Lifestyle, appearance satisfaction and depressive symptoms in 13–16 years old Norwegian adolescents – a cross sectional study

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ABSTRACT

Purpose: To examine gender-specific associations between multiple lifestyle-related risk factors, appearance satisfaction and depressive symptoms in a sample of Norwegian adolescents (13–16 years of age), and to study the role of appearance satisfaction as a possible confounder in the associations between lifestyle and depressive symptoms.

Materials and methods: Data were obtained from *Ungdata*, a cross-sectional national survey of adolescents in Norway. In total 4379 subjects were included in the study. We constructed a lifestyle risk index and used multiple logistic regression to examine the associations between lifestyle-related risk factors, appearance satisfaction and depressive symptoms.

Results: High screen time and use of alcohol were significantly associated with depressive symptoms among girls, while high screen time, tobacco and cannabis use were significantly associated with depressive symptoms among boys. An additive relationship was observed between the lifestyle risk index scores and the likelihood of depressive symptoms for both genders, the relationship being strongest among boys. Low appearance satisfaction was strongly associated with depressive symptoms, especially among boys, and identified as an important confounder in the associations between lifestyle and depressive symptoms, particularly among girls.

Conclusions: High screen time was the most prevalent lifestyle risk behaviour independently associated with depressive symptoms. Multiple lifestyle changes and improvement of appearance satisfaction should be included in measures targeting adolescents for the prevention and treatment of depressive symptoms. Future studies should elaborate the gender differences in other adolescent age groups. Appearance satisfaction should be acknowledged as an important confounder in future studies of lifestyle and depressive symptoms.

KEYWORDS Depressive symptoms; lifestyle; appearance satisfaction; adolescence

Introduction

Mental health problems among children and adolescents represent a major global health challenge[1]. The incidence of depression tends to increase from childhood and through adolescence, and depression is particularly common among girls[2]. Moreover, symptoms of depression in adolescence often precede depression in adult life[3, 4]. Norwegian studies indicate that after 12 years of age, 15–20% of adolescents have significant symptoms of depression, and two out of three adolescents struggling with depression or anxiety are girls[2].

Adolescence is a critical phase for the onset and increase of lifestyle risk behaviours such as unhealthy eating habits, low physical activity, extended screen time and illicit substance use, representing a significant public health concern[5, 6]. Previous studies have associated several lifestyle-related risk behaviours (physical activity[7-12], excessive screen time use (television (TV)/personal computer (PC)/tablet/mobile phone)[10, 13, 14], unhealthy eating habits[15-18] and the use of substances such as tobacco, alcohol and cannabis [19-22]) with an increased likelihood of depressive symptoms in adolescence. However, the mechanisms underlying these associations have been insufficiently explored and are not fully understood[23]. Moreover, the majority of previous studies have focused on a single or a few risk factors[17, 24-26] rather than multiple risk behaviours.

Lifestyle-related risk factors are often observed together[27]. The assessment of simultaneously present factors allows for mutual adjustments and studies of possible additive relationships. A few studies have examined multifactorial associations between lifestyle risk and depressive symptoms among adolescents[23, 28]. The US Healthy Youth Survey (HYS)[23], and the Saving and Empowering Young Lives in Europe (SEYLE) study[28] both concluded that high-risk behaviours (several applicable lifestyle indicators present simultaneously) and depressive symptoms were associated. Given the limited number of studies exploring multifactorial associations between lifestyle and depressive symptoms in adolescence, further investigations are warranted.

To examine the underlying mechanisms, studies on possible mediating and confounding factors that are particularly relevant to adolescents have been recommended[11]. Physical appearance is a common concern during the teenage years, especially among girls[29-31]. Low appearance satisfaction among girls has been suggested as an important factor explaining the gender differences in observed depressive symptoms [32-35]. In addition, negative body perceptions have been linked to gender-specific, unhealthy lifestyle behaviours in adolescence[36] and identified as a potentially important attenuating correlate in the association between physical activity and depressive symptoms of adolescents[37]. As far as we are aware, no previous studies have examined the importance of appearance satisfaction as an underlying factor in the associations between multiple lifestyle risk behaviours and depressive symptoms among adolescents.

In the present analysis, we used simultaneously collected data on several lifestyle risk factors, appearance satisfaction and depressive symptoms from a sample of 13–16-year-old Norwegian adolescents. We stratified the analyses by gender to identify possible gender differences.

