Držanje tijela kod djevojčica uzrasta od 7-15 godina u odnosu na njihov indeks tjelesne mase

Body Posture of Girls Aged 7-15 in Relation to Their Body Mass Index

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Sažetak: Uprkos značajnim teorijskim izvorima koji se odnose na loše držanje kod djece i adolescenata, a koje je izazvala promjena načina života, saznanja o problemu abnormalne kičmene krivine treba da budu dopunjena. Može se uvidjeti sve veći broj gojazne djece i ovaj problem težine može dovesti do veće učestalosti lošeg držanja tijela. Ovaj rad ima za cilj da utvrdi učestalost dobrog i lošeg držanja tijela kod djevojčica u odnosu na njihove tjelesne težine, kao i da otkrije da li prekomjerna težina (gojaznost) daju predispoziciju za loše držanje. Istraživanje je obuhvatilo 500 djevojčica uzrasta 7-15 godina, koje žive u Szczecinu u Poljskoj. U procjeni držanja tjela, korišćena je sferosomatometrijska metoda Ivanovskog. Djevojčice sa normalnom tjelesnom težinom su predstavljale 77,7% ispitanika. U 6,7% slučajeva, identifikovana je nedovoljna tjelesna težina. 11,3% su imale višak kilograma , dok je 4,3% djevojčica bilo gojazno - što iznosi 15,6 % ispitanica. Nepravilno držanje tijela je identifikovano u 32,4% ispitanica. Najveći broj djevojčica sa lošim držanjem tijela pronađeno je među 9-godišnjakinjama (38,6%), 13-godišnjakinjama (35.2 %) i 15-godišnjakinjama (35,1%). Prekomjerna težina i gojaznost je bila predispozicija kod ispitanica za pojavu nepravilnog držanja kičme: abnormalna kičmena krivina je pronađena u 30,8% gojaznih djevojčica i djevojčica sa prekomjernom težinom.
Ključne riječi: BMI, zdravlje, fiziološka krivina kičme, držanje, djevojčice.

Abstract: Despite significant theoretical resources related to bad posture in children and adolescents, the problem of abnormal spinal curvature needs to be supplemented, which is caused by a changing lifestyle. One can observe an increasing number of overweight/obese children and this weight problem may result in a greater incidence of bad posture. This paper aims to determine the incidence of good and bad posture in girls in relation to their body weight, as well as to reveal whether excess weight/obesity predispose them to bad posture. The research involved 500 girls aged 7-15, living in Szczecin, Poland. In the assessment of body posture, Iwanowski's spherosomatometric method was employed. Girls with correct body weight constituted 77.7% of the subjects. In 6.7% cases, an insufficient body weight was identified. 11.3% suffered from excess weight while 4.3% of girls were obese – which totals 15.6% of the subjects. Incorrect body posture was identified in 32.4% of the subjects. The highest proportion of girls with bad posture was found among 9-year-olds (38.6%), 13-year-olds (35.2%), and 15-year-olds (35.1%). Overweight and obesity did predispose the subjects to bad posture: abnormal spine curvature was found in 30.8% of overweight/obese girls.
Key words: BMI, health, physiological spine curvature, posture, girls.

Uvod

Pitanje epidemiologije lošeg držanja tijela kod djece i adolescenata izaziva veoma različite stavove. Istraživanje o držanju tijela sprovedeno u različitim regionima Poljske je ukazalo da je značajan dio (32,5% do 93,2%) djece i adolescenata sa značajnim poremećajima u po-

Introduction

The issue of epidemiology of bad posture in children and adolescents provokes very diverse attitudes. Research on body posture conducted in various regions of Poland pointed to a significant proportion (32.5 to 93.2%) of children and adolescents with considerable abnormali-

gledu lokomotornog aparata i statike tijela. Mnoga istraživanja govore o učestalosti lošeg držanja u populaciji: 32,5% (Łubkowska, 2003), 33,6% (Suder i sar., 2002), 40,0% (Kasperczyk, 1988), 51,1% (Żukowska, 2012), 52,5-59,7% (Stoliński i Kotwicki, 2011), 60% (Barczyk i sar., 1997; Starosta, 1993; Żukowska i sar., 2014), 71,4% (Maciałczyk-Paprocka i sar., 2012), 81,9% (Maciałczyk-Paprocka i sar., 2011), 83-93,2% zavisno od regiona (Mrozkowiak, 2007), 93,2% (Janiszewska et al., 2009). Novakovski (2011) smatra da se procenat svih anomalija držanja tijela tokom perioda rasta kreće oko 90% (kičme i grudi 40-50%, donji ekstremiteti 50%).

