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ORIGINAL ARTICLE

Association between dental fear, physical activity and physical and mental well-being among Finnish university students

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ABSTRACT

Objective: The aim of this study was to evaluate the association between physical and mental well-being and physical activity with dental fear among university students in Finland.

Methods: We used the 2016 data from the Finnish student health survey ($n = 3090$). Perceived physical and mental well-being was ascertained with the questions 'How would you describe your current state of physical well-being?' and 'How would you describe your current state of mental well-being'. Dental fear was inquired with question 'Do you feel scared about dental care?' Associations between physical and mental well-being and dental fear were analyzed with cross tabulations and logistic regression analysis.

Results: When controlling for age, gender, educational sector, tobacco and alcohol use, those reporting poor or moderate physical or mental well-being were more likely to have high dental fear than were those reporting good physical or mental well-being.

Conclusions: In addition to mental well-being, physical well-being was also associated with dental fear; those with poor or moderate physical well-being were more likely to have dental fear than were those with good physical well-being.

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Introduction

Physical and psychological health and well-being are connected, and physical activity has multiple beneficial health effects [1,2]. Also, among students physical activity has been connected with health protective factors; it has been reported e.g. to reduce anxiety and depression [2–4].

In Finland, every third adult has reported dental fear [5] and women report dental fear more often than men [5–7]. Among students the prevalence of high dental fear has varied 0,5–32% [6,8,9]. People with high dental fear have more often reported other psychological problems, such as anxiety and depression disorders, than people with lower levels of dental fear [7,10]. Dental fear has also been connected with regular alcohol and tobacco use [7,9]. Although, physical activity reduces anxiety in general [3,4], according to our knowledge, there is only one study where the association between dental fear and physical activity has been studied. In this recent randomized controlled trial study, aerobic exercise reduced clinical dental anxiety [11].

Smoking, alcohol use and physical activity behaviors are associated with gender and socioeconomic differences [12]. Lower socioeconomic position in early life has been associated with less physical activity in adulthood [13]. Young women have reported lower levels of physically activity than young men [14]. This is also the case in the university student population, where men have reported being physically active more often than women [15]. Smoking and alcohol use have been more commonly reported by men and people with low socioeconomic status than by women and people with high socioeconomic status [9,16–18].

When starting university studies students enter a new life situation, where they have responsibility for their everyday habits. Especially health habits including physical activity, alcohol and tobacco use can change and this may have impacts on health behaviors later in life [19–21]. The aim of this study was to evaluate the association between perceived physical and mental well-being and physical activity with dental fear, when controlling for age, gender, educational sector, alcohol - and tobacco use among university students in Finland. Our hypothesis was that physical and mental well-being and physical activity are associated with dental fear and physically active students have lower levels of dental fear than less physically less active students.

Materials and methods

The Finnish Student Health Service (FSHS) conducts a national University Student Health Survey (USHS) every four years. The latest survey was done in 2016 and in this study, we use the data from that cross-sectional survey. The authorities of FSHS and the Ethics Committee of the University of Turku gave permission for the study [22].

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The target population consisted of Finnish undergraduate students, aged under 35 years and studying in Finnish universities (Univ) or universities of applied sciences (UAS). The sample included 10,000 students (Univ 4,996; UAS 5,004) with 47.7% of them being male (Univ 46.7%; UAS 48.0%). Potential respondents received an initial invitation and five reminders; four by e-mail, the third reminder also served as a repeat survey and was sent as a posted questionnaire in paper format. The overall response rate was 31% (Univ 39%; UAS 25%). The response rate was 22% for men (Univ 29%; UAS 16%) and 39% for women (Univ 45%: UAS 32%). Except for the underrepresentation of men, the respondents represented well the target population. The respondents were compared with the national statistics of university students collected by the Ministry of Education in Finland (e.g. for age, educational sector, Univ, UAS, Uviv faculty and UAS degree program). In addition, the USHS 2016 study findings regarding health and health habits were compared with the results of previous USHS studies [23]. The correction of the underrepresentation of men was done with weighting adjustments (for gender, separately for the educational sectors); after this, the data included 1451 men and 1626 women and represented the target population (men 47% and women 53%). For the analyses, age was categorized into six groups: 19–21, 22–24, 25–27, 28–30, 31–33 and $>$33 years.