The aim of our study was to examine gender-specific associations between multiple lifestyle-related risk factors, appearance satisfaction and depressive symptoms in a sample of Norwegian adolescents (13–16 years of age), and to study the role of appearance satisfaction as a possible confounder in the associations between lifestyle and depressive symptoms.

Materials and Methods

Study population and design

We used data retrieved from *Ungdata*, a cross-sectional survey of adolescents in secondary schools in Norway conducted by NOVA (Norwegian Social Research) in co-operation with regional centres for drug rehabilitation (KoRus)[38]. The study was conducted in February and March of 2015 and included 5526 adolescents aged 13–16 years (grades 8–10) from 41 secondary schools in Telemark County. The questionnaire was completed at schools and there was a response rate of 89%. Only participants who provided complete data on lifestyle variables and depressive symptoms were included in the analysis. Complete data were obtained from 4379 adolescents, representing 70% of the invited cohort.

The study follows the guidelines laid down in the Declaration of Helsinki and was approved by the Norwegian Data Protection Authority. The manuscript does not contain clinical studies or patient data.

Measures

Depressive symptoms

Depressive symptoms were assessed using the Depressive Mood Inventory, derived from the Hopkins Symptom Checklist[39], with an internal consistency of $\alpha = 0.88$ in the present study. The participants answered the questions: "During the past week, how often have you been affected by any of the following issues?": "feeling too tired to do things", "having sleep problems", "feeling unhappy, sad or depressed", "feeling hopeless about the future", "feeling nervous or tense" and "worrying too much about things". On a four-point symptom load scale, the answer options were: 1, "not at all", 2, "not much", 3, "quite a lot", and 4, "a great deal". The responses were combined to form a new variable (mean scores 1–4), with a high mean score indicating a high level of depressive symptoms[40]. The variable was labelled "depressive symptoms" and dichotomized as "low level" and "high level" with a cut-off point of 3 to reflect serious depressive symptoms[33, 40, 41].

Lifestyle-related behaviours

Diet

Diet was assessed using food and meal frequency questions derived from a short validated food frequency questionnaire previously validated and used in the Norwegian *Ungkost* dietary study[42]. The participants answered the question: "How often do you eat or drink the following?: "brown bread", "fish for dinner", "fruits/berries", "vegetables/salads", "crisps", "chocolate/sweets" and "carbonated drinks with added sugar", with six response options ranking from "seldom/never" to "daily". Meal frequencies were assessed by the question: "How often do you eat the following meals each week?: "breakfast", "lunch" and "dinner", with four response options ranking from "seldom/never" to "daily". To reflect general dietary advice for health[43], the following indicators and cut-off points were used: breakfast: "daily", brown bread: "daily", fruits/berries *and* vegetable/salads: "daily", fish for dinner: "≥2–3 times/week", and the intake of crisps, chocolate/sweets, and carbonated drinks with added sugar "≤once/week". The responses were coded 0 (not following health advice) and 1 (following health advice). A summed dietary score (scale 0–5) was calculated for each participant by summarizing their scores from each

indicator[44]. The index was dichotomized into the categories of "unhealthy diet" (score 0–3) and "healthy diet" (score 4–5), the latter representing close to the recommended combination. The variable was denoted "diet".

Physical activity

Physical activity was assessed by asking the participants a single-item question: "Think of a physical activity that raises your pulse/makes you breathe more heavily than normally. Do you achieve this activity level 60 minutes every day?" with answer options "yes", "no" or "I don't know". The responses "no" and "I don't know" were merged into one category, labelled "inactive" and the response "yes" into a category labelled "active". The two categories reflect the officially recommended amount of daily physical activity for children and adolescents (at least 1 hour per day of moderate to vigorous activity)[43]. The variable was denoted "physical activity".

Screen time

Screen time use was assessed from the adolescents' report of the number of hours typically spent on different screen-based leisure activities daily (TV, PC, tablet and mobile phone). The response options for each activity were: "no time", "<1 h/d", "1–2 h/d", "2–3 h/d", "3–4 h/d", "4–6 h/d" and ">6 h/d". Norwegian health authorities generally recommend a low level of sedentary activity but do not prescribe specific time limits. A limit of 2 hours per day of sedentary screen time is commonly used as an indicator of health risk[45], but most children and adolescents in Western countries far exceed this limit[46]. The defined categories were "low screen time" (<2–3 h/d) and "high screen time" (≥2–3 h/d), and the variable was denoted "screen time".

