

Physical activity, BMI and oral health behaviour among adolescents: Finnish School Health Promotion Study

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Abstract

Background: To assess associations between oral health behaviour and physical activity and related factors among adolescents.

Methods: The study population (n=76,529) consisted of a representative sample of 16–18-year-old Finnish adolescents (boys: 37,211, girls: 39,318). An anonymous, confidential and voluntary classroom-administered questionnaire included questions about tooth brushing frequency, physical activity, BMI, and eating habits. Moderate-to-vigorous physical activity (MVPA) was used to assess the adolescents' physical activity. The chi-square test and multiple binary logistic regression were used for statistical analyses. Adjusted odds ratios (OR) and their 95% confidence intervals (CI) were calculated for MVPA, BMI, breakfast, smoking, and socioeconomic factors as parents' education and school type.

Results: The prevalence of twice daily tooth brushing was highest among adolescents reporting 4 hours or more of MVPA (51–77%). Obese and smoking adolescents exercised less often than normal weighted and non-smokers. Girls brushed their teeth twice daily significantly more often than boys ($p<0.001$), and high-school students brushed their teeth significantly more often than vocational school students ($p<0.001$). Logistic regression models showed that obesity (OR = 2.14, 95% CI 1.92–2.37) and irregular breakfast eating (OR = 2.35, 95% CI 2.19–2.52) among boys, and obesity (OR = 2.81, 95% CI 2.48–3.17), physical inactivity (OR = 1.89, 95% CI 1.78–2.00), and irregular breakfast eating (OR = 1.91, 95% CI 1.79–2.04) among girls were strong predictors for poor tooth brushing.

Conclusions: Physically active adolescents had better oral health behaviour than less active adolescents. Obesity and smoking were associated with infrequent tooth brushing.

Key words: Adolescent, BMI, physical activity, oral health, gender, socio-economic status

Introduction

Many health-related habits are adopted early in childhood and adolescence, and most of them endure into adulthood.¹⁻³ Gender, parental factors (e.g. family relationships, education, socioeconomic status), and lifestyle factors influence adolescents' general and oral health, and related behaviours.⁴⁻⁶ Gender differences among adolescents are obvious: for instance, boys tend to be physically active but have poor quality diets, while the reverse is seen in girls.⁷ Girls have a higher prevalence of more-than-once-a-day tooth brushing than boys.¹ The family plays the primary role in the acquisition, modification, and improvement of health behaviours.^{8,9} Its influence on these processes is described, for example, by the "Pre-adolescent Health Behaviour Model".⁸

Social class gradients in health exist and e.g. the Health Behaviour in School-aged Children (HBSC) showed that socioeconomic inequality has increased in many domains of adolescent health in Europe.¹⁰ In the Nordic countries the HBSC study indicated that the risk for fair or poor health was higher for young people with the lowest family affluence.¹¹ Additionally, socioeconomic status has been shown to be associated with tooth brushing frequency.⁴ Health-enhancing or health-detrimental behaviours tend to co-occur in individuals.^{12,13} Lack of physical activity, sedentary behaviours, and poor dietary behaviours are associated with overweight and obesity, which are classified by Body Mass Index (BMI).^{14,15} In addition to a higher BMI, unhealthy eating habits can negatively influence oral health.^{4,16}

The prevalence of childhood overweight and obesity has increased globally in recent decades.¹⁷ The high prevalence of overweight in youth is a major public health concern, as it is known to cause both short- and long-term adverse consequences for physical and mental health.¹⁸ Moreover, overweight is associated with poor oral health behaviours, such as snacking and irregular tooth brushing frequency among young adults in Europe.¹⁹ The relationship between dental caries and obesity is contradictory;²⁰ however, it has been found that poor oral health and obesity have a common background.²¹ Overweight and obesity have been

shown to be associated with periodontitis, and furthermore periodontitis has been associated with diabetes, for example.²²

Oral health is an integral part of general health, and tooth brushing is the most effective method of care.⁶ Tooth brushing may be considered an indicator of a healthy lifestyle in general rather than just an oral health practice.^{1,4} It has also been shown that tooth brushing behaviour forms the same cluster as physical activity among patients with type 2 diabetes.²³ To our knowledge, research on the association between physical activity and oral health behaviour is scarce. Ericsson et al.²⁴ have shown that oral health- and overall health behaviours, such as no tobacco use and regular physical exercise, and individual-environmental factors are interlinked. Our general aim in this study was to assess the associations between tooth brushing frequency and physical activity and related factors (BMI, eating habits, smoking) among adolescents (boys and girls) in Finland.

