



PHYSICALLY ACTIVE FEMALE COLLEGE STUDENTS HAVE A BETTER SEXUAL HEALTH

TJELESNO AKTIVNE STUDENTICE IMAJU BOLJE SEKSUALNO ZDRAVLJE

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SUMMARY

Due to a lack of research on correlation between physical activity and sexual health in people with no diagnose of sexual disturbances, the primary aim was to examine the correlation between the physical activity level and three factors of sexual health in women (sexual desire, sexual function and sexual satisfaction). A sample consisted 521 female students aged 18 to 30 (M=19.7, SD=1.1). Data has been gathered by International Physical Activity Questionnaire short form, New Sexual Satisfaction Scale short form, Female Sexual Function Index short form, Figure Rating Scale and the level of sexual desire indicator. The results show a significantly higher level of sexual desire and sexual satisfaction in sufficiently physically active, comparing to insufficiently physically active women. Physically active women have a significantly better total sexual function and its separate domains of sexual arousal and lubrication, while no significant differences in orgasm and pain during sexual intercourse were obtained. Positive effects of physical activity on women's sexual health can be achieved by both aerobic and/or anaerobic type of physical activity. Although previous studies suggest a positive correlation between physical activity and sexual health in older age groups than used in this research, this study points to a better sexual health of physically active women already in the college student age.

Key words: exercise, sport, sexual desire, sexual function, sexual satisfaction

SAŽETAK

Zbog nedostatka istraživanja povezanosti tjelesne aktivnosti i seksualnog zdravlja u osoba bez utvrđenih seksualnih poteškoća, primarni je cilj bio ispitati povezanost razine tjelesne aktivnosti s tri čimbenika seksualnog zdravlja u žena (seksualna želja, seksualna funkcija i seksualno zadovoljstvo). Uzorak sudionica obuhvaćao je 521 studenticu u dobi od 18 do 30 godina (AS=19,7, SD=1,1). Podaci su prikupljeni skraćenom verzijom Međunarodnog upitnika za procjenu razine tjelesne aktivnosti, skraćenom verzijom Nove skale seksualnog zadovoljstva, skraćenom verzijom Indeksa ženske seksualne funkcije, Skalom percepcije tjelesnog izgleda slikovnim podražajima i indikatorom razine seksualne želje. Rezultati upućuju na statistički značajno višu razinu seksualne želje i seksualnog zadovoljstva u dovoljno tjelesno aktivnih, u usporedbi s nedovoljno tjelesno aktivnim ženama. Tjelesno aktivne imaju i kvalitetniju ukupnu seksualnu funkciju te manje poteškoća sa seksualnim uzbuđenjem i genitalnom lubrikacijom, dok značajne razlike nisu utvrđene za domene postizanja orgazma i pojavnosti boli tijekom seksualnog odnosa. Pozitivni učinci tjelesne aktivnosti na seksualno zdravlje žena mogu se ostvariti neovisno o tomu prakticira li se dominantno aerobni i/ili anaerobni tip tjelesne aktivnosti. Iako određene studije ukazuju na pozitivnu povezanost između tjelesne aktivnosti i seksualnog zdravlja u starijim dobnim skupinama no što je uzorak ovoga istraživanja, ova studija ukazuje na bolje seksualno zdravlje tjelesno aktivnih žena već u studentskoj dobi.

Ključne riječi: tjelovježba, sport, seksualna želja, seksualna funkcija, seksualno zadovoljstvo

