

# Possible Influences of a Heavy Backpack on Back Pain Syndrome in Primary School Children

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## **Abstract**

*As they grow, children go through different phases of growth and development, and very often due to various unspecified outside influences, they are overloaded with weight. Heavy backpacks and its correlation to different types of bad posture, as well as pain in particular parts of the back, has been an important issue in the past several years. The aim of this research was to determine average backpack weight in correlation to children's weight in primary school. Also, the aim was to determine if there were some differences between pupils of the first, second, third, and fourth grade of primary school. Further on, it aimed at answering the question whether there was some correlation between the already determined relative backpack weight and the mentioned pain intensity while carrying the backpack. The research was conducted on a sample of 252 primary school pupils (boys and girls). Body weight and backpack weight were measured, and a short interview was also conducted. The short interview concerned feelings, intensity and pain location while carrying and the way they carry the backpack. The results indicate that the average values of the correlation between the backpack weight and the body weight (%) compared with the maximum allowed limit of 10%, in all grades, are in average (16.72%) over the limit, resulting with the maximum rate of 29.17% in grade 1. Out of the total number of pupils, 93.1% responded that they carry the backpack on both shoulders. Out of the whole sample, 87 (31.4%) of them said that they feel pain while carrying the backpack. The majority (18.4%) of subjects felt pain in their lower back. The youngest children in this sample, more precisely, those in grade 1, felt the most pain of high intensity, which is probably due to the fact that their backpack, compared to their body weight, was too heavy.*

**Key words:** lower back pain (LBP); primary school; school bag.

## **Introduction**

The heavy backpack problem and its correlation to different types of bad posture, as well as pain in particular parts of the back, has been an important issue over the last few years. Also, the percentage of children with bad posture has grown as recent studies show that for children aged 6 to 9, it varies from 51% to 62% (Paušić et al., 2006), and for boys, aged 10 to 13, from 10% to 22% (Paušić, Pedišić & Dizdar, 2010; Paušić & Dizdar, 2011). When speaking about bad posture we primarily refer to different bad posture functions such as kyphotic posture, lordotic posture or scoliosis. As they grow, children go through different phases of growth and development and very often, because of some unspecified outside influences, they are overloaded with weight. Their unprepared locomotor system weakens and gradually yields in bad posture. Due to the above mentioned, and the overload of the locomotor system, the stato-dynamic correlation becomes disrupted, and after a longer period of time of being overburdened, insufficiency of the posture muscles occurs. Some of the most frequent unspecific external loads are a heavy backpack bad posture while carrying the same, bad posture while sitting at school, inappropriate height of school desks, as well as the inappropriate height of school chairs, etc. Many authors from all over the world and Croatia as well, point out in their studies the problem of heavy backpacks as one of the factors responsible for the development of bad posture (Hong & Cheung, 2003; Grimmer et al., 2002; Paušić & Kujundžić, 2008; Paušić & Rausavljević, 2009). External influences cause bad posture, pain in the neck area – shoulders and other parts of the back. It is for this reason that during the adolescent age and as a result of longer weight burden on the back and the long period of carrying overloaded backpacks, the first signs of the lower back pain syndrome (LPS) occur. Various authors conclude that the phenomenon called LPS exists in adolescence, 30% to 51%. Out of that percentage 4% to 31% seek medical care (Balague et al., 1999). A child becomes submissive to the LPS problem with age (Burton, 1996). According to some studies LPS occurs in preadolescents, 5% to 19% (Harreby, 1999). The weight of the backpack along with it being carried on one shoulder has been identified as an important factor for developing LPS in adolescence (Skoffer, 2007). In some European countries the law states the exact weight of the backpack, saying it should not exceed 10% of the child's body weight (Foščarič, 2007; Gent et al., 2006). Many studies conducted all over the world show that the weight of the backpack, on average, exceeds the allowed percentage by 10% to 14% (Whittfel, 2001; Fošnarič, 2007). The latest studies conducted in some primary schools in Dalmatia among children of all grades, have shown that the average weight of the backpack in correlation to the child's weight varies from 12.5% to 13.8% (Paušić & Kujundžić, 2008).

