Modifiable Health-Risk Behaviours and Mental Health Indicators in University Students in Croatia

Jelena Kovačević[1,2], Vera Musil[3], Vesna Bilić-Kirin[2,4], Valerija Miličić[2]

[1]Institute of Emergency Medicine of the Vukovar-Srijem County, Vinkovci, Croatia, [2]Josip Juraj Strossmayer Univeristy of Osijek, Faculty of Medicine, Osijek, Croatia, [3]University of Zagreb, School of Medicine, Andrija Štampar School of Public Health, Department of Social Medicine and Organisation of Health Care, Zagreb, Croatia, [4]Institute of Public Health for the Osijek-Baranja County, Department of School Medicine, Osijek, Croatia

Correspondence:
lelutka@gmail.com
Tel.: + 385 99 604 1707
Fax.: + 385 32 300 501

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Objective – The aim of this study was to investigate the connection between mental health indicators and nutritional status, physical activity and eating habits in first-year university students in Croatia. **Materials and Methods** – The data about body weight, body height, eating habits, psychical activity and mental health indicators were obtained retrospectively from preventative care medical records of first-year university students (N=1035). The statistical analysis was performed using the R statistical software. Statistical significance was considered as P<0.05. **Results** – Out of 1035 participants (68% female), significantly more female, compared to male students, reported depressive mood (7.9% vs. 4.3%, P=0.03), low self-esteem (4.1% vs. 2.4%, P<0.01) and were underweight (12.6% vs 4.6%, P<0.01). Significantly more male students reported regular eating of a cooked meal (94.2% vs. 90.5%, P=0.04), engaging in physical activities in general (99.4% vs. 92.9%, P<0.01), active sport (51.1% vs. 30.2%, P<0.01), recreational sport (89.1% vs. 71.2%, P<0.01) and walking (90.9% vs. 80.7%, P<0.01). Significantly more physically active participants and those who practiced active sport, recreational sport and walking had high self-esteem. Significantly more participants with a healthy eating pattern, regular consumption of a cooked meal and breakfast had high self-esteem and absence of depressive mood. **Conclusion** – The results of the study showed significantly better mental health indicators in students who reported regular physical activity and a healthy dietary pattern. The results implied that physical activity and a healthy diet, as modifiable health-risk behaviors, could be an important part of public health programs for improving mental health of university students.

Introduction

Mental health problems in youth have been considered as a global public health problem with prevalence of 20% (1). Obesity and mental health disorders often occur simultaneously (2) and may have the same risk factors such as low physical activity (3-5) and poor diet (6, 7). The association between physical activity and mental health in adolescents has been opposing. Numerous studies showed positive association (4, 8-11), while others showed no association (12-14). Recent studies have reported that healthy diet is related to better mental health in adolescents (7, 15, 16). Breakfast consumption has been associated with numerous cognitive benefits in children and adolescents (17, 18).

Developing of healthy eating, regular physical activity and avoiding of health risk behaviours in late adolescence create solid foundations for good health in adulthood. Depression has been recognized as one of the leading causes of disability and illness in adolescence. Early detection and treatment is crucial to prevent disability, illness and suicide - one of the leading causes of death in late adolescence (19).

In Croatia, the research of mental health indicators in adolescents and its association to modifiable health-risk behavior has been sparse. Studies conducted among high-school and university students showed that university students with normal weight status had higher self-esteem than the obese, but such association was not observed in high-school students. Also, the association between self-esteem and eating habits or sports activity was not determined. (20). Another study among university students found that physically active female students had less depressive symptoms (21). Multidimensional approaches are necessary to deal with the complexity of mental health issues. Those include innovative approaches investigating the influence of modifiable lifestyle behaviors on mental health (10).

The aim of this study was to investigate the connection between mental health indicators and nutritional status, physical activity and eating habits in first-year university students in Croatia.

