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PHYSICAL ACTIVITY, SEDENTARY BEHAVIOR AND SUBSTANCE USE AMONG ADOLESCENTS IN SLOVENIAN URBAN AREA

TELESNA AKTIVNOST, OBLIKE SEDEČEGA VEDENJA IN UŽIVANJE PSIHOAKTIVNIH SNOVI MED MLADOSTNIKI V SLOVENSKEM URBANEM OKOLJU

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ABSTRACT

Background. Studies of the relationship between leisure time physical activity, sedentary behaviour and substance use among adolescents report contradictory results. The aim of our study was to examine the association between self-reported leisure time physical activity, sedentary behaviour and alcohol, tobacco and cannabis use among adolescents in Slovenia.

Methods. Subjects consisted of 822 school children aged from 14 to 16 years, living in urban area of Ljubljana and Maribor. The data was collected using the EURO URHIS 2 survey. Logistic regressions were conducted to assess the correlation between the independent variables of physical activity; time spent watching television and using the computer, and each of the five substance use dependent variables.

Results. Frequency of daily smoking was significantly associated with leisure time physical activity, while alcohol and cannabis use were not. Watching TV ≥ 2 hours per day was associated with heavy episodic drinking in the past month, no associations were found for smoking and cannabis use. Using the computer ≥ 2 hours per day was positively associated with daily smoking, drinking alcohol in the past month, heavy episodic drinking in the past month and ever being intoxicated, while cannabis use was not.

Conclusions. These findings suggest that leisure time physical activity is associated with daily cigarette smoking, and leisure time sedentary behaviour is associated with alcohol and tobacco use among adolescents. The results of our study show the need for the formation of suitable preventive measures concerning reduced sitting time as well as leisure time physical activity targeted to adolescents.

Keywords:
alcohol, tobacco, marijuana, adolescents, computer use, watching television

IZVLEČEK

Izhodišča. *Podatki iz do sedaj znanih študij, ki opisujejo povezavo med telesno aktivnostjo v prostem času, oblikami sedečega vedenja ter uživanjem psihoaktivnih snovi med mladostniki, so si nasprotujoči. Namen študije je bil preučiti povezanost med samoocenjeno telesno aktivnostjo in oblikami sedečega vedenja (uporaba računalnika, gledanje televizije) v prostem času ter uporabo alkohola, tobaka in marihuane med mladostniki v Sloveniji.*

Metode. *Podatki so bili zbrani v okviru presečne pregledne raziskave o zdravju mladostnikov EUROURHIS 2. Sodelovalo je 822 srednješolcev, ki živijo v urbanem okolju Ljubljane in Maribora, starih od 14 do 16 let. Z logistično regresijo smo ocenili korelacijo med neodvisnimi spremenljivkami telesne aktivnosti in časa, porabljenega za gledanje televizije in uporabo računalnika, ter vsako od petih odvisnih spremenljivk uživanja psihoaktivnih snovi.*

Rezultati. *Telesna aktivnost v prostem času je statistično pomembno povezana s pogostostjo dnevnega kajenja, medtem ko povezave z uživanjem alkohola in uporabo marihuane nismo dokazali. Gledanje televizije dve uri ali več na običajen šolski dan je statistično pomembno povezano z občasnim čezmernim pitjem v zadnjem mesecu, povezava s kajenjem tobaka in marihuane ni ugotovljena. Uporaba računalnika dve uri ali več na običajen šolski dan je statistično pomembno povezana z dnevnim kajenjem tobaka, uživanjem alkohola v zadnjem mesecu, občasnim čezmernim pitjem v zadnjem mesecu in opitostjo vsaj enkrat v življenju, povezave z uporabo marihuane nismo dokazali.*

Zaključek. *Med mladostniki je telesna aktivnost v prostem času povezana z dnevnim kajenjem tobaka, oblike sedečega vedenja pa z uživanjem alkohola in kajenjem tobaka. Rezultati raziskave kažejo na potrebo po pripravi ustreznega preventivnega programa, s katerim bi sočasno spodbujali telesno aktivnost in omejevali oblike sedečega vedenja.*

Ključne besede:
alkohol, tobak, marihuana, mladostniki, uporaba računalnika, gledanje televizije

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1 INTRODUCTION

Despite the health risks associated with alcohol consumption, tobacco and marijuana use (1), the abuse of these substances remains common in Slovenia. According to the 2010 survey among Slovenian students aged 15 years, 40,7 % were drunk at least twice in their life, 23,2 % reported using marijuana at least once, and 13,9 % were daily smokers (2).