Kontroverzni epidemiološki podaci se takođe mogu naći u odnosu na učestalost lateralnog krivljenja kičme, odnosno skolioze (1,4 % do 69%). Postoje više istraživanja koja govore o učestalosti skolioze: 1,4-9,9% (Stoliński & Kotwicki, 2011), 4,1-28,3% (Mrozkowiak, 2007), 9,8% (Janiszewska i sar., 2009), 18% (Śliwa i sar., 1995), 38% (Prętkiewicz-Abacjew i sar., 1992), 48% (Standera, 1999), 50% (Łabaziewicz, 1993), 65,3% (Kania-Gudzio & Wiernicka, 2002), 65,6% (Żukowska i sar., 2014), 69% (Wilczyński, 2005). Kao rezultat toga, mora se voditi diskusija da bi se odgovorilo na pitanje, koji procenat populacije pati od lošeg držanja tijela?

Razlike su rezultat, između ostalog, korištenja različitih metoda istraživanja i nedosljednih kvalifikacionih kriterijuma za procjenu držanja i njegovih komponenti. Mrozkowiak i sar. (2014) su razvili opis preko 100 metoda procjene položaja tijela. Istraživači su odlučili da iznesu svoje klasifikacije metoda koje se koriste za dijagnozu položaja tijela, dijeleći ih na: metode inspekcije, siluet inspekcije, manuelne i operativne dijagnostike, metode point-based, aktivnosti pokreta, metode koje koriste složene mehaničke mjerne instrumente, metode koje koriste jednostavne mjerne instrumente i tehnološki napredne metode procjene držanja tijela, uključujući i tehnološke uređaje površinskog renderinga. Uprkos nedosljednim podacima koji se odnose na učestalost nepravilnog držanja tijela, problem je dovoljno značajan da postane i značajan socijalni problem, pošto ispravno držanje tijela ne služi samo estetskoj funkciji, vec, prije svega, takođe utiče na zdravlje i kvalitet života (Łubkowska i Troszczinski, 2011; Pupišova 2013, 2014). Pregledi držanja tijela pomažu u ranom otkrivanju anomalija lokomotornog aparata, a u budućnosti oni mogu da doprinesu smanjenju bolesti vezanih za bolesti lokomotornog aparata, nervnog sistema, kao i kardiovaskularnog i respiratornog sistema. Novakovski (2011) navodi da su bolesti kičme i stanja lokomotornog aparata rezultat netretiranih abnormalnosti držanja tijela. Bendikova & Kostencka (2013) , Pivovarniček i sar. (2013a,b) ,

ties in terms of motor organs and body statics. Below is a list of incidence of bad posture in the population: 32.5% (Łubkowska, 2003), 33.6% (Suder et al., 2002), 40.0% (Kasperczyk, 1988), 51.1% (Żukowska, 2012), 52.5-59.7% (Stoliński and Kotwicki, 2011), 60% (Barczyk et al., 1997; Starosta, 1993; Żukowska et al., 2014), 71.4% (Maciałczyk- Paprocka et al., 2012), 81.9% (Maciałczyk-Paprocka et al., 2011), 83-93.2% depending on the region (Mrozkowiak, 2007), 93.2% (Janiszewska et al., 2009). Nowakowski (2011) believes that the proportion of all posture abnormalities during the growth period revolves around 90% (spine and chest: 40-50%, lower limbs: 50%).

Controversial epidemiological data can also be found in relation to incidence of lateral curvature of the spine, i.e. scoliosis (1.4% to 69%). Below is a list of incidence of scoliosis: 1.4-9.9% (Stoliński & Kotwicki, 2011), 4.1-28.3% (Mrozkowiak, 2007), 9.8% (Janiszewska et al., 2009), 18% (Śliwa et al., 1995), 38% (Prętkiewicz-Abacjew et al., 1992), 48% (Standera, 1999), 50% (Łabaziewicz, 1993), 65.3% (Kania-Gudzio & Wiernicka, 2002), 65.6% (Żukowska et al., 2014), 69% (Wilczyński, 2005).

As a result, one needs to struggle to answer the question: *What proportion of population suffers from bad posture?* The discrepancies result from, inter alia, using different research methods and inconsistent qualifying criteria to assess posture and its components. Mrozkowiak et al. (2014) developed a description of over 100 methods of body posture assessment. The researchers decided to put forward their own classification of methods used to diagnose body posture, dividing them into: inspection methods, silhouette inspections, manual and operational diagnostics, point-based methods, motion activities, methods using complex mechanical measuring instruments, methods using simple measuring instruments, and technologically-advanced methods of body posture assessment, including surface-rendering technological devices.

Despite inconsistence data related to bad posture incidence, the problem is significant enough to become a considerable social issue, as correct body posture does not only serve an esthetic function, but – above all – it also impacts one's health and wellbeing (Łubkowska and Troszczyński, 2011 a; Pupišová 2013, 2014). Body posture examinations help detect abnormalities of the motor organ early on, and in the future they can contribute to reducing ailments related to diseases of the motor organ, nervous system, as well as circulatory and respiratory systems. Nowakowski (2011) states that spinal ailments and motor organ conditions result from untreated posture abnormalities.