Material and Methods

Design, Setting and Sample

The data about body weight, body height, eating habits, psychical activity and mental health indicators were obtained retrospectively from preventative care medical records of first-year university students of Josip Juraj Strossmayer University of Osijek in academic year 2013/14 (N=1035). The data was col-lected routinely by health examination during the first-year of study within specific preventative health care measures conducted by school doctors at the Department of School Medicine in the Institute of public health for the Osijek-Baranja County. The data were anonymized and analyzed retrospectively. Body weight and body height were taken according to standard protocol using calibrated equipment. Body weight was recorded to the nearest 0.1 kg. Body height was recorded to the nearest 0.1 centimetres (cm). Body mass index (BMI) was calculated from body weight and body height as body weight/(body height)^2 in (kilograms/square meter). Nutritional status was classified according to BMI World Health Organization (WHO) classification as underweight, normal weight, overweight and obese (22, 23).

Eating habits were assessed using questions regarding the consumption and frequency of breakfast and a cooked meal per day. The question regarding breakfast was: "How often do you have breakfast (beside a cup of tea or a coffee)?" with a suggested answer: every day, sometimes and never. The question regarding a cooked meal was: "How often do you eat a cooked meal (stew, soup, meat, fish, etc.)?" with a suggested answer: every day, almost every day, rarely, almost never.

A healthy eating pattern was considered as regular daily consumption of breakfast and regular daily, or almost every day, consumption of a cooked meal. An unhealthy eating habit was considered as never eating breakfast and rarely or never eating a cooked meal. All other combinations of answers were considered as acceptable eating habits.

Physical activity was assessed using questions regarding the level of practicing active and recreational sports and hours of walking per day. Suggested answers for sports were: never, one - two hours, three - four hours and five hours or more. Suggested answers for

walking were: less than one hour, one – two hours, three – four hours and five hours or more. Regular physical activity was considered as walking at least one hour per day or engaging in recreational or active sports for at least one hour per day.

Mental health indicators were assessed according to Rosenberg's Self-esteem Scale (RSES) (24) and short six-item version of Center for Epidemiological Studies Depression (CES-D) scale for depressive mood (25). Self-esteem is defined as person's overall evaluation of his or her worth (26). Research suggests that low self-esteem predicts adolescents' mental health problems, such as depression and anxiety, through vulnerability model that states that low self-esteem is a causal risk factor for depression and anxiety (26, 27). RSES is a ten item self-report unidimensional measure of global self-esteem assessing feelings of self-worth and self-acceptance. Results were scored and cut-off points were determined according to the author's instructions (24). The CES-D scale is a unidimensional scale, not designed to diagnose clinical depression but rather to assess levels of depressive symptoms. It can be used validly as a screening instrument for depressive mood, adolescent emotional suffering and also as an efficient and effective first step in large population samples such as school populations (28). The validity of this short six-item version of CES-D scale was evaluated in The European School Survey Project on Alcohol and Other Drugs (ESPAD) (29).

Statistical Analysis

The statistical analysis was done using the R statistical software (R Foundation for Statistical Computing, Vienna, Austria). Descriptive statistics were presented as absolute and relative frequencies. To determine the differences of categorical variables, the chi-square test and Fisher's exact test were used. Statistical significance was considered as P<0.05.

Ethical Consideration

The study design was approved by the Ethics Committee of the Institute of Public Health of Osijek-Baranja County, Osijek, Croatia (number: 381-16-159).

Results

The study comprised data of 1035 first-year university students (68.2% female) from 10 different faculties of Josip Juraj Strossmayer University of Osijek in the academic year 2013/2014. The participants mean age was 19.6 years. Since late adolescence is defined as a life period from 18 to 21 years of age (30), first year university students in our study were considered as a population of late adolescents, as 89% of students were under 21 years of age. WHO states that age is only one characteristic that defines adolescent period of development and is more appropriate for assessing biological changes rather than the social transitions (19). According to the biological characteristics, university students could be considered as young adults, but their social background corresponds still to adolescents' characteristics and life-style - education, dependence on parents, unemployment and health-risk behaviours.