INTRODUCTION

Health-related physical activity is any form of physical activity which is useful for health and functional capacities, without risk or disruption of health (15). Associations between physical activity and various factors of sexual health have been recognized in a certain number of studies, most of which point to a positive relationship between physical activity and the level of sexual desire, quality of sexual function and sexual satisfaction in both gender. Some studies recommend physical activity as an effective non-invasive and non-pharmacological prevention method for sexual dysfunction which, in common with medical treatment and medication, may also be an effective reduction method of already existing sexual dysfunction (31, 32). The importance of proper sexual health and its research is reflected in the results of some studies, which indicate that nearly a half of women with one or more sexual disorders consider their quality of life significantly disrupted (40). Sexual reactions are determined by the coordinated activity of the sympathetic system, parasympathetic system and somatic innervation, driven by complex emotional and cognitive stimuli, as well as those related to the context, processed in the limbic part of the forebrain (45). Testosterone, present in both gender, is considered as a hormone with a significant effect on sexual drive in women and men (6, 25). The most frequent sexual dysfunction in women include hypoactive sexual desire, sexual arousal disorder, orgasm disorder and pain during sexual intercourse, with higher comorbidity compared to men (35). Lack of sexual desire is a multifactorial condition manifested by reduced sexual desire, resulting in significant interpersonal concern (1). According to McCabe et al. (36), sexual arousal disorder is a constant or recurring inability to achieve or maintain the excitement until the end of sexual activity. As a result of inadequate arousal (during the appropriate stimulation), often occurs lack of lubrication, which may lead to uncomfortable sexual experience. According to DSM V (24), hypoactive sexual desire and arousal disorder represent one syndrome. Delayed orgasm, significant absence and/or reduction of orgasm intensity is considered as an orgasm disorder (36). According to McCabe et al. (36), genital-pelvic pain disorder (dyspareunia) include constant or recurring difficulties in at least one of the following domains: vaginal penetration during sexual intercourse; significant vulvovaginal or pelvic pain during genital contact; significant anxiety or fear of vulvovaginal or pelvic pain before, during or after genital contact; significantly enhanced activity and hypertonicity of the pelvic floor muscle with or without genital contact. In the practice of sexual psychotherapy, the assessment of sexual satisfaction is one of the standard indicators of sexual health (17). Sexual satisfaction is a measure of satisfaction with sexual life, consisted of multiple factors. Štulhofer & Buško (53), whose instrument for assessing sexual satisfaction has been used in this research, explained sexual satisfaction as a complex

construct of five dimensions: sexual feelings/experience, sexual focus, sexual permutation, emotional relationship/closeness, and sexual activities. Reviewing the results of recent studies, McCabe et al. (35) estimate the prevalence of 40%-50% women with at least one sexual dysfunction, depending on age (35). In more developed countries, 25%-50% of women are faced with sexual dysfunction (6, 7). Epidemiological studies suggest the prevalence of sexual difficulties among sexually active women of all ages (3, 28). According to Burri & Spector (9), hypoactive sexual desire is the most frequent female sexual problem (about 21.4%). Following are arousal disorder (11.4%), orgasm disorder, lubrication disorder (8.7%), and pain during sexual intercourse (6.0%). The worrying prevalence has also been observed in women in 20s and 30s, the most often in hypoactive sexual desire (30, 43). It is believed that 21%-28% of sexually active women suffer of sexual arousal disorder (30, 46). The prevalence of orgasmic disorders in Australia, Sweden, United States and Canada is 16%-25% (16, 19, 30, 33, 46, 50). Data on the prevalence of sexual difficulties among younger women, showed the worrying occurrence also in Croatia. The results on a national sample of women aged 18 to 35, suggest that 27.6% of sexually active women suffer of hypoactive sexual desire, 23.65% of dyspareunia, 23.1% of inability to reach orgasm, and 18.5% of lubrication difficulties (54). By examining the causes of sexual disturbances, seems like a part of them may be prevented by regular physical activity. Some of the causes of sexual disturbances such as low testosterone, imbalance of other hormones, stress, anxiety, depression, mood disorders, dissatisfaction with body image, diabetes or obesity, may be reduced by regular physical activity (4, 23, 39). Some of the immediate effects of exercise imply reducing fat tissue, improving physical condition, better coronary blood flow, better endothelial and cardiorespiratory function, and the reduction of triglyceride and hypertension (56). There are many indirect effects of physical activity in primary and secondary prevention of cardiovascular and metabolic diseases such as type 2 diabetes, which are a part of the causes of sexual dysfunction. Due to a lack of research on correlation between physical activity and sexual health in people with no diagnose of sexual disturbances, the primary aim was to examine the correlation between the physical activity level and three factors of sexual health in women (sexual desire, sexual function and sexual satisfaction). Also, the correlation between the weekly number of training hours and sexual health factors, and the correlation between body image satisfaction and sexual health factors, were also examined.