Methods

This study uses data from the Finnish School Health Promotion Study (SHPS) monitoring the health, health behaviour, and well-being of 14–20-year-old adolescents (National Institute for Health and Welfare, 2016). The study population (n = 76,529) consisted of a representative sample of 16–18-year-old Finnish adolescents (boys: 37,211; girls: 39,318). The participants were in the first or second year of high school or vocational school in March-April of 2013. **The SHPS reached 77% of adolescents attending high school while the variation between provinces was from 69% to 88%.²⁵** (National data for the vocational schools was not available). **The study utilized total population sampling** and was sent to every municipality in Finland, and each municipality decided if the schools in their area will participate in the survey.²⁵ Five municipalities of the total of 320 municipalities were not willing to participate in the 2013 survey.²⁵ In Finland, high school and vocational school cover three years of education: both start after comprehensive school, typically at the age of 16 years. The Ethics Committee of the National Institute for Health and

Welfare, Finland, approved the study. The research was conducted in full accordance with the World Medical Association Declaration of Helsinki and the national requirements. Participation in the study was completely voluntary and by answering the student consented to the study.

The questionnaire

The present study included those participants who had reported their tooth brushing habits in the questionnaire. The question “How often do you brush your teeth?” determined tooth brushing frequency. The answer options were never, less than once weekly, at least once weekly but not daily, once daily, and more than once daily. For our analyses, we first formed three categories, ‘<once daily’, ‘once daily’, and ‘≥twice daily’, and then dichotomized the variable (<twice daily vs twice daily) according to the international recommendation of twice daily tooth brushing.⁶

The questionnaire asked the participants’ gender and age (birth month and year). The question “During your spare time, how many hours per week do you usually engage in physical exercise that causes shortness of breath and sweating?” assessed moderate-to-vigorous physical activity (MVPA). The answer options were none, about half an hour, about 1 hour, about 2–3 hours, about 4–6 hours, and about 7 hours or more. We used this question to form a three-class variable: ‘≤ one hour of MVPA’, ‘2–3 hours of MVPA’, or ‘≥ 4 hours of MVPA’.¹⁵ We defined BMI based on self-reported height (cm) and weight (kg) and categorized boys and girls separately: ‘Normal weight: boys <23.90 kg/m² and girls <24.37 kg/m²’; ‘Overweight: boys 23.90–28.88 kg/m² and girls 24.37–29.43 kg/m²’; and ‘Obese: boys >28.88 kg/m² and girls >29.43 kg/m²’.²⁶

The question “Which of the following alternatives best describes your current smoking habits?” assessed smoking habits (among those who had ever smoked). The response alternatives were once a day or more often, once a week or more often but not every day, less often than once a week, or no longer smoking (temporarily or permanently). In addition, the question “How many cigarettes, pipefuls and cigars have you smoked altogether?” determined never smokers – i.e. those answering ‘none’ and ‘only one’. Based on these

questions, we formed dichotomized variable for current smoking habit: ‘daily or occasional smoker’ vs ‘non-smoker’.

The following question assessed the adolescents’ breakfast eating habits: “How often do you have breakfast (other than just coffee, juice, or other drinks) during the school week?” The answer options were every morning, on 3–4 mornings, on 1–2 mornings, or less frequently. We narrowed these options down to three categories and formed the variable for breakfast eating habits (‘every morning’, ‘1–4 mornings’, ‘less often’).

The question “What is the highest educational level of your parents?” asked the parents’ highest education (separately for the mother and father). The answer options were comprehensive school or primary school; upper secondary school or vocational education institution; occupational studies in addition to upper secondary school or vocational education institution; university, university of applied sciences, or other higher education institution; and no education. We narrowed this information down to three categories by combining the first and last options into ‘basic education or less’, the second and third options into ‘upper secondary school or vocational education institution with or without occupational studies’, and taking ‘university, university of applied sciences, or other higher education institution’ (from the original categories) as the third category.