Low self-esteem was reported by 3.6%, normal self-esteem by 66.7% and high self-esteem by 29.7% of students. Depressive mood was reported by 6.8% of participants. Underweight were 10.0%, overweight 15.7% and obese 5.6% of participants. Regular daily consumption of breakfast was reported by 52.0% of participants, while 4.5% of them never ate breakfast. Regular daily, or almost every day, consumption of a cooked meal was reported by 91.7% of participants. A healthy eating pattern was present in 49.2% and an unhealthy eating pattern in 1.1% of participants. Regular physical activity was reported by 95.0% of participants. Walking for at least one hour a day was reported by 84.0%, en-

gaging in active sport, at least one hour a day, by 36.8% and engaging in recreational sport, at least one hour a day, by 76.9% of participants (Table 1).

Table 1. Description of the Participants (N=1035)		
Variables	Details	Students N (%)
Age	Mean 19.6 years	-
	Median 20 years	-
	Range 18-25 years	-
	18-20 years	921 (89.0)
	>20 years	114 (11.0)
Sex	Female	706 (68.2)
	Male	329 (31.8)
Faculty	Medicine	70 (6.8)
	Agriculture	219 (21.2)
	Food technology	123 (11.9)
	Nursing	49 (4.7)
	Economy	172 (16.6)
	Mathematics	76 (7.3)
	Physics	24 (2.3)
	Law	178 (17.2)
	Culture	56 (5.4)
	Governmental law	68 (6.6)
Self-esteem	Low	37 (3.6)
	Normal	690 (66.7)
	High	308 (29.7)
Depressive mood	Yes	70 (6.8)
	No	965 (93.2)
Weight status	Underweight	104 (10.0)
	Normal	711 (68.7)
	Overweight	162 (15.7)
	Obese	58 (5.6)
Breakfast	Every day	538 (52.0)
	Sometimes	450 (43.5)
	Never	47 (4.5)
Cooked meal	Every day or almost every day	949 (91.7)
	Rarely or almost never	86 (8.3)
Eating habits	Healthy	509 (49.2)
	Acceptable	515 (49.7)
	Unhealthy	11 (1.1)
Physical activity	No	52 (5.0)
	Yes	938 (95.0)
Active sports	No	654 (63.2)
	Yes	381 (36.8)
Recreational sports	No	239 (23.1)
	Yes	796 (76.9)
Walking activity	No	166 (16.0)
	Yes	869 (84.0)

A depressive mood and low self-esteem were significantly more often reported by female, compared to male students (7.9% vs. 4.3%, P=0.03 and 4.1% vs. 2.4%, P<0.01). Male students reported significantly more often high self-esteem, compared to female (40.8% vs. 24.6%, P<0.01). Female, compared to male students, were significantly more underweight (12.6% vs 4.6%, P<0.01), while male, compared to female students, were more overweight and obese (23.4% vs. 12.0%; 7.9% vs. 4.5%). Male, compared to female students, reported significantly more daily, or almost daily, eating of a cooked meal (94.2% vs. 90.5%, P=0.04), engaging in physical activities in general (99.4% vs. 92.9%, P<0.01), in active sport (51.1% vs. 30.2%, P<0.01), recreational sport (89.1% vs. 71.2%, P<0.01) and walking (90.9% vs. 80.7%, P<0.01) (Table 2).

