published on social media
2. I think it is important to think about not publishing things that others might misuse
3. I think about not publishing things from my private life that I might come to regret later
4. I think about not publishing things that might offend others

## **Self-compassion**

### Self-Compassion Scale- Short Form

*Raes, F., Pommier, E., Neff, K. D., & Van Gucht, D. (2011). Construction and factorial validation of a short form of the Self-Compassion Scale. Clinical Psychology & Psychotherapy, 18, 250-255*

Please read each statement carefully before answering. To the left of each item, indicate how often you behave in the stated manner, using the following scale:

1-Almost never, 2, 3, 4, 5-Almost always.

1. When I fail at something important to me I become consumed by feelings of inadequacy.
2. I try to be understanding and patient towards those aspects of my personality I don't like.
3. When something painful happens I try to take a balanced view of the situation.
4. When I'm feeling down, I tend to feel like most other people are probably happier than I am.
5. I try to see my failings as part of the human condition.
6. When I'm going through a very hard time, I give myself the caring and tenderness I need.
7. When something upsets me I try to keep my emotions in balance.
8. When I fail at something that's important to me, I tend to feel alone in my failure
9. When I'm feeling down I tend to obsess and fixate on everything that's wrong.
10. When I feel inadequate in some way, I try to remind myself that feelings of inadequacy are shared by most people.
11. I'm disapproving and judgmental about my own flaws and inadequacies.
12. I'm intolerant and impatient towards those aspects of my personality I don't like

## **Internalization of body ideals and pressure from media**

### Social Attitudes Towards Appearance Questionnaire-4

*Schaefer, L. M., Burke, N. L., Thompson, J. K., Dedrick, R. F., Heinberg, L. J., Calogero, R. M., ... & Anderson, D. A. (2015). Development and validation of the Sociocultural Attitudes Towards Appearance Questionnaire-4 (SATAQ-4). Psychological Assessment, 27(1), 54.*

Please read each of the following items carefully and indicate the number that best reflects your agreement with the statement.

Definitely Disagree = 1, Mostly Disagree = 2, Neither Agree Nor Disagree = 3, Mostly Agree = 4, Definitely Agree = 5

#### Subtest: Internalization – Muscular/Athletic

- It is important for me to look athletic
- I think a lot about looking muscular
- I spend a lot of time doing things to look more athletic.
- I think a lot about looking athletic
- I spend a lot of time doing things to look more muscular.

#### Subtest: Internalization – Thin/Low body fat:

- I want my body to look very thin.
- I want my body to look like it has little fat
- I think a lot about looking thin.
- I want my body to look very lean
- I think a lot about having very little body fat

#### Subtest: Pressures – Media

- I feel pressure from the media to look in better shape.
- I feel pressure from the media to look thinner.
- I feel pressure from the media to improve my appearance.
- I feel pressure from the media to decrease my level of body fat.