METHODS

A sample consisted 521 female students aged 18 to 30 ($M=19.78$, $SD=1.16$), from six Faculties of the University of Zagreb, who completed the questionnaire in full (77.87% response). There were 87.90% heterosexual women in a sample. The research was conducted in accordance to the

ethical principles of scientific research. Data has been gathered by International Physical Activity Questionnaire short form (IPAQ-SF, 13), New Sexual Satisfaction Scale short form (NSSZ, 53), Female Sexual Function Index short form (FSFI-6, 26), Figure Rating Scale (FRS, 51) and the level of sexual desire indicator (52) with the question: „Thinking about a typical day in the last two months, mark the level of your desire for sexual activities“ (scale 0-10, higher number determines higher sexual desire level). The survey also contained the questions about general and specific topic-related data (age, weekly number of sport or recreational training hours, assessment of the intensity of increasing in own sexual desire during and after the training, frequency of sexual intercourse and masturbation in the last two months). One question was especially for recreational practitioners (the dominant training type - aerobic/anaerobic; the descriptions of categories were listed, with examples of typical activities). A sample has been divided by the physical activity level criterion. The results of the IPAQ-SF questionnaire enabled participants to be categorized into one of three possible categories according to physical activity level on a weekly basis: insufficient physical activity (0-600 MET-min), minimal physical activity (601-3000 MET-min) and sufficient physical activity (> 3001 MET-min). For all variables, basic descriptive parameters and Kolmogorov-Smirnov test were calculated. Mann-Whitney U test for the independent sample and series of linear bivariate regression analysis were used. One-way ANOVA and Tukey's HSD Post-hoc test were used for calculating statistical significance of mean age difference between the groups of insufficiently, minimal and sufficiently physically active women.

RESULTS

The physical activity variable was dichotomized to a sufficient (sufficient physical activity level) and insufficient level of physical activity (insufficient and minimal physical activity level) in order to create two groups. Such a concept showed a sufficient level of physical activity in 41.07%, insufficient in 58.92% of women. Among all sufficiently physically active women, 86.93% were recreational

practitioners, 11.21% athletes and 1.86% of those who do not exercise at all. The average number of training hours on a weekly basis in a sample of women who exercise was 5.06. Among all recreational practitioners, 52.68% practice predominantly anaerobic and 47.31% aerobic type of exercise. 67.17% of women have been sexually active in the last two months. Among those with sufficient physical activity, the proportion of sexually active women was 75.70%, among insufficiently physically active the proportion of sexually active women was 61.23%. Regarding masturbation frequency on a two months basis, results are as follow: 13.09 in sufficiently physically active women, 6.80 in insufficiently physically active women. Data on sexual intercourse frequency on a two months basis for those who have been sexually active are as follow: 17.30 in sufficiently physically active women, 10.85 in insufficiently physically active women. Data from Table 1 suggests that about 68% of recreational practitioners believe that the level of sexual desire increases during the training or after the training.

The results indicate a statistically higher level of sexual desire and sexual satisfaction in sufficiently physically active women, compared to insufficiently active (Table 2). Sufficiently physically active women reported better overall sexual function and its domains of sexual arousal and lubrication, while no significant differences were obtained in domains of orgasm and pain during sexual intercourse (Table 2).

The results suggest a significantly positive correlation between the physical activity level and sexual satisfaction, while significant correlation has not been obtained for the level of sexual desire (Table 3). The level of physical activity is significantly positively related to a total sexual function and its separate domains of sexual arousal and lubrication, while it has not been obtained for the domains of orgasm and pain during sexual intercourse (Table 3).

Examining the type of exercise among recreational practitioners, no significant difference in sexual health domains between the groups of women who practice dominantly aerobic or anaerobic type of exercise was obtained (Table 4).

Table 1. The proportion of women who exercise, according to the subjective feeling of increasing the sexual desire level during and immediately after the sports or recreational training

Tablica 1. Udio žena koje vježbaju, prema subjektivnom osjećaju povećanja razine seksualne želje tijekom i neposredno nakon sportskog ili rekreativnog treninga

Intensity of increase	Sexual desire during the training	Sexual desire after the training
	Recreational practitioners (% of all recreational practitioners)	Recreational practitioners (% of all recreational practitioners)
No increase	59 (31.72%)	60 (32.25%)
Slightly	49 (26.34%)	45 (24.19%)
Moderate	45 (24.19%)	39 (20.96%)
Severe	27 (14.51%)	34 (18.27%)
Very severe	6 (3.22%)	8 (4.30%)

Table 2. Differences between sufficiently and insufficiently physically active women in sexual health variables
 Tablica 2. Razlike između dovoljno i nedovoljno tjelesno aktivnih žena u varijablama seksualnog zdravlja