SHP Study

SHPS collects information on Finnish adolescents’ health, health behaviour, and related factors every second year.²⁷ The SHPS **employed total population sampling** and covered participants from the whole country in 2013. An anonymous, confidential, and voluntary classroom-administered questionnaire is used for data gathering: the topics include living conditions, school conditions, health, health-related behaviour, and school health services

(http://www.thl.fi/attachments/kouluterveyskysely/SHP_questionnaire_2013.pdf).

Data analysis

We first analysed the associations between the background variables and tooth brushing frequency with cross-tabulation, which we also performed separately for boys and girls. The chi-square test measured the statistical significance of the bivariate association between the variables. Multiple binary logistic regression was used for the primary statistical analyses. We stratified the regression analyses by gender and presented the results with adjusted odds ratios (OR) and their 95% confidence intervals for each explanatory/independent variable, which included school type, MVPA (the main independent variable), BMI, breakfast eating, parents' education (according to the highest reported education for the mother/father), and adolescent's smoking status. The reference category of the dichotomized outcome (dependent variable) was 'brushing teeth twice daily'. We used IBM SPSS Statistics for Windows, Version 22 (Armonk, NY: IBM Corp) for all statistical analyses.

Results

Physical activity among the Finnish 16–18-year-olds ($n = 76,113$) is shown in **Table 1**. The majority of the adolescents were not physically active; 59.4% of the boys and 66.8% of the girls reported three hours or less of MVPA weekly. Boys and high school students reported higher levels of physical activity than girls and vocational school students. Almost half (45.8%) of the vocational school students reported one hour or less of MVPA per week. The adolescents' physical activity decreased slightly with age. Students whose parents had a higher level of education reported physical activity more frequently than students whose parents had a lower level of education. Obese and smoking adolescents exercised less than normal weight and non-smoking adolescents.

Adolescents reporting 4 hours or more of MVPA weekly more often brushed their teeth twice daily than adolescents reporting less than 4 hours of MVPA weekly. More than half of the adolescents (56.5%) who brushed their teeth less frequently than daily reported one hour or less of MVPA weekly.

Boys who attended high school and those whose parents had a higher level of education brushed their teeth twice daily more often than vocational school students and those whose parents had a lower level of education ($p < 0.001$) (**Table 2**). Obese and smoking adolescents were more likely to brush their teeth less frequently than the non-obese and non-smokers. Of the boys, 13% brushed their teeth less than once a day. The girls brushed their teeth twice daily more often than the boys ($p < 0.001$) (see [tables 2 and 3](#)). The trends in tooth brushing among the girls were similar to those of the boys.

Those who ate breakfast every morning before school more frequently brushed their teeth twice a day than those who ate breakfast on 1–4 mornings or less often. The prevalence of twice daily tooth brushing among those eating breakfast every morning, 1–4 mornings, and less often was 63.6%, 45.8%, and 38.6%, respectively ($p < 0.001$, data not presented). Similar trends were found regarding eating school lunch and not eating sweet snacks.

The results of the logistic regression analyses among the boys and girls are shown in **Table 4**. Those who ate breakfast irregularly during the school week (OR = 2.35 95% CI 2.19–2.52) and were obese (OR = 2.14 95% CI 1.92–2.37) were less likely to brush their teeth twice daily than those who ate breakfast every morning and were normal weight. Furthermore, those studying at vocational school (OR = 1.79 95% CI 1.70–1.88) and reporting ‘one hour or less of MVPA’ per week (OR = 1.72 95% CI 1.63–1.82) were less likely to brush their teeth twice daily than those studying at high school and exercising 4 hours or more per week. Similar results were found among the girls (**Table 4**); obesity (OR = 2.81 95% CI 2.48–3.17) was the clearest predictor of brushing less than twice daily among the girls.

Discussion

Our study shows that physical activity is clearly associated with oral health behaviour among adolescents in Finland. Physically active adolescents' oral hygiene habits were better in comparison to their inactive peers. The strongest predictors of poor oral health behaviour were obesity and irregular breakfast eating among adolescents, regardless of gender.