Pupišova - Pupiš (2013), Šmida (2015) su došli do sličnih zaključaka. Oni su predstavili teorijske i praktične rezultate istraživanja dobijenih od strane istraživača koji se bave zdravstvenim problemima. Istraživanje je koncentrisano na funkcionalne i strukturne promjene na mišićno-koštanom sistemu. Autori su zaključili da nedovoljna primarna i sekundarna prevencija i dijagnostika, kao i funkcionalni nemar ili morfološke promjene u mišićno-koštanom sistemu često dovode do funkcionalnih i strukturnih poremećaja lokomotornog aparata kod odraslih.

Prema Janiszevska i sar. (2009), uzroci lošeg držanja tijela su raznovrsni. Mogu uključivati genetske predispozicije, statičke i dinamičke poremećaje ravnoteže, razne bolesti, kao i nepovoljne uslove života (navike u ishrani, zamor, nedostatak fizičke aktivnosti, dugo vrijeme provedeno u sjedećem položaju, itd).

Ključni metod borbe protiv lošeg držanja tijela je fizikalna terapija, odnosno tretmani na bazi kretanja (kineziterapija). Fizičke vježbe su izgleda glavni faktor za izliječenje (Kotwicki, 2011). Takođe se smatra da je to jedna od ključnih preventivnih mjera (Łubkowska & Troszczinski, 2011b). Nedostatak fizičke aktivnosti dovodi do prekomjerne težine i gojaznosti (Maciałczik-Paprocka, 2012), koje sa svoje strane dovode do degenerativnih promjena kičme zbog preopterećenja. Ove promjene nisu više tipične samo za starije ili srednje dobi pacijenata-one takođe utiču na djecu i adolescente (Kim i sar., 2010; Martinez-Lage i sar., 2003). Istraživanje sprovedeno od strane Levandovski (2011), koje je obuhvatilo 5.321 učenika uzrasta od 14-19 godina, je pokazalo da 63 % ispitanika pati od hroničnog bola kičme. Bol je možda izazvana nedovoljnom fizičkom aktivnošću učenika, koja je možda dovela do povećanja učestalosti lošeg držanja tijela. Istraživanje koje je sprovela Zukowska i sar. (2014) ukazuje da postoje statistički značajne korelacije između lošeg držanja tela u sagitalnom podrucju i fizičke spretnosti-funkcionalnosti među učenicima prvog razreda u ruralnim područjima.

Razmatrana pitanja opravdavaju dalja istraživanja, pa je cilj ovog rada da se utvrdi učestalost lošeg i dobrog držanja tijela kod devojčica uzrasta od 7-15 godina, uzimajuci u obzir njihovu tjelesnu masu kako bi se odgovorilo na sljedeće pitanje: Da li su prekomjerna težina i gojaznost predispozicija za loše držanje tijela?

Metod

Istraživanje je obuhvatilo 500 djevojčica uzrasta od 7-15 godina koje su pohađale škole u različitim dijelovima Szczecina- velikog lučkog grada u Poljskoj. Izbor škola i ispitanica je nasumično izabrano, samo na osnovu starosne kategorije (Tabela 1). Da bi se utvrdila starost

Bendíková & Kostencka (2013), Pivovarniček et al. (2013a,b), Pupišová – Pupiš (2013), Šmída (2015) arrived at similar conclusions: they presented theoretical and practical research results obtained by researchers who focus on health issues. The research concentrated on functional and structural malfunctions of the musculoskeletal system. The authors concluded that insufficient primary and secondary prevention and diagnostics, as well as functional negligence or morphological changes in the musculoskeletal system often lead to functional and structural disorders of the motor organ in adults.

According to Janiszewska et al. (2009), origins of bad posture are diverse: they may include genetic predispositions, static and dynamic balance disorders, various diseases, as well as unfavorable living conditions (dietary habits, fatigue, lack of physical exercise, long stretches of time spent in sedentary position, etc.).

Key method of fighting bad posture is physical therapy, i.e. treatments based on movement (kinesiotherapy). Providing physical exercise seems to be the main healing factor (Kotwicki, 2011); it is also considered to be one of the key preventive measures (Łubkowska & Troszczyński, 2011b). Lack of exercise leads to overweight and obesity (Maciałczyk-Paprocka et al., 2012), which in turn results in degenerative overload changes of the spine. These changes are no longer typical only of the elderly or middle-aged patients – they also affect children and adolescents (Kim et al., 2010; Martínez-Lage et al., 2003). Research made by Lewandowski (2011), which included 5,321 pupils aged 14-19, indicated that 63% of subjects suffered from chronic spinal pain. The pain might have been caused by insufficient physical activity of the pupils, which may have led to an increased incidence of bad posture. Research conducted by Żukowska et al. (2014) indicated that there are statistically significant correlations between bad posture in sagittal plane and physical dexterity/functionality amongst 1st grade pupils in rural areas.