Variable	Insufficient PA	Sufficient PA	Mann-Whitney U Test	
	M (SD)		p	Z
Sexual desire (N=521)	5.96 (1.66)	6.21 (2.16)	0.03*	-2.15
Total FSFI-6 score (N=350)	23.20 (2.72)	24.29 (2.69)	0.00**	-3.77
Arousal (N=350)	3.90 (0.73)	4.13 (0.71)	0.00**	-2.60
Lubrication (N=350)	4.00 (0.90)	4.24 (0.79)	0.01*	-2.45
Orgasm (N=350)	3.78 (0.81)	3.82 (0.85)	0.59	-0.53
Pain (N=350)	4.19 (0.71)	4.24 (0.82)	0.33	-0.95
Sexual satisfaction (N=350)	47.73 (6.67)	49.18 (6.16)	0.02*	-2.22

M-mean, SD-standard deviation, PA-physical activity, p-significance of difference (*p<0.05, **p<0.01), Z-Z value, N-number of participants

Table 3. Contribution of the physical activity level to sexual health variables
 Tablica 3. Povezanost razine tjelesne aktivnosti s čimbenicima seksualnog zdravlja

Independent variable	Dependent variable	β	p	R ²
Physical activity level	Sexual desire (N=521)	0.06	0.12	0.00
	Total FSFI-6 score (N=350)	0.19	0.00**	0.03
	Arousal (N=350)	0.15	0.00**	0.02
	Lubrication (N=350)	0.14	0.00**	0.01
	Orgasm (N=350)	0.02	0.70	0.00
	Pain (N=350)	0.02	0.59	0.00
	Sexual satisfaction (N=350)	0.11	0.03*	0.01

β-standardized regression coefficient, p-significance of correlation (*p<0.05, **p<0.01), R²- proportion of variance of the dependent variable explained by an independent variable, N-number of participants

Table 4. Differences in sexual health variables among recreational practitioners who practice dominantly aerobic and anaerobic type of exercise
 Tablica 4. Razlike u varijablama seksualnog zdravlja između rekreativnih vježbačica koje prakticiraju dominantno aerobni odnosno anaerobni tip tjelesnog vježbanja

Variable	Aerobic	Anaerobic	Mann-Whitney U Test	
	Mean		p	Z
Sexual desire (N=521)	6.04	6.57	0.15	-1.43
Total FSFI-6 score (N=350)	23.93	24.45	0.53	-0.62
Sexual satisfaction (N=350)	51.00	49.88	0.33	-0.97

p-significance of differences at level p<0.05, Z-Z value, N-number of participants

Table 5. Contribution of the number of sport or recreational training hours on a weekly basis to sexual health variables
 Tablica 5. Povezanost tjednog broja sati sportskog ili rekreativnog treninga s čimbenicima seksualnog zdravlja

Independent variable	Dependent variable	β	p	R ²
Number of training hours on a weekly basis	Sexual desire	0.02	0.55	0.00
	Sexual function	0.17	0.00**	0.02
	Sexual satisfaction	0.09	0.07	0.00

β-standardized regression coefficient, p-significance of correlation (**p<0.01), R²-proportion of variance of the dependent variable explained by an independent variable

Table 6. Contribution of body image satisfaction to sexual health variables

Tablica 6. Povezanost zadovoljstva vlastitim tjelesnim izgledom s čimbenicima seksualnog zdravlja

Variable	Body image satisfaction ^a		
	β	p	R ²
Sexual desire	-0.07	0.07	0.00
Sexual function (FSFI-6)	-0.05	0.32	0.00
Sexual satisfaction	-0.09	0.09	0.00

^a-result 0 represents satisfaction with body image (-8 to +8 represent the level of dissatisfaction), β -standardized regression coefficient, p-significance of correlation (p<0.05), R²-proportion of variance of the dependent variable explained by an independent variable

The results (Table 5) suggest a significantly positive correlation between the weekly number of sport or recreational training hours and the quality of sexual function, although a very small proportion of dependent variable's variance is explained by independent variable. No significant correlation has been obtained for the level of sexual desire and sexual satisfaction.

Examining the relationship between body image satisfaction and sexual health factors (Table 6), the results do not suggest a significant correlation between body image and sexual desire, sexual function and sexual satisfaction.