The results of this study indicate that physically active adolescents are more likely to brush their teeth twice daily than less physically active adolescents. Previous studies have shown that among school-aged children, physical activity, psychosocial health, and health habits appear to be positively linked, and that physical activity is associated with positive health effects and well-being.^{28,29} According Finnish recommendations, all 7–18-year-olds should be physically active for at least 1–2 hours daily.³⁰ Physical activity decreases during the transition from late adolescence to adulthood³¹ and the result of our study supported this. However, the majority of the adolescents in transition to adulthood reported exercising less than is recommended.³⁰ This underlines the need to promote physical activity among adolescents in Finland.

In the present study, obesity and irregular breakfast eating were the strongest predictors of brushing less than twice daily, regardless of gender. Actions become habituated or 'automatic' when regularly performed in stable contexts.^{32,33} Tooth brushing and eating breakfast are habits learned at home; the parents' favourable oral health-related behaviour and breakfast eating predict the adolescent's good oral health-related behaviour^{21,34} and breakfast eating.^{35,36} 'Being in hurry' in the morning, not 'finding time' to brush their teeth, and skipping breakfast may be part of the adolescents' learned habits. This is important considering the positive associations observed between childhood overweight and the skipping of daily breakfast^{14,36} and a higher prevalence of dental caries.²⁰ Additionally, in several European countries it has been found that overweight adults more often brush their teeth infrequently compared to adults of normal weight.¹⁹ To our knowledge, there are few previous studies on the associations between diet, overweight,

and tooth brushing.^{4,19,37} In Sweden, overweight was associated with insufficient tooth brushing and skipping breakfast among 13–15-year-old boys.³⁷ In Scotland, eating breakfast was found to be the best predictor of twice daily tooth brushing among 11–15-year-olds.⁴ The results of the present study are in concordance with these previous studies.

Socioeconomic status (SES) is considered a good predictor of adolescent health and health behaviours,¹⁰ and educational level is a commonly used indicator for SES in Finland. The parents' high level of education predicted their children's good oral health habits.¹ Conversely, adolescents' lower educational level has been positively associated with physical inactivity,³⁸ infrequent tooth brushing,²¹ and a higher prevalence of tobacco and alcohol consumption⁵ when comparing vocational school students with high school students. Parents' example and support for good oral health behaviour are obviously vital for the children. The results of this study are in concordance with the findings of previous studies revealing SES-physical activity and SES-oral health behaviour associations.^{1,21,38} The accumulation of health-detrimental behaviours, in particular among vocational school students, are reasons for concern.

Smoking, obesity, low physical activity, and poor oral hygiene habits have been associated with diabetes²² and cardiovascular diseases (CVDs).³⁹ Quitting smoking and increasing physical activity are important for improving general and oral health. However, we should also consider the importance of oral health behaviours in preventing problems of general and oral health.^{28,40} Periodontitis has been shown as a risk indicator for atherosclerotic cardiovascular diseases,³⁹ and a two-way relationship between diabetes and periodontitis has been found (with diabetes increasing the risk for periodontitis, and periodontal inflammation negatively affecting glycaemic control).²² Additionally, frequent tooth brushing and regular physical activity have been positively associated with improved control of type 2 diabetes (DM2).²³ Thus, oral health together with physical activity may have an important role in CVDs^{29,40} and DM2.²³ In order to prevent general and oral health problems, physicians, dentists, and other healthcare professionals should work together to ensure adolescents' favourable health habits. This might also reduce health inequalities

between socioeconomic groups, which is on the political agenda worldwide, (e.g. UN Sustainable Developmental Goals #3 and # 10;

<http://www.un.org/sustainabledevelopment/sustainable-development-goals/>). Our study may provide a new insight in terms of promoting a multidisciplinary approach to reduce the SES gap in both physical activity and oral health behaviour for future health outcomes.