## **Research Aim**

The first aim of this research was to determine the average backpack weight in correlation to children's weight in the primary school (relative backpack weight). Secondly, the research aimed to determine if there were some differences between

pupils of the first, the second, the third, and the fourth grade of primary school. Finally, it aimed to determine whether there was some correlation between the already determined percentage of the backpack weight in comparison to the body weight and the mentioned pain intensity while carrying the backpack, along with establishing differences in the pain intensity variable between pupils of different grades.

## **Methodology**

The research was conducted on a sample of 252 primary school pupils (boys and girls) in grades 1 to 4. The weight of the backpack was measured for 58 pupils from grade 1, 78 pupils from grade 2, 52 pupils from grade 3, and 64 pupils from grade 4. Body weight and the weight of the backpack were also measured. The variable relative backpack weight was obtained from the relation between body weight and the weight of the backpack (%). A short interview was also conducted. Measurements of body weight and backpack weight were conducted on a randomly chosen week, while values were measured over a five-day-period, at the beginning of every first lesson. The mean values of all five measurements, conducted over five school days, have been taken into consideration. The interview, in which the assessor talked to each pupil, was conducted immediately after measuring the body weight and backpack weight. As the participants were pupils aged 6 to 9, it was very important not to use the usual interview method (questionnaire), rather the interview was conducted by the assessor explaining closely each question to the pupils. The questions referred to the presence of pain while carrying a backpack (yes or no); the way they carry a backpack (on both shoulders, on a single shoulder, in hand, wheeled backpack, or the parents carry it for them); pain intensity while carrying a backpack (every time I carry a backpack, often, rarely); in which part of the back they feel the pain (neck and shoulders, middle part of the back, lower part of the back, the whole back). Data was analysed using descriptive statistics. The following values were measured: AM - arithmetic mean, SD – standard deviation, min – minimum result, max – maximum result. The percentage (%) of the backpack weight in comparison to the body weight was also measured. Analysis of variance (ANOVA) was used in measuring the differences between pupils of different school levels in body weight variables, backpack weight, and the relative backpack weight. Contingency tables were used, contingency coefficient was calculated, and the Chi-square test was used. The Spearman rank order correlations of the relative backpack weight and pain intensity were also measured. All of the results were analysed using the statistical software package SPSS 16.0 (SPSS Inc., USA).

## **Results and Discussion**

There are no statistically significant differences between the measured body weight values for boys and girls and the backpack weight in boys and girls of different grades (confirmed by analysis of variance). Due to that, a single sample was used in all the analyses (both sexes formed the sample). Using additional analysis of variance

according to grades, it was established that pupils varied in body weight ( $p=0.000$ ), with the average weight increasing, resulting with 30.5kg in grade 1, and 43.88kg in grade 4. Statistically significant differences were also found in the weight of the backpack from grade 1 to 4 ( $p=0.000$ ). The weight of the backpack in grade 1 was on average 4.92kg, 5.00kg in grade 2, 4.54kg in grade 3, and 5.28kg in grade 4. Still, the values resulting from these two mentioned variables, i.e. the correlation between the backpack weight and the body weight (%) is a value set in many studies as the only relevant data about backpack weight carried by an individual. Table 1 shows the average values of the stated correlation (%). Comparing the given results with the maximum backpack weight in correlation to the 10% of the body weight, we can conclude that the allowed limit was exceeded in all grades. What is more concerning is the data showing the average value of the stated percentage 16.72%, according to which the maximum percentage in grade 1 was 29.17%.