DISCUSSION AND CONCLUSIONS

The associations between physical activity and sexual health factors have been recognized in a certain number of studies, most of which suggest a positive relationship between physical activity and the level of sexual desire, quality of sexual function and sexual satisfaction in women, but mostly in the older samples than was used in this study (10, 14, 21, 41). This study showed a significantly higher level of sexual desire and sexual satisfaction in sufficiently physically active female students, compared to insufficiently active. Physically active women also have better overall sexual function and its separate domains of sexual arousal and lubrication, while no relationships in the domains of orgasm and pain during sexual intercourse were obtained. By observing some of the causes of hypoactive sexual desire which include hormonal imbalance (5), mainly low testosterone and high prolactin, imbalance inhibitors and excretionists (27), stress and other psychological problems such as depression and mood disorders, higher sexual desire in sufficiently physically active young women may be explained in the context of the effects of physical activity on the endocrine system and the psychological and interpersonal effects in increasing self-confidence, reducing anxiety, depression, fear and tension (8, 23), increasing the sense of competence (47) and positive effect on mood and sleep quality (56). Physical activity is negatively related to demureness, somatic difficulties, social problems and problems with attention among Croatian adolescents (18). Some of the mechanisms of a better sexual function among physically active women

are often explained by psychosocial, and the following reasons or their combinations: improvement of endothelial function and nitrogen oxide flow, vascularization of genital warts and reduction of oxidative stress (32). By examining some of the causes of sexual function difficulties which include hormonal imbalance, reduced genital blood flow, depression, stress and interpersonal difficulties, the effects of physical activity may be interpreted in the context of its effects on the endocrine system and circulation, and effects in preventing and reducing stress and depression. The results of this research on Croatian sample are mostly congruent with the findings of the foreign research. Differently, this study does not confirm the difference between sufficiently and insufficiently physically active women in the domains of orgasm and pain during sexual intercourse. In a sample of young women, the explanation may be in the complex aetiology of orgasmic disorders, which often involves pregnancy concern and socio-cultural factors, such as gender stereotypes or religious norms. In the aetiology of dyspareunia are sometimes various infections, tissue damage, hormonal causes, retroverted uterus, tumours, but also fear of injury or pregnancy (34). Obtained results may also be affected by interpersonal causes, such as emotional dissatisfaction with a partner, so it is not always advisable to understand them exclusively through the single interviewee. As the level of physical activity in this sample explains very small proportion of the total variance of sexual health factors, it may be concluded that in the student age, the level of physical activity is important, but not one of the most important factors in preserving the quality of sexual health. Although previous studies suggest a positive correlation between physical activity and sexual health in older age groups, this study points to a better sexual health of physically active women already in the college student age. Lack of research on the relationship between anaerobic exercise and sexual health, do not allow comparing the results to other studies. Both, aerobic and anaerobic type of exercise, increase the level of testosterone (20). Since the potential mechanisms which describe the relationship between physical activity and sexual health such as improving endothelial function, blood circulation in the genital region etc. (32) may be achieved independently of the type of exercise, the fact that significant differences

in sexual health factors according to type of exercise have not been confirmed may be considered as logical. Findings indicate that physical activity is positively related to sexual health factors, regardless of whether the dominant aerobic or anaerobic type of exercise is practiced. The critical value of total physical activity level of 3001 or more MET-min per week differs women with better and poorer sexual health. Physical activity covers all day movement. Due to the results, it may be concluded that the number of training hours, as one of the constituents of total physical activity, is important in preserving the quality of sexual function in women.

Ambwani & Strauss (2) suggest that women believe, more often than men, that their own body image influences their sexual relations. It may be expected that women who exercise and have good physical condition, may have better self-esteem and higher satisfaction with own body image, which reduces the number of stress factors in initiating sexual intercourse, but may also help in achieving a pleasant sexual experience, deprived about distractors such as thinking about how a partner sees her body. Physical activity and fitness are not important only for preserving quality sexual function. Physical fitness may be important also for the quality of sexual intercourse (29). Peplau et al. (44) indicate that nearly a half of North American women believe that their body image has the effects on sexual life. In this study, no significant correlations between body image satisfaction and the factors of sexual health were obtained. Although Van den Brink et al. (55) suggest that body image satisfaction is positively related to the sexual desire of Dutch female students, the results of the relationship between body image satisfaction and the level of sexual desire in this study are congruent with the most of foreign studies, which suggest that body image is not a significant predictor of sexual desire (12, 49). By observing