The discussed issues justify further research, therefore the aim of this paper is to determine the incidence of bad and good posture in girls aged 7-15 with consideration given to their body mass in order to answer the following question: *Does overweight and obesity predispose them to bad posture?*

Methodology

The research encompassed 500 girls aged 7-15 who attended schools in various parts of Szczecin – a large, port city in Poland. The choice of schools was merithorically-based, and the subject group was selected at random, based only on age categories (Table 1). To

subjekata korišćene su kalendarske godine; da se utvrde segmenti starosti, ± ½ sredina godine je tretirana kao segment polovine.

determine subjects' age, calendar years were used; to determine age segments, ± ½ middle of the year was treated as the segment half.

Tabela 1. *Kvantitativne karakteristike subjekata (n = 500)*   **Table 1.** *Quantitative characteristics of the subjects (n = 500)*

Starost (godine) / *Age (years)*	7	8	9	10	11	12	13	14	15
Djevojcice (n = 500) / *Girls (n = 500)*	51	52	57	54	57	57	54	61	57

Za procjenu položaja tijela Ivanovski (1982) je koristio sferosomatometrijsku metodu, koja određuje oblik prednje i zadnje fiziološke krivine kičme u sagitalnoj ravni. U ovom postupku, grafički prikaz prostorne krivine se dobija u razmjeri 1:1. To je skup tačaka koje predstavljaju vrhove spinosus procesa. Mjerenje je uključilo raspon od C7 - L5. Analiza grafikona je utvrdila uglove - a, b, g –koji ilustruju obim grudnog koša kifoze i lumbalne lordoze. Oni određuju krivinu gornjeg dijela grudnog koša -kifoze (ugao a), donji dio grudne kifoze (ugao b) i lumbalne lordoze (ugao γ) (Slika. 1).

Detaljna analiza uglova kičmene krivine koristi normativne obime fizioloških kičmenih krivina koju je definisala Łubkowska (2012) za djecu i omladinu u Szczecinu. Tako je uspostavljena klasifikacija pravilnih i nepravilnih oblika kičmenog stuba ispitanica.

To assess body posture, Iwanowski's (1982) spherosomatometric method was used, which determines the shape of front and back physiological curvatures of the spine in sagittal plane. In this method, a graphic representation of the spacial curvature is obtained in 1:1 scale; it is a collection of points representing the tips of spinous processes. The measurement included a range of C7 – L5. The analysis of the graphs determined angles - a, b, g - which illustrate the scope of thoracic kyphosis and lumbar lordosis; they determine the curvature of the upper section of the thoracic kyphosis (alpha angle - a), lower section of the thoracic kyphosis (beta angle - b), and lumbar lordosis (gamma angle - γ) (Fig. 1).

The detailed analysis of spine curvature angles used normative ranges of physiological spinal curvatures, prepared by Łubkowska (2012) for children and adolescents in Szczecin. Thus, a classification of correct and incorrect spine shapes of the subjects was established.

Slika 1. *Fiziološke krivine kičme i način utvrđivanja uglova i visina spinalnih dijelova*

Figure 1. *Physiological spine curvature and method of determining angles and heights of spine sections*

Legenda: *C7 - tačka koja odgovara visini sedmog vratnog pršljena; L5/S - tačka koja odgovara visini petog lumbalnog pršljena, tretirana ovde kao vrh interglutealnog zazora; Ek - najisturenija tačka grudne krivine (ekstremne kifoze); El - najisturenija tačka lumbalne lordoze (ekstremna lordoza); Vc – visina kicme od L5/S do C7; VK - visina kičme od L5/S do Ekstremne kifoze ,Ek; VL - visina kičme od L5/S do ekstremne lordoze El; Alfa ugao - α – nagibni ugao gornjeg grudnog dijela; Beta ugao - ß - nagibni ugao donjeg grudnog dela (torako lumbalni dio); Gama ugao - γ - nagibni ugao lumbalnog dijela (Lumbo – sakralni dio).*
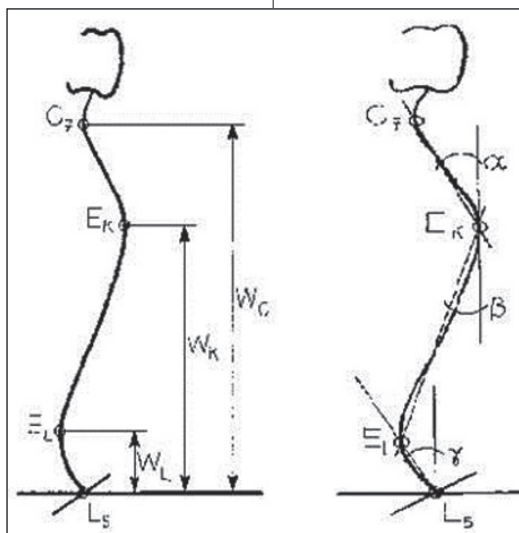
Legend: *C7 – a point corresponding to the height of the seventh cervical vertebrae; L5/S – a point corresponding to the height of the fifth lumbar vertebrae, treated here as a tip of intergluteal cleft; Ek – the most protruding point of thoracic curvature (extremum of kyphosis); El – the most protruding point of lumbar lordosis (extremum of lordosis); Wc – Spine height from L5/S to C7; Wk – spine height from L5/S to extremum of kyphosis Ek; Wl – spine height from L5/S to extremum of lordosis El; Alpha angle - α – inclination angle of the upper thoracic section; Beta angle - ß – inclination angle of the lower thoracic section (thoraco-lumbar section); Gamma angle - γ – inclination angle of the lumbar section (lumbo-sacral section).*