Regular physical activity in childhood and adolescence improves strength and endurance, helps build muscles and bones, helps control weight, reduces stress and anxiety, increases self-esteem, and may improve blood pressure and cholesterol levels (3). Physical activity declines and sedentary behaviour becomes more common during adolescence (4), as well as substance use (2). A number of cross-sectional studies found an association between physical inactivity and substance use – smoking, other tobacco use and alcohol consumption in the previous 30 days (5), alcohol consumption (6), initiation of cigarette smoking and alcohol use (7), cigarette smoking and marijuana use (8). There is also evidence that adolescent physical activity may have a protective effect against subsequent adult alcohol use (9) and progression to other illicit drugs (10). However, sport participation has been associated with a greater use of alcohol (11, 12), heavy episodic drinking of five or more units of alcohol on one occasion (13), and getting drunk (12) among adolescents. In addition, studies have examined gender differences between sport participants and those not participating. Males participating in sports were less likely to use cigarettes, cocaine and other drugs compared with males not participating in sports (8). Male sports participants have been found to be more likely users of alcohol (7) and cannabis (14) than nonparticipants. Females participating in sports have been found to be less likely users of cigarettes (7) and cannabis (14) than those not participating in sports. Longitudinal studies among adolescents found an association between physical inactivity and substance use later in life, resulting in excess alcohol use, illicit drug use (15), and adult smoking (16).

A longitudinal study found that adolescents, aged from 10 to 15 years, who watched more than five hours of television (TV) per day, had significantly higher odds of smoking initiation during the follow-up than those who watched less than two hours of TV per day (17). A study found that elementary school pupils who were watching ≥ 3 hours of TV/video games were significantly more likely to drink alcohol compared with those who watched TV/video games ≤ 2 hours (18), while another study found that adolescents who indicated they play computer games reported significantly less substance abuse than those who indicated not playing computer games (19). A study found that video and computer game use in adolescents was not associated with the onset of drinking, in contrast to the baseline TV viewing hours, which were associated with it (20). According to Krčmar and Greene, children who watch violent television are more likely to use/abuse substances; among adolescents, there is a link between an exposure to violent TV and risk-taking behaviour (e.g., drug abuse, drinking and driving) (21). Furthermore, a higher daily screen-based media use is associated with more frequent reports of alcohol use and illicit drug use (22).

For children and youth, physical activity includes playing, games, sports, transportation, chores, recreation, physical education, or planned exercise. They should accumulate at least 60 minutes of physical activity daily (23). The American Academy of Pediatrics recommendation set a time limit on the amount of total media time for children and adolescents to no more than 2 hours per day (24).

There is not enough data about the correlation between physical activity and substance use among youth in Slovenia. Therefore, the aim of this study was to examine the correlation between self-reported leisure time physical activity, sedentary behaviour and alcohol, tobacco and cannabis use among adolescents in Slovenia.

2 METHODS

2.1 Study Design

We analysed data from the European Urban Health Indicators System Part 2 study (EURO-URHIS 2), an international cross-sectional survey, conducted in 2010. EURO-URHIS 2 aimed to develop methodology and validate tools useful to policy makers to make health gains via evidence-based policy decisions for urban populations. It gathered information by collecting data from routinely available registration data, and by conducting youth (14–16 years old) and adult (19–64 and 65+ years old) survey in 26 urban areas in Europe. The sampling frame was all secondary schools within Ljubljana and Maribor, selected to provide the representative sample of pupils aged from 14 to 16 years. A sample size of 10 schools (with 2 classrooms from each) was acquired following a stratified random sampling approach. The study was approved by the Medical Ethics Commission of the Republic of Slovenia, No. 105/06/10. The participation was anonymous and voluntary. The participants were minors, hence informed written consent of their parents was obtained.