the relation between body image satisfaction and the quality of sexual function and sexual satisfaction, their significant associations were obtained in a certain number of studies (11, 22, 37, 38, 42, 49). Woertman & Van den Brink (58) refer to some key conclusions in their review: problems caused by body image dissatisfaction may cause interference from all domains of sexual function; difficulties in the sexual life are not related only to sexual function, but also to a sexual behaviour in general, avoiding sexual contact and a risky sexual behaviour. In this study, findings indicate that sexual health and sexual satisfaction do not depend on body image. Sexual satisfaction is a complex construct which is, apart from sexual activity itself, consisted of sexual feelings/experience, sexual focus, sexual permutation, and emotional relationship/closeness. Potential reasons for this finding may therefore be found in each of the above domains, whereby certain domains are individually, more important than the others. Since it is a transversal research with a correlation plan, it is not possible to make a causal conclusion. Although the questionnaires are not the most reliable method for assessing the physical activity level (57), this methodology is the most frequently used (48) because the cheapest way of gathering data for a large number of participants in a short period of time (57). This study may contribute to the dissemination of information on differences in sexual health among sufficiently and insufficiently physically active young women. Findings may be important to doctors, sexual therapists, sport scientists and other experts, in order to expand the knowledge about physical activity as one of the effective methods in the primary prevention of sexual dysfunction. Further research on national samples of adult women of different age groups, longitudinal studies, and qualitative research which may help to explain the relationship between physical activity and sexual health, are recommended.