Tobacco

The adolescents reported whether and how often they smoked cigarettes or used snus (smokeless tobacco, Swedish type[47]), by answering a single-item question: "How often do you smoke/use snus?" The answer options were: "never smoked/never used snus", "smoked/used snus before, but stopped", "smoke/use snus seldom more than weekly", "smoke/use snus weekly but not each day" and "smoke/use snus every day". The responses "never smoked/never used snus" and "smoked/used snus before but stopped" were merged and categorized as "no smoking/snus use". The responses "smoke/use snus seldom more than weekly", "smoke/use snus weekly but not each day" and "smoke/use snus every day" were merged and categorized as "current smoking/snus use". The variable was denoted "tobacco".

Alcohol

A single-item question was applied to assess the participants' consumption of alcohol: "How many times have you drunk so much alcohol that you felt clearly intoxicated in the last 12 months?" with answer options: "never", "once", "2–5 times", "6–10 times" and "≥11 times". To reflect the recommendations of no alcohol use by people under 18 years of age, the variable was dichotomized into the categories "no alcohol use" and "some/regular alcohol use". The variable was denoted "alcohol".

Cannabis

For alcohol, a similar question was used to assess cannabis (hashish or marijuana) use: "How many times have you used hashish/marijuana/cannabis in the last 12 months?" with answer options: "never", "once", "2–5 times", "6–10 times" and "≥11 times". To reflect the recommendation to refrain from the use of cannabis, the variable was dichotomized into the categories "no cannabis use" and "some/regular cannabis use". The variable was denoted "cannabis".

Lifestyle risk index

To study a possible additive (dose–response) effect of multiple lifestyle risk factors on depressive symptoms, an overall lifestyle risk index was constructed. The individual lifestyle factors were given weighted risk scores: 0 (low health risk): healthy diet, active, low screen time, no tobacco use, no alcohol and no illicit substances; and 1 (high health risk): unhealthy diet, inactive, high screen time, smoking/snus use, some/regular alcohol use and some/regular illicit substance use. The risk scores were summed to form a total index (scale 0–6), categorized into low risk (0–1 risk factors present), medium risk (two risk factors present), high risk (three risk factors present) and very high risk (4–6 risk factors present) and the variable denoted "Lifestyle risk index".

Appearance satisfaction

The adolescents' appearance satisfaction was measured using the "Physical Appearance" subscale of a revised version of Harter's Self-Perception Profile for Adolescents with various features of appearance[48, 49]. The instrument contained five statements: "I am not happy with the way I look", "I wish my body were different", "I wish my physical appearance were different", "I think I am good-looking", and "I really like my looks", with response options: "describes me very poorly", "describes me quite poorly", "describes me quite well", and "describes me very well". The responses were used to compute a mean score index (0–3) for girls and boys. The index was dichotomized to low appearance satisfaction (values ≤2.0) and high appearance satisfaction (values >2.0), and the variable denoted "appearance satisfaction".

Background variables

The participants also provided information regarding gender, age (school grade), and socio-economic background (parental education level and family income).

Parental education level

The adolescents were asked whether their parents had higher education (university or university college), with answer options: "yes" and "no" for mother and father.

Family income

Family income was assessed using a subjective measure whereby the adolescents were asked whether they thought their families had experienced economic problems in the previous two years[40]. The response options were "we have been well off for the entire time", "we are normally well off", "neither well off nor badly off", "we are normally badly off", and "we have been badly off for the entire time".

Statistical analyses

Data describing gender differences in lifestyle-related behaviours, appearance satisfaction and the likelihood of depressive symptoms were analysed using cross-tabulation and Pearson's χ^2 and Fisher's exact tests. We used multiple logistic regression analysis to associate single lifestyle-related behaviours (diet, physical activity, screen time, smoking/snus, alcohol, illicit substances) and the multifactorial lifestyle risk index (independent variables) with the likelihood of depressive symptoms (the dependent variable). The individual lifestyle variables were adjusted for each other in the respective models. Odds ratios (ORs) with 95% confidence intervals (CIs) were calculated for the likelihood of depressive symptoms. We adjusted for gender, age (school grade), parental

education level, and family income in the final model. Only participants for whom there were complete data on the lifestyle variables and depressive symptoms were included in the analyses. Respondents with missing values on appearance satisfaction and adjustment variables were included with "missing" as a separate adjustment variable category. For all tests, $p < 0.05$ was considered significant. The statistical analyses were carried out using IBM SPSS Statistics for Windows v. 23.