Table 2. Mental Health Indicators, Nutritional Status and Behavioral Variables in Male and Female Students			
Variables	Male N (%)	Female N (%)	P
Depressive mood			
Yes	14 (4.3)	56 (7.9)	0.03*
No	315 (95.7)	650 (92.1)	
Self-esteem			
Low	8 (2.4)	29 (4.1)	
Normal	187 (56.8)	503 (71.2)	<0.01*
High	134 (40.8)	174 (24.6)	
Nutritional status			
Underweight	15 (4.6)	89 (12.6)	
Normal	211 (64.1)	500 (70.8)	<0.01*
Overweight	77 (23.4)	85 (12.0)	
Obese	26 (7.9)	32 (4.5)	
Breakfast			
Every day	173 (52.6)	365 (51.7)	
Sometimes	147 (44.7)	303 (42.9)	<0.16*
Never	9 (2.7)	38 (5.4)	
Cooked meal			
Every or almost every day	310 (94.2)	639 (90.5)	0.04*
Rarely or almost never	19 (5.8)	67 (9.5)	
Eating habits			
Healthy	163 (49.5)	346 (49.0)	
Acceptable	165 (50.2)	350 (49.6)	0.32†
Unhealthy	1 (0.3)	10 (1.4)	
Physical activity			
No	2 (0.6)	50 (7.1)	<0.01†
Yes	327 (99.4)	656 (92.9)	
Active sports			
No	161 (48.9)	493 (69.8)	<0.01*
Yes	168 (51.1)	213 (30.2)	
Recreational sports			
No	36 (10.9)	203 (28.8)	<0.01*
Yes	293 (89.1)	503 (71.2)	
Walking activity			
No	30 (9.1)	136 (19.3)	<0.01*
Yes	299 (90.9)	570 (80.7)	

*Chi-square test; †Fisher's exact test.

Significantly more participants, who were physically active in general (30.5 vs. 15.4, P<0.01), who played active sport (38.8 vs. 24.5, P<0.01), recreational sport (32.0 vs. 22.2, P<0.01) and walking (31.9 vs. 18.7, P<0.01), reported high level of self-esteem (Table 3).

Mental health indicators and nutritional status of participants were not significantly connected (Table 4). Significantly more participants who reported healthy eating pattern, regular consumption of cooked meal and breakfast, had high self-esteem and absence of depressive mood (Table 5).

Table 3. Connection Between Mental Health Indicators and Physical Activity

Type of physical activity		Self-esteem			P*	Mood		P*
		Low N (%)	Normal N (%)	High N (%)		Depressive N (%)	Non-depressive N (%)	
Physical activity in general	Yes	32 (3.3)	651 (66.2)	300 (30.5)	<0.01	65 (6.6)	918 (93.4)	0.40
	No	5 (9.6)	39 (75.0)	8 (15.4)		5 (9.6)	47 (90.4)	
Active sports	Yes	12 (3.1)	221 (58.0)	148 (38.8)	<0.01	19 (5.0)	362 (95.0)	0.08
	No	25 (3.8)	469 (71.7)	160 (24.5)		51 (7.8)	603 (92.2)	
Recreational sports	Yes	24 (3.0)	517 (65.0)	255 (32.0)	<0.01	49 (6.2)	747 (93.8)	0.16
	No	13 (5.4)	173 (72.4)	53 (22.2)		21 (8.8)	218 (91.2)	
Walking activity	Yes	25 (2.9)	567 (65.2)	277 (31.9)	<0.01	54 (6.2)	815 (93.8)	0.11
	No	12 (7.2)	123 (74.1)	31 (18.7)		16 (9.6)	150 (90.4)	

*Chi-square test.

Table 4. Connection Between Mental Health Indictors and Nutritional Status

Nutritional status	Self-esteem			P*	Mood		P*
	Low N (%)	Normal N (%)	High N (%)		Non-depressive N (%)	Depressive N (%)	
Underweight	5 (4.8)	70 (67.3)	29 (27.9)	0.37	94 (90.4)	10 (9.6)	0.48
Normal	29 (4.1)	479 (67.4)	203 (28.6)		662 (93.1)	49 (6.9)	
Overweight	2 (1.2)	103 (63.6)	57 (35.2)		154 (95.1)	8 (4.9)	
Obese	1 (1.7)	38 (65.5)	19 (32.8)		55 (94.8)	3 (5.2)	

*Chi-square test.