Mjerenje visine i tjelesne težine je izvedeno korišćenjem direktne metode, prema principima antropometrije: stepen gojaznosti (pothranjenost je određena BMI indeksom (indeks tjelesne mase), izračunat pomoću sljedeće formule: BMI = tjelesna masa (u kg) / visina² (m), prema Woinarowska (2013). Statistička analiza je koristila mjere centralne tendencije i mjere disperzije: aritmetičku sredinu i standardnu devijaciju.

Rezultati

Srednje vrijednosti, standardna devijacija i niz varijabli (minimum-maksimum) koji karakterišu fizički razvoj ispitanica, prikazane su u tabeli 2.

Height and body weight measurements were made using a direct method, according to principles of anthropometry; the extent of overweight / underweight was determined by BMI (Body Mass Index), calculated with the following formula: BMI = body weight [in kg] / height² [in m] (Woynarowska, 2013). The statistical analysis employed central tendency and measures of dispersion: arithmetic mean and standard deviation.

Results

Mean values, standard deviation and the range of variables (minimum-maximum) which characterized the physical development of the subjects, is presented in Table 2.

Tabela 2. *Visina, tjelesna masa i BMI djevojčica (n=500)*

Table 2. *Height, body weight and BMI of the subjects (n = 500)*

Uzrast (godine) Age (yesrs)	n = 500	Mean ± SD min- max	Djevojčice		
			Visina (cm) *Height (cm)*	Tjelesna masa (kg) *Body mass (kg)*	Body mass index BMI (kg/m²)
7	51	Mean±SD	121.5±5.1	23.3±3.8	15.9±2.3
		min-max	112-130.5	17-31.5	11.7-22.3
8	52	Mean±SD	125.7±5.2	25.1±3.9	15.8±1.8
		min-max	114.5-138.5	18.5-33.5	13.1-19.2
9	57	Mean±SD	131.4±5.8	29.4±6.6	17.0±3.2
		min-max	125-145	19.7-46.5	13.1-28.2
10	54	Mean±SD	137.1±6.1	33.2±5.2	17.1±2.1
		min-max	117.5-148	22.6-44.5	13.5-22.5
11	57	Mean±SD	144.1±7.9	37.8±8.0	18.1±3.1
		min-max	130-168.5	22.5-61.5	13.3-27.7
12	57	Mean±SD	149.4±8.1	41.9±9.4	18.7±3.2
		min-max	125-167	26.8-74	13.7-26.5
13	54	Mean±SD	154.9±7.2	46.9±10.9	19.4±3.7
		min-max	139-171	28.5-73	14.3-30
14	61	Mean±SD	161.1±5.2	52.4±7.8	20.1±2.4
		min-max	147.5-172	33.8-71.5	14.5-26
15	57	Mean±SD	163.5±6.0	54.9±9.2	20.6±3.2
		min-max	149.5-178	37.2-83.3	15.3-32.1

Tabela 3 prikazuje rezultate analize BMI djevojčica uzrasta 7-15 godina. Poređenje izračunatog BMI sa "normom" za određene starosne segmente dobi i pola (Voinarovska, 2013) nam je dozvolilo da podijelimo subjekte u: neuhranjene djevojčice, djevojčice sa pravilnom tjelesnom težinom i gojazne (prekomjerne težine) djevojčice. Djevojčice sa normalnom tjelesnom težinom predstavljaju 77,7% ispitanica. U 6,7% slučajeva je identifikovana nedovoljna tjelesna masa. Višak kilograma je pronađen u 11,3% ispitanica, dok je gojaznost u 4,3%. Ove dvije

Table 3 presents results of the BMI analysis of girls aged 7-15. Comparison of the calculated BMI with the 'norm' for particular age and sex segments (Woynarowska, 2013) permitted us to divide the subjects into: underweight girls, girls with correct body weight and overweight/obese girls. Girls with a correct body weight constituted 77.7% of subjects. In 6.7% cases, an insufficient body weight was identified. Overweight was found in 11.3% of subjects, while obesity – in 4.3%. These two phenomena (over-

pojave (prekomjerna masa i gojaznost) čine do 15,6% od svih ispitanica (Tabela 3).

weight and obesity) added up to 15.6% of all subjects (Table 3).