Perceived physical and mental well-being was assessed with the questions 'How would you describe your current state of physical well-being (e.g. physical health)?' and 'How would you describe your current state of mental well-being (e.g. mental balance)'. Both questions had answer options 'Very poor', 'Poor', 'Moderate', 'Good' and 'Very good'. Later these answer options were combined into two categories: 'Poor or moderate' (including options 'Very poor', 'Poor' and 'Moderate') and 'Good or very good' (including options 'Good' and 'Very good'). In the previous USHS studies, perceived health was inquired with the question 'How would you rate your own health?' The questions used in the present study were included in the USHS in 2012. The questions separating physical and mental health were found to be more informative and were selected for the USHS in 2016. Since these questions directly refer to 'physical health' or 'mental balance', they can be considered as measures of perceived physical or mental well-being [23].

Physical activity was examined with the question 'How often do you engage in free-time physical activity for a minimum of half an hour so that you sweat and become at least slightly short of breath (e.g. jogging, cycling, gymnastics, swimming, ball games)?' Answer options were 'Never or very seldom', '1–3 times a month', 'Once a week', '2–3 times a week', '4–6 times a week' and 'Daily'. These answer options were later combined into two categories: 'Once a week or less often' (including options 'Never or very seldom', '1–3 times a month' and 'Once a week') and 'Two times a week or more often' (including options '2–3 times a week', '4–6 times a week' and 'Daily'). This was done to follow the international public health guidelines, which are also used in Finland as recommendations for healthy physical activity [24,25]. In the Finnish national surveys of university students' health habits the questions concerning physical activity have been the same since 2000, originating from the Health Behaviour and Health among Adults survey [26].

Dental fear was assessed with the question 'Do you feel scared about dental care?' Answer options were 'Not at all', 'Somewhat' and 'Very'. The alternatives 'Not at all' and 'Somewhat' were latter combined into a category 'No or low dental fear' and 'Very' was used as the category for 'High dental fear'. This categorization was because high dental fear has the most severe clinical consequences e.g. for dental attendance and dental health. Measuring dental fear with single questions has been shown to be valid and reliable [27].

Smoking behavior was examined using the question 'Do you smoke?' and snuff use with question 'Do you use snuff?' Answer options to both questions were 'Not at all', 'Yes previously but I have quit', 'Less than once a week', 'Weekly but not daily' and 'Daily'. Later two categories were used: 'Not at all or having quit' (including answer options 'Not at all' and 'Yes previously but I have quit'), and 'Yes' (answer options 'Less than once a week', 'Weekly but not daily' and 'Daily'). Later, the questions of smoking and snuff use were combined into 'Tobacco use' with two answer categories: 'Not at all or having quit' and 'Yes'; these categories included the same answer options as the questions of smoking and snuff use. Alcohol consumption was examined using the AUDIT questionnaire, which is a 10-item questionnaire that covers alcohol consumption, drinking behavior and alcohol-related problems [28]. The answer options were 'Never', 'About once a month or less', '2–4 times a month', '2–3 times a week' or '4 times a week or more often'. We combined the results into two classes that were AUDIT score $\leq$ 7 (indicating non-hazardous alcohol consumption) and AUDIT score $\geq$ 8 (indicating hazardous and harmful alcohol consumption) [28]. AUDIT has been shown to be a valid and reliable measurement of alcohol use [28–30].

Statistical analyses

Bivariate associations between dental fear and perceived physical and mental well-being, physical activity, alcohol use, smoking, snuff use and tobacco use, age, gender, educational sector (Academic universities or Universities of applied sciences) were evaluated using cross-tabulations. Chi-square tests were used to evaluate the statistical differences of these bivariate associations. After checking the collinearities logistic regression analysis was conducted with dental fear as the dependent variable along with perceived physical and mental well-being, physical activity, age, gender, educational sector, alcohol - and tobacco use were entered in the model as covariates. The final model included all confounders, values of $p < .05$ were considered statistically significant. Weighting adjustments were used in the analyses to correct the underrepresentation of men in the data. IBM SPSS Statistics for Windows, Version 22 (Armonk, NY, IBM Corp.) was used for all analyses.

Results

The distribution of participants according to their background factors, perceived physical and mental well-being, physical activity, alcohol use, tobacco use (smoking, snuff use) are shown in Table 1. One third of the students reported that their mental well-being was moderate, poor or very poor and almost one fourth reported that their physical well-being was moderate, poor or very poor. Men reported good or very good physical or mental well-being more often than women. Almost half of the students exercised once a week or less. Men exercised 4–6 times a week or daily more often than women. No gender differences in smoking were seen, but men reported snuff use more often. Men's tobacco use (smoking and snus use) was higher than women's ($p < .001$). Men also reported hazardous, harmful or dependent alcohol use more often than women.