Evidence regarding the association between physical activity and oral health behaviour is scarce. The strengths of this study were: the Finnish School Health Promotion Study **utilizes total population sampling thus providing profound insight and** reaches approximately 70% of 16–18-year-old adolescents attending upper secondary schools. The gender distribution in the study was equal, and because of the large sample size in our study, the findings can be generalized to all Finnish 16–18-year-old adolescents. The **substantial** sample size also makes our study comparable to international surveys studying adolescents' oral health behaviour. Tooth brushing frequency is the best measure of oral health behaviour²⁰ and it also reveals use of fluoride since all toothpaste in Finland contain fluoride. Self-reported outcome measures might be susceptible to socially desirable answering and thus considered as a weakness of the study. However, the students participated in this study voluntarily and the answers were anonymous, thus the responses can be considered reliable. **The non-response was low; the main reason for not participating in the SHPS was absence from school during the study day.**²⁵ Self-reported height and length has also been shown to be a reliable measure.¹⁷ The cross-sectional design of this study limits the results to associations evident at a specific point in time and precludes any conclusions regarding causality. Additional stratified cross-tabulation analyses confirmed the main findings concerning physical activity, BMI, and tooth brushing frequency. Given that the School Health Survey takes place continuously, it offers an opportunity for future analyses of trends over time.

In conclusion, physically active adolescents had better tooth brushing habits than less active adolescents. In addition, eating habits, obesity and SES were related to tooth brushing. Among boys eating breakfast

irregularly and obesity among girls were the clearest predictors of less than twice daily tooth brushing, and students of vocational schools were at risk of having poor oral health behaviour. The present study findings should be taken into account in health promotion activities targeting Finnish adolescents. Inequalities in health between socioeconomic groups could be reduced by improving favourable health habits, especially among adolescents engaged in vocational education.

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Conflict of interest

None declared.

Key points

- **Physically active adolescents and those who frequently eat breakfast had better oral health behaviour**
- **Obesity was associated with infrequent tooth brushing**
- **Inequalities in health between socioeconomic groups could be reduced by improving favourable health habits**

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Table 1. Physical activity among Finnish 16-18-year-olds (n=76 113) by their gender, school type, age, parents' education level, tooth brushing frequency, BMI, and smoking.

| | Physical activity | | | Total n (column %) | P value ^a |
|---------------------------|-----------------------------|----------------------|----------------------------|-----------------------|----------------------|
| | One hour or less of MVPA | 2-3 hours of MVPA | 4 hours or more of MVPA | | |
| | row % | row % | row % | | |
| Gender | | | | | |
| Boy | 34.8 | 24.6 | 40.7 | 36 966 (48.6) | <0.001 |
| Girl | 36.6 | 30.2 | 33.2 | 39 147 (51.4) | |
| School type | | | | | |
| High School | 28.9 | 28.1 | 43.0 | 45 440 (59.7) | <0.001 |
| Vocational School | 45.8 | 26.5 | 27.7 | 30 673 (40.3) | |
| Age | | | | | |
| 16 years | 34.0 | 27.7 | 38.3 | 23 924 (31.4) | <0.001 |
| 17 years | 35.0 | 27.8 | 37.2 | 36 681 (48.2) | |
| 18 years | 39.9 | 26.4 | 33.7 | 15 508 (20.4) | |
| Parents' education | | | | | |
| BE or less | 50.8 | 25.6 | 23.6 | 4324 (5.8) | <0.001 |
| SEC | 40.4 | 27.9 | 31.7 | 34 575 (46.3) | |
| TER | 29.1 | 27.4 | 43.5 | 35 771 (47.9) | |
| Tooth brushing | | | | | |
| < Once daily | 56.5 | 21.4 | 22.1 | 6203 (8.1) | <0.001 |
| Once daily | 40.8 | 26.7 | 32.5 | 27 967 (36.7) | |
| Twice daily | 29.2 | 28.8 | 41.9 | 41 943 (55.1) | |
| BMI | | | | | |

| | | | | | |
|---------------------|-------------|-------------|-------------|---------------------|--------|
| Normal weight | 34.3 | 27.8 | 37.9 | 56 189 (77.5) | <0.001 |
| Overweight | 36.1 | 26.7 | 37.2 | 12 688 (17.5) | |
| Obese | 50.0 | 26.3 | 23.7 | 3656 (5.0) | |
| Smoking | | | | | |
| Daily or occasional | 40.0 | 27.2 | 32.7 | 27 110 (36.0) | <0.001 |
| Non-smoker | 33.4 | 27.6 | 39.0 | 48 182 (64.0) | |
| Total | 35.7 | 27.5 | 36.8 | 76 113 (100) | |