Tabela 3. Učestalost neuhranjenosti, normalne tjelesne mase, prekomjerna mase i gojaznosti, zasnovan na BMI djevojčica uzrasta 7.-15. godina (n = 500)

Table 3. Incidence of underweight, correct body weight, overweight and obesity, based on the BMI of girls aged 7-15 (n = 500)

Uzrast [godine] / Age (year)	Djevojčice / Girls (n =500)											
	Pothranjenost / Underweight		Normalna tjelesna masa / Correct body weight		Prekomjernost / Overweight		Gojaznost / Obesity		Prekomjernost + gojaznost / Overweight + Obesity		Suma / The sum
	n	%	n	%	n	%	n	%	n	%	n
7	6	11.8	38	74.5	6	11.8	1	1.9	7	13.7	51
8	3	5.8	48	92.3	1	1.9	0	0	1	1.9	52
9	6	10.5	39	68.4	8	14.1	4	7.0	12	21.1	57
10	4	7.4	45	83.3	5	9.3	0	0	5	9.3	54
11	4	7.1	41	71.9	10	17.5	2	3.5	12	21.0	57
12	2	3.5	43	75.5	10	17.5	2	3.5	12	21.0	57
13	4	7.4	40	74.1	4	7.4	6	11.1	10	18.5	54
14	2	3.3	50	81.9	7	11.5	2	3.3	9	14.8	61
15	2	3.5	44	77.2	6	10.5	5	8.8	11	19.3	57
	33	6.70	388	77.7	57	11.3	22	4.3	79	15.6	500

Tabela 4 predstavlja pojavu nepravilnog držanja tijela u pojedinim starosnim grupama. Nepravilna spinalna krivina je identifikovana u 162 učenice, što čini 32,4 % ispitanika. Najveći broj djevojčica sa nepravilnim držanjem (abnormalno spinalna krivina) pronađeno je među 9-godišnjakinjama (38,6%), 13-godišnjakinjama (35,2 %) , i 15 -godišnjakinjama (35,1%). Učestalost lošeg držanja tijela je bila najmanja u sljedećim starosnim grupama: 12-godišnjakinjama (24,6%), 7-godišnjakinjama (29,4%) i 11-godišnjakinjama (29,8 %).

Table 4 presents incidence of incorrect posture in particular age groups. Abnormal spinal curvature was identified in 162 pupils, which constitutes 32.4% of subjects. The highest proportion of girls with bad posture (abnormal spinal curvature) was found among 9-year-olds (38.6%), 13-year-olds (35.2%), and 15-year-olds (35.1%). The incidence of bad posture was the lowest in the following age groups: 12-year olds (24.6%), 7-year-olds (29.4%) and 11-year-olds (29.8%).

Tabela 4. Učestalost lošeg držanja u ispitivanoj populaciji

Table 4. Incidence of bad posture in the researched population

Uzrast (godine) / Age (years	Fiziološka zakrivljenost kičme / Physiological spine curvature			
	pravilno / normal		nepravilno / incorrect	
	N	%	n	%
7	36	70.6	15	29.4
8	34	65.4	18	34.6
9	35	61.4	22	38.6
10	36	66.7	18	33.3
11	40	70.2	17	29.8
12	43	75.4	14	24.6
13	35	64.8	19	35.2
14	42	68.9	19	31.1
15	37	64.9	20	35.1
	338	67.6	162	32.4

Tabela 5 prikazuje pojavu nepravilnog držanja tijela kod djevojčica u odnosu na njihove tjelesne težine. Nepravilno držanje tijela je identifikovano u 24,9% preteš-kih i 5,9% gojaznih djevojčica, što pokazuje da je 30,8% prekomjerno uhranjenih (gojaznih devojaka). Učestalost lošeg držanja tijela je veća u 11 i 12- godišnjakinja koje pate od prekomjerne težine (gojaznosti).

Table 5 presents incidence of bad posture in girls in relation to their body weight. Incorrect body posture was identified in 24.9% of overweight girls and 5.9% obese girls, which adds up to 30.8% of overweight/obese girls. Bad posture incidence was higher in 11- and 12-year-old girls suffering from overweight/obesity.