Literatura

1. AlAwlaqi A, Amor H, Hammadeh ME. Role of hormones in hypoactive sexual desire disorder and current treatment. *J Turk Ger Gynecol Assoc* 2017; 18(4):210-8.
2. Ambwani S, Strauss J. Love thyself before loving others? A qualitative and quantitative analysis of gender differences in body image and romantic love. *Sex Roles* 2007; 56:13-21.
3. Bancroft J, Loftus J, Long JS. Distress about sex: a national survey of women in heterosexual relationships. *Arch Sex Behav* 2003; 32:193-208.
4. Barić R, Greblo Z, Cajner Mraović I. Emotional and behavioral problems in adolescent athletes and non-athletes. In: Doupona Topič & Kajtna, ed. *Youth Sport: Abstract book of the 7th Conference for youth sport 2014*. Ljubljana: University of Ljubljana, Faculty of Sport.
5. Bartlik B. Ask the expert: Sexual dysfunction medication, hormones, and nutrition. *Focus* 2010; 8:547-9.
6. Basson R, Brotto LA, Petkau AJ et al. Role of androgens in women's sexual dysfunction. *Menopause* 2010; 17(5): 962-71.
7. Berman JR, Berman L, Goldstein I. Female sexual dysfunction: incidence, pathophysiology, evaluation, and treatment options. *Urology* 1999; 54:385-91.99
8. Bungić M, Barić R. Tjelesno vježbanje i neki aspekti psihološkog zdravlja. *Hrvatski športskomedicinski vjesnik* 2009; 24(2):65-75.
9. Burri A, Spector T. Recent and lifelong sexual dysfunction in female UK population sample: prevalence and risk factors. *J Sex Med.* 2001; 8(9):2420-30.
10. Cabral PU, Canario AC, Spyrides MH et al. Physical activity and sexual function in middle – aged women. *Rev Assoc Med Bras.* 2014; 60(1):47-52.
11. Calogero RM, Thompson JK. Potential implications of the objectification of women's bodies for women's sexual satisfaction. *Body Image.* 2009; 6:145-8.
12. Carvalho J, Nobre P. Predictors of women's sexual desire: The role of psychopathology, cognitive-emotional determinants, relationship dimensions, and medical factors. *J Sex Med.* 2010; 7:928-37.
13. Craig CL, Marshall AL, Sjöström M et al. International physical activity questionnaire: 12- country reliability and validity. *Med Sci Sports Exerc.* 2003; 35(8):1381-95.
14. Dabrowska J, Drosdzol A, Skrzypulec V et al. Physical activity and sexuality in perimenopausal women. *Eur J Contracept Reprod Health Care.* 2010; 15(6):423-32.
15. Foster C. Guidelines For Health-Enhancing Physical Activity Promotion Programmes. The European Network For The Promotion Of Health-Enhancing Physical Activity 2000. The UKK Institute For Health Promotion Research.
16. Fugl-Meyer AR, Fugl-Meyer KS. Sexual disabilities, problems and satisfaction in 18e74 year-old Swedes. *Scandinavian Journal of Sexology.* 1999; 2:79.
17. Graziottin A, Whipple B, Dennerstein L et al. Female sexual disorders: Future trends and conclusions. In: Porst & Buvat, ed. *Standard practice in sexual medicine 2006*. Oxford: Blackwell.
18. Greblo Z, Barić R, Kozina et al. Tjelesna aktivnost i psihološka dobrobit adolescenata. In: Pavlin-Bernardić et al., ed., *Knjiga sažetaka 22. godišnje konferencije hrvatskih psihologa: Kako obrazovanju dodati boju?* 2014. Zagreb: Željeznička tiskara.
19. Gruszecki L, Forchuk C, Fisher WA. Factors associated with common sexual concerns in women: new findings from the Canadian Contraception Study. *Can J Hum Sex.* 2005; 14:1-2.
20. Hackney AC, Premo MC, McMurray RG. Influence of aerobic versus anaerobic exercise on the relationship between reproductive hormones in men. *J Sport Sci.* 1995; 13(4):305-11.
21. Halis F, Yildirim P, Kocaaslan R et al. Pilates for Better Sex: Changes in Sexual Functioning in Healthy Turkish Women After Pilates Exercise. *J Sex Marital Ther.* 2016; 42(4):302-8.
22. Hoyt WD, Kogan LR. Satisfaction with body image and peer relationships for males and females in a college environment. *Sex Roles.* 2001; 45:199-215.
23. Hughes JR. Psychological Effects of Habitual Aerobic Exercise: A Critical Review. *Prev Med.* 1984; 13:66-78.
24. IsHak WW, Tobia G. DSM-5 Changes in Diagnostic Criteria of Sexual Dysfunctions. *Disorders*
25. Isidori AM, Giannetta E, Gianfrilli D et al. Effects of testosterone on sexual function in men: results of a meta-analysis. *Clin Endocrinol.* 2005; 63(4):381-94.
26. Isidori AM, Pozza C, Esposito K et al. Development and validation of a 6-item version of the female sexual function index (FSFI) as a diagnostic tool for female sexual dysfunction. *J Sex Med.* 2010; 7(3):1139-46.
27. Janssen E, Bancroft J. The dual control model: The role of sexual inhibition & excitation in sexual arousal and behavior. In: Janssen, E. *The Psychophysiology of Sex 2006*. Bloomington: Indiana University Press.
28. Johnson SD, Phelps DL, Cottler LB. The association of sexual dysfunction and substance use among a community epidemiological sample. *Arch Sex Behav.* 2004; 33:55-63.
29. Kalka D, Domagala Z, Dworak J et al. Association between physical exercise and quality of erection in men with ischaemic heart disease and erectile dysfunction subjected to physical training. *Kardiologia Polska.* 2013,71(6):573-80.
30. Laumann EO, Paik A, Rosen RC. Sexual dysfunction in the United States: prevalence and predictors. *JAMA.* 1999; 281:537.
31. Leoni LA, Fukushima AR, Rocha LY et al. Physical activity on endothelial and erectile dysfunction: a literature review. *Aging Male.* 2014; 17(3):12-30.