**Table 1.** Descriptive variable values of the relative backpack weight (%) with the variance analysis results, Grade 1 to 4: (AM - arithmetic mean, Min - minimum result, Max - maximum result, SD - standard deviation; F - value; df - degrees of freedom; p - significance level)

Grades	AM	Min	Max	SD	ANOVA
Grade 1	16.72	10.17	29.17	3.78	F = 21.57
Grade 2	15.26	7.53	22.22	2.916	df <sub>1</sub> = 3
Grade 3	12.59	6.33	20.00	2.818	df <sub>2</sub> = 248
Grade 4	12.83	6.71	21.8	3.56	p = 0.00

The relative backpack weight significantly decreases in higher grades. It is important to say that a first-grade-child with the average body weight of 30.5kg is overloaded, and in that phase of growth and development a child is not yet fully prepared for the planned overload that begins from the first day of school, from grade 1 of primary school. According to the results, a certain balance between body weight and backpack weight, in higher grades, is more evident. It will be interesting to see in the follow-up of this research, the result of this correlation in the next phase of education i.e. grades 5 to 8. Other significant information regarding this problem has been collected through interviewing pupils. From the total number of pupils, 93.1% of them responded carrying the backpack on both shoulders. A small number of pupils answered carrying the backpack diagonally (0.8%), 2.3% in hand, while 3.8% responded that their parents carry it for them.

The basic factor that influences backpack overload is carrying unnecessary didactic material. After talking to parents of the children attending grades 1 and 2 of primary school, the basic problem lies in not keeping to the daily timetable. The timetable is always defined but it is not always followed and some teachers insist that children bring to school even the books for subjects that are not in the timetable for the particular day. Another possible factor is oversize and the weight of the backpack itself which is, by no means to be disregarded. The majority of today's backpacks weigh over 1000 g, some of them even weigh up to 1500 g. If we take into consideration that a child is allowed to carry a maximum backpack weight that is 10% of his/her body weight (Foščarič,

2007; Gent et al., 2006), or 3kg (average weight of grade 1 pupils is 30.5kg and 4.92 kg is the average backpack weight) in grade 1 of primary school, it is clear that the final weight of the full backpack exceeds the allowed limit.

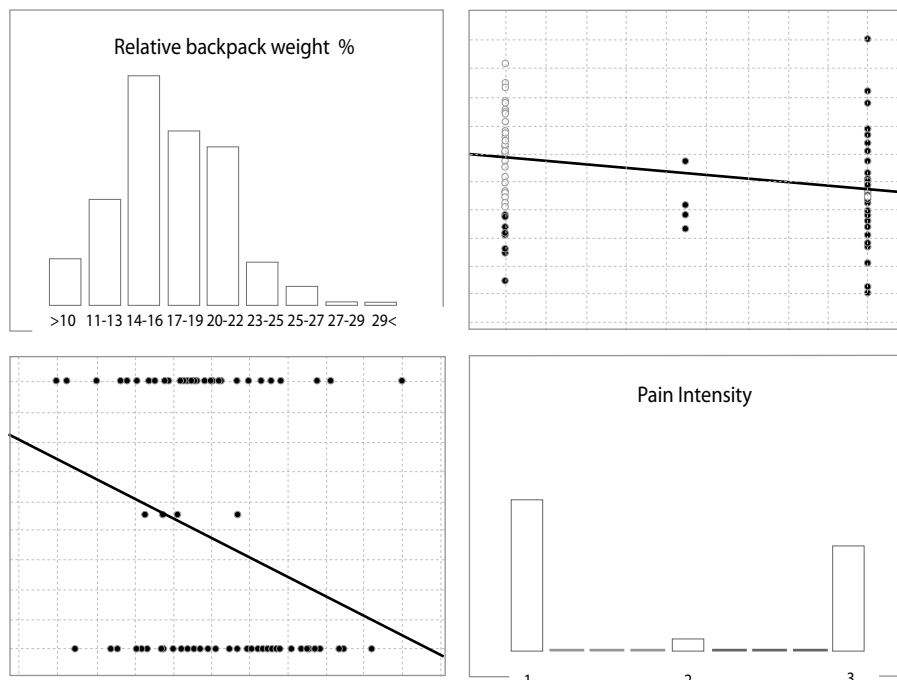
The pain intensity analysis showing the pain children feel while carrying the backpack is very important. The analysis was conducted in classes using the contingency table and the Chi-square test (Table 2). Out of the whole sample, 87 (31.4%) of the participants answered feeling pain while carrying the backpack, 4.2% felt it in the neck and shoulders, 18.4% felt it in the lower back, 5.7% felt it in the middle back, and 3.4% felt it in the whole back. In grade 1, the number of pupils who feel the pain was 39.7% (23), while 73.9% feel it every time while carrying the backpack. There was also a significant percentage of pupils in grade 2 who also reported feeling pain while carrying the backpack. Out of 27 (34.6%) who feel the pain, 74.1% of them feel the pain every time. A high percentage of pupils (43.8%) who feel the pain was observed among the pupils in grade 4. It shows that the pain they were feeling was of a weaker intensity, i.e. that 60.17% of the pupils feels pain rarely. Statistically significant differences in grades were noticed using the Chi-square test, as shown in the contingency table. If we recall the results obtained in the first table, and after the conducted analysis, we may confirm that the youngest children in the sample, i.e. those attending grade 1, feel the most pain, and their pain is of high intensity.