Tabela 5. *Učestalost lošeg držanja u ispitivanoj populaciji dje-vojčica uzrasta 7-15 godina u odnosu na njihove tjelesne težine*

Table 5. *Incidence of bad posture in the researched populati-on of girls aged 7-15 in relation to their body weight*

Nepravilno držanje tijela / *Incorrect body posture*										
Uzrast (godine) / *Age (year)*	**Pothranjenost / *underweight***		**Normalna tjelesna masa / *Correct body weight***		**Pretežak / *Overweight***		**Gojazan / *Obesity***		**Zajedno / *Together***	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
7	3	20.0	8	53.3	3	20.0	1	6.7	15	29.4
8	0	0	17	94.5	1	5.5	0	0	18	34.6
9	1	4.6	14	63.6	7	31.8	0	0	22	38.6
10	1	5.6	14	77.8	3	16.6	0	0	18	33.3
11	1	5.9	7	41.2	7	41.2	2	11.7	17	29.8
12	0	0	4	28.6	8	57.1	2	14.3	14	24.6
13	0	0	13	68.4	3	15.8	3	15.8	19	35.2
14	1	5.2	14	73.7	4	21.1	0	0	19	31.1
15	2	10.0	14	70.0	3	15.0	1	5.0	20	35.1
	9	5.7	105	63.5	39	24.9	9	5.9	162	32.4

DISKUSIJA I ZAKLJUČAK

Učestalost prekomjerne tjelesne mase i gojaznosti kod djece i adolescenata se povećava sličnom brzinom kao i kod odraslih . Prema IOTF -a (Međunarodne operativna grupa za gojaznost) izvještaju, 155 miliona uče-nika u svijetu boluje od prekomjerne težine (gojaznosti). Među njima, 30-45 miliona su gojazna djeca uzrasta 6-17 godina i 22 miliona su gojazna djeca mlađa od 5 godina (Obuchowicz, 2005; IOTF, 2004). Američko istraživanje koje je uključivalo grupu od 8.000 djece i adolescenata, završeno u 2002. godini, je pokazalo da oko 30% ispi-tanika pati od prekomjerne težine (Hedli, et al., 2004). Podaci SZO pokazuju da u zemljama zapadne Evrope procenat gojazne djece se povećao sa 10% na početku 1980-ih do 20% u kasnim 1990-im . U Poljskoj, u 2005. godini bilo je 13% gojaznih adolescenata uzrasta od 13-15 godina pa je i opravdano očekivati dalji rast ovih pro-cenata (Woinarowska, 2013) .

Istraživanja prezentovana u ovom radu otkrila su da je 15,6% gojaznih devojaka, sa najvećom učestalosti problema sa težinom među 9, 11 i 12 – godišnjakinja-ma (oko 21 %). Istraživanje koje su sproveli Maciałczyk i Paprocka (2012), koje je obuhvatalo 581 devojčica uzrasta od 7-12 godina, stalno nastanjenih u Poznanju

DISCUSSION AND CONCLUSION

Incidence of overweight and obesity in children and adolescents is increasing at a similar rate as amongst adults. According to IOTF's (International Obesity Task Force) report, 155 million schoolchildren in the world suffer from overweight/obesity. Amongst them, 30-45 million are obese children aged 6-17 and 22 million are obese children under the age of 5 (Obuchowicz, 2005; IOTF, 2004). American research which involved a group of 8,000 children and adolescents, completed in 2002, indicated that approximately 30% of subjects suffered from overweight (Hedley et al., 2004).WHO data indica-ted that in the Western European countries the proportion of obese children increased from 10% at the beginning of 1980s to 20% in the late 1990s. In Poland, in 2005 there were 13% of overweight/obese adolescents aged 13-15 and it is justified to expect a further increase of this pro-portion (Woynarowska, 2013).

Research presented in this paper revealed 15.6% of overweight/obese girls, with the highest incidence of weight problem amongst 9-, 11- and 12-year-olds (approx 21%). Research carried out by Maciałczyk-Paprocka's (2012) team, which encompassed 581 girls aged 7-12, who lived permanently in Poznań, Poland, identified

(Poljska), identifikovalo je 6,7% gojaznih djevojčica . Mazur i sar. (2001) su dijagnostikovali gojaznost u 10% učenica, dok Smorczewska- Czuprinska i sar. (2000) su identifikovali gojaznost u 12,3% djevojčica uzrasta 14 godina, koje žive u Białystok (Poljska).

Gojaznost je jedan od glavnih faktora rizika za uče-stalost degenerativnih promjena preopterećenja osteo-artikularnog sistema. Gojazni subjekti pate uglavnom od degenerativnih promjena preopterećenja zglobova ko-ljena i kuka, kao i lumbalne kičme. One mogu dovesti do skeletnih deformiteta. Američke procjene pokazuju da 50% gojaznih pate od bolova u zglobovima, kao i da nedostatak fizičke aktivnosti dovodi do povećanja goja-znosti (Skovronska i Fichna, 2011) .