Table 5. Connection between mental health indicators and eating habits

Indicators	Self-esteem			P*	Mood		P*
	Low N (%)	Normal N (%)	High N (%)		Non-depressive	Depressive	
Eating habits							
Healthy	16 (3.1)	311 (61.1)	182 (35.8)	<0.01†	490 (96.3)	19 (3.7)	<0.01†
Unhealthy	0 (0)	8 (72.7)	3 (27.2)		10 (90.9)	1 (9.1)	
Acceptable	21 (4.1)	371 (72.0)	123 (23.9)		465 (90.3)	50 (9.7)	
Cooked meal							
Every or almost every day	31 (3.3)	627 (66.1)	291 (30.7)	0.03*	893 (94.1)	56 (5.9)	<0.01*
Rarely or almost never	6 (7.0)	63 (73.3)	17 (19.8)		72 (83.7)	14 (16.3)	
Breakfast							
Every day	18 (3.0)	331 (55.4)	189 (31.6)	<0.01†	515 (95.7)	23 (4.3)	<0.01*
Sometimes	18 (4.0)	319 (70.9)	113 (25.1)		408 (90.7)	42 (9.3)	
Never	1 (2.1)	40 (85.1)	6 (12.8)		42 (89.4)	5 (11.9)	

*Chi-square test, † Fisher's exact test.

Discussion

The results showed moderate values of depressive mood among first-year university students, which was in concordance with the results of other studies conducted among university students in Croatia (21, 31). Low self-esteem and a depressive mood were reported more often by female than male students and were in concordance with the results of other studies investigating adolescents' mental health (4, 10, 17, 21, 31).

Higher prevalence of overweight and obesity in male, than in female students, was similar to the results of other studies conducted among university students in Croatia (20). A significant relationship between mental health indicators and nutritional status was not observed in this study. However, overweight and obese students reported high self-esteem and absence of depressive mood. The results of the other studies conducted among adolescents showed a negative link between good mental health and overweight/obesity (10, 20).

The results of our study showed that male students were significantly more physically active than female students, similarly to the results of the other studies conducted among adolescents in Croatia (32) and in other countries (10, 11, 33). The study showed a high proportion of physically active students. Such high proportions of physicaly active university students in Croatia are not surprising since university curriculum during first two study years at universities in Croatia contains mandatory classes of physical education (34). Furthermore, sports are highly appreciated among Croats, which consider themselves a sport nation with around 16000 sport associations, 1500 sport clubs and about 130000 competitors (35). Study results also revealed high levels of daily physical activity among students. If we take into account WHO's global recommendations on physical activity for health, which for children and adolescents (5-17 years) recommend 60 minutes per day, and for adults (18-64 years) recommend 150 minutes per week (36), we can conclude that university students better adhere to WHO recommendations for children and adolescents rather than to those for adults. The study results showed that physically active students had a higher level of self-esteem and are in line with recent meta-analysis showing that intervention of physical activity alone is associated with increased self-concept and self-worth in children and adolescents (9).

The results of our study revealed that the habit of regular breakfast eating among students was similar to the results of other studies (37, 38). Positive influence of regular breakfast consumption on mental health was observed in our study and many other studies (4, 17, 39-41). The connection between mental health and consumption of cooked meal was not investigated in other studies. The reason for this is unclear, but we could speculate that daily intake of a cooked meal is typical for Croatian life-style, while in other countries that might not be the case. Furthermore, university students in Croatia have organized university cantinas where cooked meals are daily available and partially subsidized by the state which makes it, besides being the healthiest food, also the cheapest and thus well accepted among students. The results of our study imply that regular consumption of cooked meal could positively influence mental health and should be the object for further research.

The connection between healthy dietary patterns in general and mental health in adolescents was observed in other studies (10, 11, 15). In our study the results showed the connection between a healthy eating pattern considered as regular consumption of breakfast and a cooked meal, and better mental health. Self-reported data about eating habits, physical activity and mental health status could be possible limitations of the study

due to the influence of social desirability and selective bias (12). Possible limitations could also relate to the frequency of physical activity investigated which could be more differentiated and guided by WHO global recommendations on physical activity for health (36). Further research is needed to explain the connection among different components of eating habits, levels of physical activity and mental health.

Conclusion

In conclusion, the results of the study showed that first-year university students who reported regular physical activity and healthy dietary pattern had better mental health indicators. They had high self-esteem and were not in a depressive mood. Physical activity and healthy diet are considered as modifiable health-risk behaviors and could be used in public health programs for improving mental health of university students.

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