BE=Basic education; SEC=High school, vocational school, occupational studies; TER=University, polytechnics; MVPA=Moderate-to-vigorous physical activity

^aFrom χ^2 test

Table 2. Finnish boys' (n=37 211) tooth brushing frequency by their age, school type, parents' education, physical exercise, BMI and smoking status.

| | Tooth brushing | | | Total n (column %) | P value^a |
|---------------------------|-----------------------|---------------------|----------------------|-----------------------|----------------------------|
| | < Once daily row % | Once daily row % | Twice daily row % | | |
| Age | | | | | |
| 16 years | 12.9 | 45.0 | 42.1 | 11 545 (31.0) | 0.001 |
| 17 years | 13.2 | 44.9 | 41.9 | 17 994 (48.4) | |
| 18 years | 14.7 | 45.4 | 40.0 | 7672 (20.6) | |
| Total | 13.4 | 45.0 | 41.6 | 37 211 (100) | |
| School type | | | | | |
| High School | 7.9 | 39.9 | 52.2 | 19 693 (52.9) | <0.001 |
| Vocational School | 19.6 | 50.8 | 29.6 | 17 518 (47.1) | |
| Total | 13.4 | 45.0 | 41.6 | 37 211 (100) | |
| Parents' education | | | | | |
| BE or less | 31.3 | 40.9 | 27.8 | 2163 (5.9) | <0.001 |
| SEC | 15.1 | 48.8 | 36.1 | 16 643 (45.8) | |
| TER | 9.4 | 42.0 | 48.6 | 17 571 (48.3) | |
| Total | 13.3 | 45.1 | 41.6 | 36 377 (100) | |
| Physical exercise | | | | | |
| One hour or less of MVPA | 21.1 | 48.2 | 30.7 | 12 853 (34.8) | <0.001 |
| 2-3 hours of MVPA | 11.9 | 46.4 | 41.8 | 9077 (24.6) | |
| 4 hours or more of MVPA | 7.7 | 41.7 | 50.6 | 15 036 (40.7) | |
| Total | 13.4 | 45.1 | 41.5 | 36 966 (100) | |
| BMI | | | | | |

| | | | | | |
|---------------|------|------|------|---------------|--------|
| Normal weight | 10.9 | 43.9 | 45.2 | 25 167 (70.7) | <0.001 |
| Overweight | 14.2 | 48.7 | 37.1 | 7951 (22.3) | |
| Obese | 31.8 | 46.0 | 22.1 | 2468 (6.9) | |
| Total | 13.1 | 45.1 | 41.8 | 35 586 (100) | |

Smoking

| | | | | | |
|---------------------|------|------|------|---------------|--------|
| Daily or occasional | 18.2 | 48.7 | 33.1 | 13 167 (35.9) | <0.001 |
| Non-smoker | 10.7 | 43.1 | 46.2 | 23 544 (64.1) | |
| Total | 13.4 | 45.1 | 41.5 | 36 711 (100) | |

BE=Basic education; SEC=High school, vocational school, occupational studies; TER=University, polytechnics; MVPA=Moderate-to-vigorous physical activity

^aFrom χ^2 test

Table 3. Finnish girls' (n=39 318) tooth brushing frequency by their age, school type, parents' education, physical exercise, BMI and smoking status.