Results

Complete data on lifestyle variables and depressive symptoms were obtained for 4379 respondents. Further background characteristics of the study population are shown in Table 1. Gender-specific distributions of the main variables are specified in Table 2. Of the participants, 51% were girls and 49% boys. Depressive symptoms were reported by 17% of the girls and 5% of the boys. Low appearance satisfaction was reported by 28% of the girls and 5% of the boys.

Significant associations between all individual lifestyle risk factors, except for diet among boys, and depressive symptoms were observed in the crude model (OR_{crude}, Table 3). After adjustment for the other individual lifestyle risk behaviours, background variables, and appearance satisfaction, the multiple logistic regression analysis (OR_{adj2}, Table 3) showed a significant association between high screen time and increased likelihood of depressive symptoms for both genders. Use of alcohol was associated with depressive symptoms among girls, while tobacco and cannabis were associated with an increased likelihood of depressive symptoms among boys (OR_{adj2}, Table 3).

An additive (dose–response) relationship was observed between the lifestyle risk index and the likelihood of depressive symptoms for both genders, the relationship being strongest among boys (OR_{adj4}) (Table 3). The association was adjusted for available background variables and appearance satisfaction. Appearance satisfaction was strongly associated with depressive symptoms in both genders, and the association was strongest among boys (OR_{adj2} and OR_{adj4}) (Table 3).

Discussion

In this study, significant gender-specific associations were observed between lifestyle risk behaviours and depressive symptoms in a sample of Norwegian adolescents. Furthermore, an additive (dose–response) relationship was observed between risk behaviours and depressive symptoms, as increasing numbers of risk behaviours were associated with an increased likelihood of depressive symptoms. The observed association was strongest among boys. Low appearance satisfaction was strongly associated with depressive symptoms in both genders, especially in boys, and was identified as an important confounder in the association between lifestyle risk and depressive symptoms, particularly among girls.

A direct comparison of our results with other studies is difficult because of different study designs, and different measures of lifestyle risk behaviours, appearance satisfaction and depressive symptoms. However, some similarities and differences can be noted. In line with previous research, important gender differences were observed in appearance satisfaction and depressive symptoms, with girls reporting low appearance satisfaction[29, 33] and depressive symptoms[2, 50] more often than boys (28% vs. 8% and 17% vs. 5%, respectively). Increased pubertal developmental challenges for girls, their dissatisfaction with weight, attainment of a mature female body and the increased importance of feminine sex role identification, may partly explain the differences[33]. Girls tended

to have a healthier diet, be less physically active, use less time on screen and use illicit substances less often than boys. Others have reported similar gender differences[26, 46].

Consistent with previous studies, high screen time use was associated with depressive symptoms for both genders[10, 13, 14]. Although media use may provide important benefits for adolescents in areas such as information seeking, learning and communication[51], potentially harmful effects should be recognized[51]. Possible negative effects relevant to depression could include exposure to harmful media content, sleep disturbance and displacing or influencing social activities[26, 51]. Furthermore, excessive screen time has been associated with unhealthy dietary habits[52] and low physical activity[53], which in turn have been associated with depressive symptoms in adolescents[10, 12, 15-17, 37]. However, in our study, adjustment for other lifestyle risk behaviours did not significantly alter the association between screen time and depressive symptoms, indicating an important independent relationship. The association may also be bidirectional, and we consider it likely that depressive symptoms may lead to increased screen activity as a coping strategy.

Our results are consistent with several previous studies in which alcohol consumption, tobacco and cannabis use have been associated with depressive symptoms among adolescents[26]. In the final adjusted models, alcohol use was associated with depressive symptoms among girls, but not among boys, while the opposite was the case for tobacco use. Boys who reported using cannabis were five times more likely to have depressive symptoms than those who never used such substances. One possible explanation for the associations between substance use and depressive symptoms is that depressive symptoms lead to adolescent self-medication[22], and that girls, in that respect, often choose traditional intoxicants like alcohol while boys choose illegal substances. Furthermore, substance use could increase the risk of depressive symptoms through adverse neurobiological responses or problematic life circumstances[26]. As other Norwegian studies[21] have found, the gender differences in alcohol and tobacco use were small, with similar trends for both genders. Overall, a minority of the adolescents reported the use of alcohol, tobacco and cannabis, in line with newly published national data[54], so this problem is only relevant within a small group of adolescents.