Women reported high dental fear (Table 2) more commonly than men. Students who reported very poor, poor or moderate physical or mental well-being had high dental fear more often than students who reported good or very good physical or mental well-being. Students exercising once a week or less often had more commonly high dental fear than students exercising two times or more often a week; one exception was students who exercised daily; almost one out of ten (9.4%) of the daily exercising students had high dental fear. Smokers reported high dental fear more often than non-smokers. Students using snuff (Table 3) exercised more often at least two times a week compared to those not using snuff, while smokers exercised at least two times a week less commonly than those who had quitted smoking or had never smoked. Students exercising at least two times a week reported good or very good physical and mental well-being more often than students exercising once or less often per week.

In the logistic regression analyses (Table 4), when age, gender, educational sector, alcohol - and tobacco use were controlled for, those reporting poor or moderate physical or mental well-being were more likely to have high dental fear compared to those reporting good physical or mental well-being. Free-time physical activity was not statistically significantly associated with dental fear. In gender-specific logistic regression analyses among women, physical well-being was associated with dental fear; those reporting poor or moderate physical well-being were more likely to have high dental fear than those reporting good physical well-being. Among men, physical well-being was not associated with dental fear, but mental well-being was. Men who reported poor or moderate mental well-being were more likely to have high dental fear compared with those reporting good mental well-being.

Discussion

Students reporting poor or moderate physical or mental well-being were more likely to have high dental fear than students reporting good physical or mental well-being, when controlling for age, gender, educational sector, alcohol - and tobacco use. Frequent physical activity has been positively associated with good perceived mental well-being [31,32] and our results support these previous studies where physical inactivity appears to be associated with psychological disorders, e.g. anxiety [2–4,33].

In the present study, we found an association between physical activity and dental fear. Students who exercised once per week or less reported more commonly high dental fear than students who exercised two or more times during a week, but this was not confirmed in the multivariable analyses. The Lindenberger et al. [11] study, which detected that aerobic exercise reduced clinical dental anxiety, was conducted among patients having dental fear. Majority of the studies of physical activity have showed greater physical activity among those in higher socioeconomic groups [13–16]. As this study was conducted among university students [13–16] it is possible that a positive association between physical activity and dental fear could have been found among the general population. Additionally, as there are gender differences in physical activity and dental fear (men reporting physically activity more often than women [15,16] and women reporting dental fear more often than men [5–7]); it could be possible that associations between physical activity and dental fear were diluted by the gender differences. Although, we did not find a significant association between physical activity and dental fear in the logistic regression analysis, the fact that those with poor or moderate physical well-being were more likely to have high dental fear supports the possible additional role of physical activity in moderating of dental fear among some fearful patients.

According to health guidelines for adults (appropriate for university students) at least 150 min of moderate intensity aerobic activity in a week or 75 min of vigorous aerobic activity in a week is recommended [24,25]. In our study, rarely or not at all exercising students reported more often high dental fear than students who exercised regularly. This supports the findings of previous studies where physical activity has reduced anxiety [2–4]. In this study, the prevalence of high dental fear was lowest among students who reported exercising 4–6 times a week. However, interestingly, students exercising daily reported high dental fear more often than students exercising six times or less in a week. Dental fear is very often a matter of lack of control when visiting a dentist [34]. It might be possible that students exercising daily want to have a strong control in their life (e.g. physical health and/or their weight) and they reported dental fear because they do not have enough feeling of control when visiting a dentist. These people needing strong control, exercising daily and having high dental fear might belong to the group of 'constitutional vulnerability' to dental fear [7,35].

Among the Finnish university students, those reporting poor or moderate mental well-being were more likely to have high dental fear than were those reporting good mental well-being. This is in line with previous studies where e.g. those with anxiety and depressive disorders have reported dental fear more often than those without these disorders [7,10]. In the gender-specific models in our study, the association between mental well-being and dental fear was found among men. As men were exercising more frequently than

Table 1. Description of the data ($n = 3077$) according to background factors, physical and mental wellbeing, physical activity, alcohol use, smoking, snuff and tobacco use.