32. Leško L, Barić R, Možnik M. Tjelesna aktivnost i kvaliteta seksualne funkcije – pregled istraživačkih studija u razdoblju od 1998. do 2016. godine. *HŠMV*. 2016; 31(2):49-57.
33. Lindau ST, Schumm LP, Laumann EO et al. A Study of sexuality and health among older adults in the United States. *N Engl J Med*. 2007; 357:762.
34. Masters WH, Johnson VE, Kolodny RC. *Human Sexuality* 1997. New York: Harper Collins College Publishers.
35. McCabe MP, Sharlip ID, Lewis R et al. Incidence and Prevalence of Sexual Dysfunction in Women and Men: A Consensus Statement from the Fourth International Consultation on Sexual Medicine 2015. *J Sex Med*. 2016; 13(2):144-52.
36. McCabe MP, Sharlip ID, Atalla E et al. Definitions of Sexual Dysfunctions in Women and Men: A Consensus Statement From the Fourth International Consultation on Sexual Medicine 2015. *J Sex Med*. 2016. 13(2):135-43.
37. Meana M, Nunnink SE. Gender differences in the content of cognitive distraction during sex. *J Sex Res*. 2006; 43: 59-67.
38. Meston CM. The effects of state and trait self-focused attention on sexual arousal in sexually functional and dysfunctional women. *Behav Res Ther*. 2006; 44:515-32.
39. Mišigoj-Duraković M et al. Tjelesno vježbanje i zdravlje: znanstveni dokazi, stavovi, preporuke 1999. Fakultet za fizičku kulturu, Grafos, Zagreb.
40. Nappi PR, Cicinella L, Martella S et al. Female sexual dysfunction (FSD): Prevalence and impact on quality of life (QoL). *Maturitas*. 2016; 94:87-91.
41. Nazarpour S, Simbar M, Tehrani FR et al. Sexual function and Exercise in Postmenopausal Women Residing in Chalous and Nowshahr, Northern Iran. *Iran Red Crescent Med J*. 2016; 18:5.
42. Nobre PJ, Pinto-Gouveia J. Dysfunctional sexual beliefs as vulnerability factors for sexual dysfunction. *J Sex Res*. 2006; 43:68-75.
43. Osborn M, Hawton K, Gath D. Sexual dysfunction among middle-aged women in the community. *BMJ*. 1988; 2:296.
44. Peplau LA, Frederick DA, Yee C et al. Body image satisfaction in heterosexual, gay, and lesbian adults. *Arch Sex Behav*. 2008; 38:713-25.
45. Purves D, Augustine GJ, Fitzpatrick D et al. *Neuroscience* 2011. Sinauer Associates. Sunderland, Massachusetts, SAD. Editors of Croatian version: Heffer, M., Puljak, L. & Kostić, S.
46. Richters J, Grulich AE, de Visser RO et al. Sex in Australia: sexual difficulties in a representative sample of adults. *Aust N Z J Public Health*. 2003; 27(2):164-70.
47. Sallis JF, Prochaska JJ, & Taylor WC. A review of correlates of physical activity of children and adolescents. *Med Sci Sports Exerc*. 2000; 32(5):963-75.
48. Sallis JF, Saelens BE. Assessment of physical activity by self-report: Status, limitations, and future directions. *Res Q Exerc Sport*. 2000; 71(2):1-14.
49. Satinsky S, Reece M, Dennis B, et al. An assessment of body appreciation and its relationship to sexual function in women. *Body Image*. 2012; 9:137-44.
50. Shifren JL, Monz BU, Russo PA et al. Sexual problems and distress in United States women: prevalence and correlates. *Obstetrics & Gynecology*. 2008;112(5):970-8.
51. Stunkard AJ, Sorenson T, Schlusinger F. Use of the Danish adoption register for the study of obesity and thinness. In: Kety et al., ed., *The genetics of neurological and psychiatric disorders* 1983 (115-120). New York: Raven Press.
52. Štulhofer A, Burgeron S, Jurin T. Is High Sexual Desire a Risk for Women's Relationship and Sexual Well-Being? *J Sex Res*. 2016; 53(7):882-91.
53. Štulhofer A, Buško V. Evaluacija novog instrumenta za procjenu seksualnog zadovoljstva. *Suvremena psihologija*. 2008; 11(2):287-312.
54. Štulhofer A, Kuljanić K, Buzina DŠ. Sexual health difficulties in a population-based sample of Croatian women aged 18-35 and the effects of the dual (career and motherhood) role. *J Sex Med*. 2011; 8(5):1314-21.
55. Van den Brink F, Smeets MA, Hessen DJ et al. Positive Body Image and Sexual Functioning in Dutch Female University Students: The Role of Adult Romantic Attachment. *Arch Sex Behav*. 2016; 45:1217-26.
56. Vina J, Sanchis-Gomar F, Martinez-Bello V et al. Exercise acts as a drug; the pharmacological benefits of exercise. *Br J Pharmacol*. 2012; 167(1):1-12.
57. Warren JM, Ekelund U, Besson H et al. Assessment of physical activity – a review of methodologies with reference to epidemiological research: a report of the exercise physiology section of the European Association of Cardiovascular Prevention and Rehabilitation. *Eur J Cardiovasc Prev Rehab*. 2010; 17(2):127-39.
58. Woertman L, Van den Brink F. Body Image and Female Sexual Functioning and Behavior: A Review. *J Sex Res*. 2012; 49(2-3):184-211.

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