Unfavourable lifestyle behaviours often appear together[23, 27, 55, 56]. We observed an additive (dose–response) relationship between risk behaviours and depressive symptoms, as increasing numbers of risk behaviours were associated with an increased likelihood of depressive symptoms. This is consistent with the results of the US HYS study[23] and in line with those of the European SEYLE study[28]. The additive relationship was strongest for boys and only significant in the two upper categories of the index. This reflects the trend of stronger associations observed for boys between individual risk factors and depressive symptoms. According to the lifestyle risk index, the majority of adolescents (~80%) reported at least two risk behaviours (medium, high or very high risk scores), while almost 50% reported at least three risk behaviours (high or very high risk scores); these results suggest a need for multiple lifestyle changes.

Low appearance satisfaction was strongly associated with depressive symptoms in both genders. The likelihood of depressive symptoms was six times higher for girls and 14 times higher for boys with low appearance satisfaction compared with others. Previous studies have suggested that appearance dissatisfaction is an important contributor to gender differences in depressive symptoms[33], as girls report such problems more often than boys. Our results suggest that low appearance satisfaction could also be a serious problem among adolescent boys with

depressive symptoms. It has been suggested that a cultural shift in the 1990s and 2000s has led to increased social pressure on young men to be slim and muscular, and associations between this and low self-esteem, psychological distress and depression have been found[57, 58].

The association between low appearance satisfaction and depressive symptoms may vary according to age and developmental stage. Early adolescent girls could be particularly vulnerable to negative body image[32, 33], while boys could be more vulnerable at an older age[32, 35]. Future studies should elaborate the observed gender differences in younger and older groups of adolescents.

As other studies have suggested[11], appearance satisfaction seemed to be an important confounder in the association between lifestyle and depressive symptoms. Adjusting for appearance satisfaction attenuated several of the association estimates, especially among girls. To our knowledge, this is the first study to include appearance satisfaction as a possible attenuating factor in the study of gender differences in associations between lifestyle and depressive symptoms among adolescents. Our results suggest that improvement of appearance satisfaction should be included in measures targeted at adolescents for the prevention and treatment of depressive symptoms, and further support the inclusion of appearance satisfaction in future studies of lifestyle and depressive symptoms[11].

The strengths of the present study are the relatively large sample size and the high response rate, reducing the possibility of selection bias. The inclusion of several lifestyle behaviours has allowed for mutual adjustment and examination of both independent and additive relationships. Further advantages are the collection of information using previously validated instruments and current recommendations and the inclusion of important background variables with respect to lifestyle and depressive symptom variability[32, 33, 35, 55, 59-62].

The study also has some limitations. Participants' self-reports may entail bias attributable to misreports or errors in recollection. We adjusted for the background variables we considered important for lifestyle and depressive symptoms in adolescence. Nevertheless, we cannot exclude the possibility that other psychological, biological, socio-cultural and environmental factors that were not considered may have attenuated these associations[21, 50]. The extent of lifestyle risk behaviours and depressive symptoms normally changes throughout adolescence. Appearance dissatisfaction is often understood with reference to puberty, which occurs earlier in girls than in boys. Therefore, the gender-specific associations observed may differ among older youth. Because data collection was limited to one Norwegian county, the results are not necessarily representative of the national population[40]. Finally, owing to the study's cross-sectional design, causal associations cannot be determined.

Conclusions

High screen time appeared to be the most prevalent lifestyle risk behaviour independently associated with depressive symptoms. Furthermore, our results suggest that multiple lifestyle changes and improvement of appearance satisfaction should be included in measures targeted at adolescents in the prevention and treatment of depressive symptoms. Future studies should elaborate the observed gender differences in younger and older adolescent age groups. The findings highlight that appearance satisfaction should be acknowledged in future studies of lifestyle and depressive symptoms. Prospective studies are warranted to clarify the direction of the relationships.

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