2.2 Measures

All pupils completed an international standardized questionnaire, comprised of 40 questions that retrieved information about age, gender, alcohol and drug consumption, smoking behaviour, sedentary behaviour, physical activity, and other health behaviour. The

questionnaire was standardised, translated into Slovenian language, and for validation purposes, translated back into English. In further analysis, the physical activity variable was recoded in two variables: at least 60 minutes of physical activity per day over the past week (1=0 days to 8=7 days), and participating in vigorous physical activity for two or more hours per week in free time (0=no, 1=yes). The sedentary behaviour variable was recoded in two variables: watching TV ≥ 2 hours per day on an average school day (0=no, 1=yes), and using computer ≥ 2 hours per day on an average school day (0=no, 1=yes). Smoking behaviour was recoded as daily smoking (0=no, 1=yes). Alcohol use was measured with three variables: drinking alcohol over the last 30 days in a pub, bar, restaurant or disco (0=0 days, 1=1 to 20 days or more), heavy episodic drinking over the last 30 days (0=0 times, 1= 1 to 10 or more times), and being intoxicated during lifetime (0 = 0 times, 1 = 1 to 40 or more times). Respondents were also asked of lifetime use of cannabis (no=0, yes=1).

2.3 Statistical Analysis

Descriptive statistics conducted included frequencies, means and standard deviations. A logistic regression model was used to examine and identify associations between the independent variables of physical activity and sedentary behaviour, and each of the five dependent variables of substance use. We used a significance level of 0,05 for all statistical tests. The data was weighted by gender. All analyses were conducted by using SPSS, Release 20.

3 RESULTS

Out of 978 respondents (499 in Ljubljana, 479 in Maribor), 822 (84 %) returned a complete questionnaire that was included in the database. School respond rate was 100 %. Just over half of the pupils participating in the study were female (55,7 %). Most of the participating youth was 15 years old (mean = 14,81, standard deviation = 0,53). Of all the students who completed the questionnaire, 12,2 % reported they were daily smokers, 15,0 % reported they had used cannabis, 56,1 % reported drinking alcohol over the last 30 days in a pub, bar, restaurant or disco, 37,5 % reported heavy episodic drinking in the past month, and 37,8 % reported being intoxicated during lifetime. Only 17.2 % of the youth reported being physically active for at least 60 minutes per day every day in the past week. Vigorous physical activity ≥ 2 hours per week in leisure time was reported by 52,2 % of adolescents. 42,2 % of participants reported watching TV ≥ 2 hours per day on an average school day, while 52,1 % of participants reported using the computer ≥ 2 hours per day on an average school day (Table 1). 25,5 % of males reported being physically active for at least 60 minutes per day every day in the past week, whilst vigorous physical activity ≥ 2 hours per week in leisure time was reported by 65,6 % of males. Females reported being physically active for at least 60 minutes per day every day in the past week in 11,4 %, while vigorous physical activity ≥ 2 hours per week in leisure time was reported by 43,1 % of females.

Table 1. The prevalence of substance use by demographic categories, sedentary behaviour and physical activity among high school students (EURO-URHIS 2, 2010) .

	Daily smoking %	Ever used cannabis %	Drinking alcohol over the last 30 days in a bar %	Heavy episodic drinking in the past month %	Intoxicated during lifetime %
Gender					
male	10,8	17,0	63,4	41,9	43,3
female	13,3	14,5	53,0	36,0	38,9
Chi sq (P value)	(0,281)	(0,341)	(0,003)	(0,085)	(0,219)
Age					
14 years	0	9,1	40,0	18,2	14,3
15 years	9,4	13,8	57,0	37,3	39,7
16 years	43,1	33,8	68,1	58,5	61,3
Chi sq (P value)	(0,000)	(0,000)	(0,009)	(0,001)	(0,000)
Television hours					
>2 hours	13,3	15,9	62,1	44,3	41,6
<2 hours	10,6	14,9	55,2	34,6	40,2
Chi sq (P value)	(0,252)	(0,718)	(0,055)	(0,006)	(0,707)
Computer use					
>2 hours	15,4	19,1	63,4	43,6	44,4
<2 hours	8,2	10,5	51,5	32,7	36,6
Chi sq (P value)	(0,002)	(0,001)	(0,001)	(0,002)	(0,029)