	All (%)	Men (%)	Women (%)	*p*-value[a]
Age				
19–21 years	13.8	11.8	15.7	0.003
22–24 years	36.5	35.5	37.5	
25–27 years	27.4	29.3	25.6	
28–30 years	13.4	15.0	11.9	
31–33 years	7.0	6.6	7.3	
33–35 years	1.9	1.8	2.0	
Educational sector				
Universities of applied sciences	40.6	41.3	39.9	
Academic universities	59.4	58.7	60.1	0.440
Physical wellbeing				
Very poor	0.2	0.1	0.3	
Poor	3.3	3.5	3.2	
Morerate	20.9	19.7	22.0	<.001
Good	55.7	52.5	58.5	
Very good	20.0	24.3	16.1	
Mental wellbeing				
Very poor	1.3	1.4	1.2	
Poor	8.3	9.2	7.4	
Morerate	25.1	23.6	26.5	0.003
Good	44.9	44.9	48.5	
Very good	20.9	20.9	16.4	
Freetime physical activity (at least 0.5 h each time)				
Never or very seldom	11.5	12.3	10.7	
1–3 times a month	14.3	13.4	15.2	
Once a week	19.0	17.6	20.2	0.008
2–3 times a week	32.1	30.9	33.1	
4–6 times a week	19.9	22.5	17.7	
Daily	3.1	3.3	3.0	
AUDIT score				
≤ 7	68.4	59.8	76.1	<.001
≥ 8	31.6	40.2	23.9	
Smoking				
Not at all or quitted	83.6	84.2	83.1	0.428
Yes	16.4	15.8	16.9	
Snuff use				
Not at all or quitted	91.2	84.0	97.5	<.001
Yes	8.8	16.0	2.5	
Tobacco use				
Not at all or quitted	77.7	73.3	81.6	<.001
Yes	22.3	26.7	18.4	

[a]Chi-square test.

women did (which is in concordance with earlier studies [14]), it was not surprising that among men not physical well-being, but mental well-being was associated with dental fear.

In previous studies gender and smoking have been associated with dental fear [7,9,36]. Also, in this study women and smokers were more likely to experience high dental fear compared men and non-smokers, but there was no difference in prevalence of high dental fear among snuff users. Smoking and snuff use were combined into tobacco use because of nicotine; nicotine dependence has been associated with anxiety disorders [37]. In several previous studies men have reported smoking more frequently than women [9,38]. In our study women smoked as often as men, but men were using snuff more often than women were. The overall tobacco use was more common among men than among women, which is in line with previous studies [9,18]. Gender differences in dental fear, smoking and snuff use could explain the difference in the associations between dental fear, smoking and snuff use. Students who used snuff reported exercising at least twice a week more often than those who did not use snuff. There is a contradiction between being sportive and smoking—a smoking athlete does not look good; this might be one reason why physically active individuals use snuff more often than physically less active. We also often see our top athletes (e.g. ice hockey players) using snuff. As adolescents tend to imitate their idols, they may in this way learn snuff use behavior. It was interesting that in this study women were smoking as often as men, which is partly explained by the men's snuff use. However, in previous studies, those with higher educational levels have reported smoking less frequently than those with lower levels of education [17]. As our study was conducted among university students, the educational level of the study population might also have diminished the gender differences in smoking.

In Finland, the first educational differentiation takes place at the age of 15–16 when pupils enter high school or vocational school. The second differentiation occurs at the age of 18–19, when students enter academic universities, universities of applied sciences, further vocational studies or working life. It is important to study young adults as the period between adolescence and adulthood is related with many health risks, e.g. addictive behaviors are most likely to develop in this part of life [20,21] and the decline in physical activity is biggest when adolescents transit into adulthood [19]. Subjective measurement of physical activity might cause overestimation

Table 2. Dental fear ($n = 3014$) according to background factors, physical and mental wellbeing, physical activity, alcohol use, smoking, snuff and tobacco use.

	Dental fear			
	None (%)	Some (%)	Very much (%)	*p*-value[a]
Gender				
Men	66.3	29.9	3.8	<.001
Women	53.2	35.6	11.2	
All	59.3	32.9	7.8	
Age				
19–21 years	58.5	34.0	7.5	0.687
22–24 years	57.0	34.9	8.1	
25–27 years	59.0	33.8	7.2	
28–30 years	56.1	34.5	9.4	
31–33 years	55.7	32.3	11.9	
33–35 years	60.7	28.6	10.7	
Educational sector				
University of applied sciences	56.9	33.6	9.5	0.006
Academic universities	61.0	32.4	6.6	
Physical wellbeing				
Very poor-Moderate	54.9	33.5	11.6	<.001
Good or very good	60.9	32.6	6.4	
Mental wellbeing				
Poor or moderate	54.1	35.3	10.6	<.001
Good or very good	62.2	31.6	6.2	
Freetime physical activity (at least 0,5h each time)				
Never or very seldom	57.3	31.3	11.4	
1–3 times a month	51.5	39.2	9.3	
Once a week	63.3	29.4	7.3	<.001
2–3 times a week	61.4	31.5	7.1	
4–6 times a week	57.4	37.0	5.6	
Daily	66.7	24.0	9.4	
Audit score				
≤7	60.4	32.1	7.4	0.175
≥8	56.8	35.1	8.1	
Tobacco use				
Not at all or quitted	60.8	32.6	6.7	<.001
Yes	54.9	33.6	11.5	
Smoking				
Not at all or quitted	60.9	32.4	6.7	
Yes	52.0	35.2	12.8	<.001
Snuff use				
Not at all or quitted	59.1	33.1	7.8	
Yes	64.9	28.7	6.4	0.177

[a]Chi-square test.