Malo je istraživanja posvećeno, detaljnoj analizi dr-žanja tijela u odnosu na tjelesnu masu. Autori ovog rada su pokazali da u istraženoj populaciji djevojčica uzrasta od 7-15 godina, 32,4% ispitanica pati od lošeg držanja ti-jela, što je znatno niža vrijednost nego u istraživanju dru-gih autora koji su se bavili ovom tematikom. Nesumnjivo, nedosljedan rezultat proizilazi iz različitih metodologija procjene položaja tijela. U ovom radu, abnormalno drža-nje tijela se primjenjuje samo na prednje-zadnje oblike fi-ziološke krivine kičme, dok su Maciałczik - Paprocka i sar. (2012) identifikovali pogrešan položaj tijela u smislu uče-stalosti abnormalnosti položaja tijela zasnovanoj na mo-difikovanoj tabeli nepravilnosti držanja tijela (Dega). Taj metod je subjektivan, a autori ukazuju da su abnormalnosti držanja tijela nađeni u 71,4% djevojčica (i kod čak 82,8% djevojčica uzrasta od 7 godina). Isti istraživački tim je oci-jenio učestalost lošeg držanja tijela u odnosu na tjelesne težine. Oni su posmatrali anomalije držanja tijela u 85,5% prekomjerno teških (gojaznih) djevojčica. U istraživanju opisanom u ovom radu, autori su identifikovali loše drža-nje u 30,8% prekomjerno teških (gojaznih) djevojčica.

S obzirom na to da postoji sve veći procenat gojazne djece, rana korekcija nepravilnog držanja tijela može biti značajna, ne samo u spriječavanju lošeg držanja tiela, već i u prevenciji gojaznosti (Woinarowska, 2013). Liječenje bo-lesti povezanih sa gojaznošću predstavlja najveći dio troš-kova u zdravstvu (oko 7% ukupne potrošnje u zapadnim zemljama Evrope i 5% u Istočnoj Evropi). Zbog zdravstve-nih i socijalnih posljedica, gojaznost je jedan od prioritetnih zdravstvenih problema u Evropi (SZO, 2005) i zabrinutost zbog zdravlja djece, pravilnog držanja tijela i pravilne kič-mene krivine postaje značajan društveni problem.

Postoji hitna potreba za programe zdravstvenog obrazovanja i programe porodičnog vaspitanja koji će promovisati zdrav način života kao faktor koji podrža-va ispravno formiranje držanja tijela kod djece. Pravil-

6.7% of obese subjects. Mazur et al. (2001) diagnosed obesity in 10% of schoolgirls, while Smorczewska-Czupryńska et al. (2000) identified obesity in 12.3% girls aged 14, living in Białystok, Poland.

Obesity is one of the main risk factors for inciden-ce of degenerative overload changes of the osteoarticular system. Overweight subjects suffer mainly from degene-rative overload changes of knee and hip joints, as well as lumbar spine. These can lead to skeletal deformity. American estimates show that 50% of the obese suffer from joint pain, and lack of physical exercise leads to an increase in obesity (Skowrońska & Fichna, 2011).

There is little research devoted to a detailed analysis of body posture in relation to body mass. The authors of this paper showed that in the researched population of girls aged 7-15, 32.4% of subjects suffered from bad po-sture, which is a value lower than in research conducted by other authors in this subject matter. Undoubtedly, the inconsistent result stems from a different methodology of body posture assessment. In this paper, abnormal body posture is applied solely to front-back shape of physiolo-gical spine curvature, while Maciałczyk-Paprocka et. all (2012) identified incorrect body posture in terms of inci-dence of body posture abnormalities based on modified table of posture irregularities by Dega. That method is subjective, and authors indicated that posture abnormali-ties were found in 71.4% of girls (and as many as 82.8% of girls aged 7). The same research team assessed the in-cidence of bad posture in relation to body weight; they observed posture abnormalities in 85.5% of overweight/ obese girls. In the research described in this paper, the authors identified bad posture in 30.8% of overweight/ obese girls.

Considering the fact that there is an increasing pro-portion of overweight/obese children, early correction of bad posture may be significant not only in prophylaxis of bad body posture, but also in prevention of obesity (Woynarowska, 2013). Treatment of obesity-related di-seases constitutes the biggest part of healthcare spen-ding (approx. 7% of total spending in Western Europe countries and 5% in Eastern Europe). Due to its health and social consequences, obesity is one of the priority health problems in Europe (WHO, 2005), and concern over children's health, posture and correct spinal curva-ture becomes a significant social problem.

There is an urgent need for health education pro-grams and family education programs which would pro-mote healthy lifestyle as a factor which supports correct posture formation in children. Sensible diet, physical ac-tivity (especially water sports), seems to be one of the

na ishrana, fizička aktivnost (naročito vodeni sportovi), su izgleda jedni od najefikasnijih faktora promovisanja zdravlja (Łubkowska i sar., 2014).

Nepravilan položaj tijela je pronađen u 32,4% djevoj-čica uzrasta 7-15 godina. Prekomjerna težina i gojaznost su predispozicija za subjekte za nastajanje nepravilnog držanja kičme: abnormalna kičmena krivina je pronađena u 30,8% prekomjerno teških (gojaznih) devojaka.

most effective health-promoting factors (Łubkowska et al. 2014).

Bad posture was observed in 32.4% of girls aged 7-15. Overweight and obesity did predispose the subjects to bad posture: abnormal spine curvature was found in 30.8% of overweight/obese girls.

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