| | Tooth brushing | | | | P value^a |
|---------------------------|-----------------------|---------------------|----------------------|-----------------------|----------------------------|
| | < Once daily row % | Once daily row % | Twice daily row % | Total n (column %) | |
| Age | | | | | |
| 16 years | 3.1 | 28.2 | 68.7 | 12 515 (31.8) | 0.012 |
| 17 years | 3.2 | 28.7 | 68.1 | 18 886 (48.0) | |
| 18 years | 3.2 | 30.4 | 66.4 | 7917 (20.1) | |
| Total | 3.2 | 28.9 | 68.0 | 39 318 (100) | |
| School type | | | | | |
| High School | 2.0 | 24.8 | 73.2 | 26 057 (66.3) | <0.001 |
| Vocational School | 5.5 | 36.9 | 57.7 | 13 261 (33.7) | |
| Total | 3.2 | 28.9 | 68.0 | 39 318 (100) | |
| Parents' education | | | | | |
| BE or less | 7.5 | 33.9 | 58.6 | 2193 (5.7) | <0.001 |
| SEC | 3.8 | 32.3 | 63.9 | 18 072 (46.7) | |
| TER | 2.1 | 24.9 | 73.0 | 18 399 (47.6) | |
| Total | 3.2 | 28.9 | 67.9 | 38 664(100) | |
| Physical exercise | | | | | |
| One hour or less of MVPA | 5.5 | 36.5 | 58.1 | 14 331 (36.6) | <0.001 |
| 2-3 hours of MVPA | 2.1 | 27.6 | 70.2 | 11 826 (30.2) | |
| 4 hours or more of MVPA | 1.6 | 21.7 | 76.8 | 12 990 (33.2) | |
| Total | 3.2 | 28.9 | 67.9 | 39 147 (100) | |
| BMI | | | | | |

| | | | | | |
|---------------|------|------|------|---------------|--------|
| Normal weight | 2.5 | 26.8 | 70.7 | 31 316 (83.9) | <0.001 |
| Overweight | 5.0 | 36.9 | 58.0 | 4793 (12.8) | |
| Obese | 13.5 | 45.3 | 41.2 | 1202 (3.2) | |
| Total | 3.1 | 28.7 | 68.1 | 37 311 (100) | |

Smoking

| | | | | | |
|---------------------|-----|------|------|---------------|--------|
| Daily or occasional | 4.3 | 32.3 | 63.3 | 14 086 (36.1) | <0.001 |
| Non-smoker | 2.5 | 27.0 | 70.5 | 24 886 (63.9) | |
| Total | 3.2 | 28.9 | 67.9 | 38 972 (100) | |

BE=Basic education; SEC=High school, vocational school, occupational studies; TER=University, polytechnics; MVPA=Moderate-to-vigorous physical activity

^aFrom χ^2 test

Table 4. Logistic regression models for factors associated with boys' (n=34 203) and girls' (n=36 591) poor tooth brushing^a.

| | Boys | | Girls | |
|---------------------------|-------------|---------------|--------------|---------------|
| | OR | 95% CI | OR | 95% CI |
| School type | | | | |
| High School | 1.00 | | 1.00 | |
| Vocational School | 1.79 | (1.70–1.88) | 1.41 | (1.34–1.49) |
| Parent's education | | | | |
| BE or less | 1.37 | (1.23–1.53) | 1.26 | (1.14–1.40) |
| SEC | 1.22 | (1.16–1.28) | 1.20 | (1.14–1.26) |
| TER | 1.00 | | 1.00 | |
| Physical exercise | | | | |
| One hour or less of MVPA | 1.72 | (1.63–1.82) | 1.89 | (1.78–2.00) |
| 2-3 hours of MVPA | 1.22 | (1.16–1.30) | 1.24 | (1.17–1.32) |
| 4 hours or more of MVPA | 1.00 | | 1.00 | |
| BMI | | | | |
| Normal weight | 1.00 | | 1.00 | |
| Overweight | 1.30 | (1.23–1.37) | 1.63 | (1.53–1.74) |
| Obese | 2.14 | (1.92–2.37) | 2.81 | (2.48–3.17) |
| Smoking | | | | |
| Daily or occasional | 1.25 | (1.19–1.31) | 1.05 | (1.00–1.10) |
| Non-smoker | 1.00 | | 1.00 | |
| Breakfast | | | | |
| Every 5 mornings | 1.00 | | 1.00 | |

| | | | | |
|--------------|------|-------------|------|-------------|
| 1-4 mornings | 2.04 | (1.93–2.16) | 1.64 | (1.56–1.74) |
| Less often | 2.35 | (2.19–2.52) | 1.91 | (1.79–2.04) |

BE=Basic education; SEC=High school, vocational school, occupational studies;

TER=University, polytechnics; MVPA=Moderate-to-vigorous physical activity

^aReference = twice daily.