Table 3. Participants' freetime physical activity ($n = 3056$) according to physical and mental wellbeing, alcohol use, smoking, snuff and tobacco use.

	Freetime physical activity (at least 0,5 h at a time)		
	Once a week or less often	Two times a week or more often	*p*-value[a]
Physical wellbeing			
Poor or moderate	73.9	26.1	<.001
Good or very good	35.7	64.3	
Mental wellbeing			
Poor or moderate	55.7	44.3	<.001
Good or very good	39.3	60.7	
Smoking			
Not at all or quitted	42.5	57.5	<.001
Yes	55.1	44.9	
Snuff use			
Not at all or quitted	45.7	54.3	0.004
Yes	36.6	63.4	
Tobacco use			
Not at all or quitted	43.2	56.8	0.005
Yes	49.3	50.7	
AUDIT score			
≤7	45.9	54.1	0.053
≥8	42.2	57.8	

[a]Chi-square test.

of physical activity, in general when using perceived measures people tend to over-report physical activity and underestimate sedentary pursuits [39].

The considerably large sample was collected from all academic universities and universities of applied sciences in Finland. The health inquiry was answered by 31% of the

Table 4. Results of logistic regression analyses for all participants and separated gender specific results of logistic regression analyses for women and men, dental fear as dependent variable (very afraid = 1).

			95% CI	
	Sig.	Exp (B)	Lower	Upper
All (n=3014)				
Physical well-being	0.022	1.5	1.1	2.1
Mental well-being	0.026	1.4	1.0	1.9
Gender	<0.001	3.7	2.7	5.2
Educational sector	0.020	1.4	1.1	1.9
Tobacco use	<0.001	2.0	1.4	2.7
Constant	<0.001	0.021		
Women (n = 1607)				
Physical well-being	0.036	1.5	1.0	2.2
Tobacco use	0.002	1.8	1.3	2.7
Educational sector	0.005	1.6	1.1	2.2
Age	0.015	0.5	0.3	0.9
Constant	<0.001	0.078		
Men (n = 1407)				
Mental well-being	0.030	2,0	1.1	3.6
Tobacco use	0.005	2.5	1.3	4.7
Constant	<0.001	0.020		

Variables entered in the model: Physical well-being (poor or moderate = 1), Mental well-being (poor or moderate = 1), Physical activity (once a week or less often = 1), Age (19-21 = 1 years), Gender (women = 1), Educational sector (UAS = 1), Alcohol use (AUDIT score 8 or more = 1) and Tobacco use (yes = 1).
All: Nagelkerke R2 = 0.092.
Woman: Nagelkerke R2 = 0.059.

university students, which can still be considered as a good participation in a web survey. According to a meta-analysis, the mean response rate in the web survey was 34% [40]. However, the response rate especially among our male UAS students was low and thus we have a challenge in motivating young men to participate in surveys. The electronic questionnaire used in this study has both positive and negative features; in patient studies, participants seem to prefer electronic formats in reporting outcomes [41]. It might be hard to answer a long questionnaire on your own, but it may be easier to answer questions related to your personal problems (dental fear, tobacco and alcohol use) when using electronic questionnaires. Except for the underrepresentation of men, the respondents represented well the target population. In Finland 47% of the university students are men and the underrepresentation of men in the data could have caused some bias. However, in this study, weighting adjustments were used and the data presented the target population. When comparing the USHS 2016 study findings regarding health and health habits with the results of previous USHS studies, no significant trends downwards or upwards were seen [23]. The lack of such alterations supports the fact that the composition of the respondents has not essentially changed.

Our study did not include those who did not study in academic universities or universities of applied sciences, thus we do not know how dental fear and physical well-being, or physical activity are associated among the whole young adult population. For measuring dental fear single questions has been shown to be valid and reliable [27]; the AUDIT questionnaire has been shown to be reliable and valid for asking about alcohol use [28–30]. Since this study is cross sectional, no causal interpretations can be made.

Conclusions

In addition to mental well-being, also physical well-being was connected to dental fear; those reporting poor physical well-being were more likely to have dental fear than those reporting good physical well-being.

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Data availability

The data are available in the Finnish Social Science Data Archive where registered users can download data online according to the conditions set for this data.

Disclosure statement

The authors report no conflict of interest.

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