	Daily smoking %	Ever used cannabis %	Drinking alcohol over the last 30 days in a bar %	Heavy episodic drinking in the past month %	Intoxicated during lifetime %
Vigorous physical activity					
>2 hours	9,6	15,8	57,4	38,4	41,4
<2 hours	15,3	15,1	58,6	39,2	40,6
Chi sq (P value)	(0,012)	(0,136)	(0,719)	(0,826)	(0,840)
Physically active >1h/day in past week					
0	2,4	5,8	2,7	2,1	2,5
1	5,1	10,0	3,9	5,8	5,0
2	11,8	10,0	15,2	13,5	13,7
3	17,8	13,3	17,6	17,3	16,0
4	17,4	17,5	16,7	16,2	18,3
5	16,5	12,5	14,5	15,2	14,8
6	11,1	8,3	12,7	12,1	12,8
7	17,9	22,5	16,7	17,7	16,9
Chi sq (P value)	(0,000)	(0,100)	(0,017)	(0,102)	(0,015)

Females were significantly less likely to drink alcohol in the past month than males. It can also be noted that older students were significantly more likely to smoke daily ($p < 0,005$), drink alcohol in the past month ($p < 0,05$), indulge in heavy episodic drinking in the past month ($p < 0,005$), and being intoxicated during lifetime ($p < 0,005$). Students watching TV ≥ 2 hours per day were significantly more likely to conform to heavy episodic drinking in the past month ($p < 0,05$) than students watching TV less than 2 hours per day. Pupils using computer ≥ 2 hours per day were significantly more likely to smoke daily ($p < 0,005$), drink alcohol in the past month ($p < 0,005$), indulge in heavy episodic drinking in the past month ($p < 0,005$), and being intoxicated during lifetime ($p < 0,05$) than those using the computer less than 2 hours per day. Students that participate in vigorous physical activity ≥ 2 hours per week in their leisure time were significantly less likely to smoke daily ($p < 0,05$) than students participating in less vigorous physical activity. Students that reported being physically active for at least 60 minutes per day, every day in the past week, are significantly less likely to smoke daily than students that reported less physical activity ($p < 0,005$).

Logistic regressions were conducted for females for each of the five substance use measures. Older female students were significantly more likely, than students aged 14 years, to smoke daily ($p < 0,005$) and ever use cannabis ($p < 0,05$). Female pupils watching TV ≥ 2 hours per day on an average school day were significantly more likely to smoke daily ($p < 0,05$) than pupils watching less TV. Female adolescents using computer ≥ 2 hours per day were significantly more likely to smoke daily ($p < 0,005$), drink alcohol in the past month ($p < 0,005$), indulge in heavy episodic drinking in the past month ($p < 0,005$), and being intoxicated during lifetime ($p < 0,05$) than their peers. Females that participate in vigorous physical activity ≥ 2 hours per week in leisure time were significantly less likely to smoke daily ($p < 0,05$) than those participating less. Females that reported being physically active for at least 60 minutes per day, every day in the past week, are significantly less likely to smoke daily ($p < 0,005$), ever use cannabis ($p < 0,05$), and being intoxicated during lifetime ($p < 0,05$) than those that reported less physical activity.

Logistic regressions were also conducted for males for each of the five substance use measures to examine which behaviours might predict use. Older male students were significantly more likely, than students aged 14 years, to smoke daily ($p< 0,005$), drink alcohol in the past month ($p < 0,05$), participate in heavy episodic drinking ($p < 0,005$), and being intoxicated during lifetime ($p < 0,005$). Male adolescents using computer ≥ 2 hours per day were significantly more likely to ever use cannabis ($p < 0,005$). In the males-only analyses, watching television and participating in vigorous physical activity were not significantly associated with any of the five substances.

There are some differences between health risk behaviours in Ljubljana and Maribor (Table 2). Logistic regressions were conducted for each city separately. Youth from Ljubljana using computer ≥ 2 hours per day, were significantly more likely to smoke daily ($p < 0,05$) and to ever use cannabis ($p < 0,005$) than those using computer less. Youth from Maribor watching TV ≥ 2 hours per day on an average school day were significantly more likely to drink alcohol in the past month ($p < 0,05$), to indulge in heavy episodic drinking in the past month ($p < 0,005$) and being intoxicated during lifetime ($p < 0,05$) than pupils watching less TV. Also, students from Maribor using the computer ≥ 2 hours per day were significantly

more likely to drink alcohol in the past month ($p < 0,005$), indulge in heavy episodic drinking in the past month ($p < 0,005$) and being intoxicated during lifetime ($p < 0,05$) than those using less computer.

Table 2. The prevalence of lifestyle factors among high school students from Ljubljana and Maribor (EURO-URHIS 2, 2010).

	Ljubljana %	Maribor %
vigorous physical activity ≥ 2 hours per week	60	53
television hours ≥ 2 hours	41	47
daily smoking	13	12
ever used cannabis	19	14
heavy episodic drinking in the past month	40	40

4 DISCUSSION

The survey explores leisure time physical activity and sedentary behaviour and its relation to substance use among in-school adolescents from Slovenia. Our findings suggest that tobacco, alcohol and cannabis are used by a substantial number of youth in Slovenia, despite age and legal regulations prohibiting their use (25), and that adolescents who are physically less active have greater odds for daily cigarette smoking, students who watch more TV have greater odds for heavy episodic drinking, and students who use the computer more have greater odds for smoking daily and alcohol use.

The study found that the frequency of daily smoking was significantly associated with leisure time physical activity. This finding seems to concur with other studies (5, 8, 14, 15, 26). Females participating in sports have been found to be less likely to smoke daily than nonparticipants, a relationship that has been reported in previous studies (5, 20). Tobacco use among males was not associated with physical activity, while other studies found an association (10, 27). In general, it appears that sport participants are more aware of health effects of smoking, or more affected by the potential performance consequences of smoking. This study found that alcohol and cannabis use were associated with physical activity in females, similar as other studies (5, 6, 8, 15, 28). It seems to be a different combination of intrapersonal factors (e.g., self-esteem, rebelliousness, valuing health, susceptibility to media) and external factors (e.g., peer group social norms, media images) that affect a pupil's desire to participate in sports and to use or not to use a certain substance (29).

Furthermore, this study found that watching TV ≥ 2 hours per day on an average school day was associated with heavy episodic drinking in the past month, which is consistent with some previous research (17, 19), but not with others (30). No associations were found for tobacco and cannabis use. Watching TV for two or more hours per day on an average school day was associated with daily smoking with females, but not with males. Alcohol use is frequently presented as positive in TV, and even in some programming. Though cigarette ads have been removed from TV, smoking is still common in music videos and TV shows. Additionally, cigarette or alcohol beverage billboards, logos, and banners can be seen on TV (18). Using the computer for two or more hours per day was positively associated with daily smoking, drinking alcohol in the past month, heavy episodic drinking in the past month and being intoxicated during lifetime – a relationship that has been reported in some previous studies (31), but not in others (30). Using the computer for two or more hours per day with females was positively associated with daily smoking, drinking alcohol in the past month, heavy episodic drinking in the past month and being intoxicated during lifetime, but not with males. Using the computer for two or more hours per day on an average school day was associated with cannabis use with males, which is consistent with results from the previous study (32). Consistent with findings from previous studies (33, 34), we found that those who use the computer excessively compared to their peers were seen to be at an increased risk of substance use: alcohol, tobacco and cannabis. There are several possible mechanisms explaining this association. Computer use, eating and gambling may share the same neurobiological mechanism with substance dependence and can be named 'behavioural addiction' (35). Thus, if the computer usage or television watching had the potential to be addictive, adolescents with vulnerability to drug use would be vulnerable to excessive computer use. Alternatively, the co-occurrence of excessive computer use and drug use may also be due to shared risk factors, such as neurobehavioral disinhibition, high novelty-seeking (34), low life satisfaction, and low self-esteem (36). It is also possible that one behaviour may cause the other.

Alcohol was the most prevalent substance used by youth. This is consistent with the previous research from Slovenia's Health Behaviour in School-Aged Children (HBSC) study from 2010 (37), and European School Survey Project on Alcohol and Other Drugs (ESPAD) from 2011 (38). Percentages are higher for all three variables of alcohol consumption in ESPDAD survey (58 % of youth reported drinking alcohol over the last 30 days in a bar or pub, while heavy episodic drinking in the past month was reported by 53 %, and lifetime intoxication by 56 %), compared to our results. Daily smoking was reported more frequently in HBSC study (13,9 %) than in the present study. Reported lifetime use of cannabis was higher in the ESPAD survey (23 %) and the HBSC survey (23,2 %), compared to our

results. The differences could be attributed to a smaller sample size of our study and, consequently, understated results.

Slovenia is an example of a typical wet culture where alcohol is cheap, easy to come by, and frequently used by everybody. To limit the availability of alcohol, especially among youth, the Act Restricting the Use of Alcohol (Zakon O Omejevanju Porabe Alkohola, ZOPA) was approved in 2003. It includes restrictions about alcohol content labelling on the package, a warning that the product is not suitable for children, and a ban on the sale and supply of alcoholic drinks and beverages with added alcohol to persons under the age of 18 years and those who show obvious signs of intoxication from alcohol. Also, the following policy tools and legislation are important: the Act Restricting the Use of Alcohol (2003); the Act Regulating the Sanitary Suitability of food and goods and substances which come into contact with food (2000); the Media Act (2001). Advertising of alcohol selling is also restricted; there are regulations on alcohol advertising and on alcohol sponsorship as well as on sales promotion. But it must be mentioned that despite the laws, in many ways the advertising of alcoholic beverages (beer and wine) is permitted (39). Nine Slovenian municipalities have banned drinking in public places, where it is also prohibited to disperse alcoholic beverages (40).

Physical inactivity and sedentary lifestyle are associated with being overweight in children and adults (41). Decreasing sedentary behaviours and increasing physical activity participation should be the focus of strategies aimed at preventing and treating overweight and obese youth (42). Key legislative measures for preventing or reducing risk behaviours in Slovenian adolescents are: increasing the taxation (prices) of alcohol beverages and tobacco products; banning marketing activities in the field of alcohol and tobacco industries; introducing pictorial health warnings on tobacco products; further measures to reduce the attractiveness of tobacco products; limiting and regulating the sale of cannabis products. All measures need to be strictly monitored (43).

The findings of this study are subject to several limitations. Firstly, the data are cross-sectional, therefore causation cannot be implied. Secondly, this data apply only to youths who attend school and are therefore not representative of all persons in this age group. Thirdly, the data were self-reported, increasing the chance of under-reporting or over-reporting. Although gender was accounted for in the analysis, there are many other potentially contributing factors for substance use, i.e. socioeconomic status, intensity of sport participation, different types of sport, parental monitoring, teasing at school (14).

Despite these limitations, our study indicates that excessive time spent behind the monitor is common among Slovenian adolescents, and that duration of TV and computer use was significantly associated with smoking tobacco and alcohol use. Many of them are inadequately active, though physical activity was significantly associated with smoking tobacco. Further research is necessary to describe the link between physical activity and sedentary behaviour and their influence on substance use more clearly; it is critical that future research includes longitudinal studies that can investigate the underlying causal mechanisms.

5 CONCLUSION

This study indicates that high school children who are physically less active have greater odds of reporting daily cigarette smoking. Students who watch TV more have greater odds of reporting heavy episodic drinking in the past month. In addition, students who use the computer more have greater odds of reporting daily smoking and alcohol use.

Many health outcomes associated with sedentary behaviour occur independent of physical activity. It is important that health promotion seeks to increase physical activity and decrease time spent in sedentary behaviour, because these are independent, rather than mutually exclusive,behaviours.

CONFLICTS OF INTEREST

The authors declare that no conflicts of interest exist.

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ETHICAL APPROVAL

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