**Table 2.** Contingency table, contingency coefficient with the calculated Chi-square test of distributed intensity pain result felt by children while carrying a backpack in all four grades: (F – frequency; % - subject number percentage within a single grade; Chi-square test value; df – degrees of freedom; C – contingency coefficient; p – significance level)

		Pain intensity (I feel pain ...)			Total
		...every time I carry a backpack	...often	...sometimes	
Grade 1	F	17	0	6	<b>23</b>
	%	73.9%	0.0%	26.1%	<b>100.0%</b>
Grade 2	F	20	1	6	<b>27</b>
	%	74.1%	3.7%	22.2%	<b>100.0%</b>
Grade 3	F	4	0	5	<b>9</b>
	%	44.4%	0.0%	55.6%	<b>100.0%</b>
Grade 4	F	8	3	17	<b>28</b>
	%	28.6%	10.7%	60.7%	<b>100.0%</b>
Total	F	<b>49</b>	<b>4</b>	<b>34</b>	<b>87</b>
	%	<b>56.3%</b>	<b>4.6%</b>	<b>39.1%</b>	<b>100.0%</b>

Chi-square= 17.560    C=0.410    df=6    p=0.007

It could be assumed that this is the result of an overloaded relative backpack weight. In order to test the last hypothesis, we have conducted the Spearman rank order correlation between the relative backpack weight (%), and the pain intensity while carrying a backpack (Figure 1). The obtained statistically significant correlation connection (-0.313) proves that the children who feel more frequent pain, i.e. the pain is present every time the backpack is carried, have a higher relative backpack weight.



**Figure 1.** Correlations between relative backpack weight (%) and pain intensity (1 – I feel pain every time I carry a backpack, 2 – While I carry a backpack, I often feel pain; 3 – While carrying a backpack, I rarely feel pain)

Although there are no studies that indicate the occurrence of back pain at such an early age, recent data shows a large prevalence of back pain in the adolescent age group (Balague et al., 1999; Burton et al., 1996; Gent et al., 2003; Skofer, 2007; Pejak et al., 2007). The results obtained should not be ignored and should serve as a guideline for future research studies.

## Conclusion

According to the results and explanations of the research conducted, it can be concluded that one of the most important things for first graders is enabling them with the least stressful transition into the first grade. New commitments represent a load themselves and together with an overloaded backpack become a limiting factor in the child's adaptation to a new way of life. Very often we see a parent carrying a backpack to and from school, but the question is what happens with those children whose parents are not there to carry their backpack for them. Finally, we should think about the growth and development of children. Studies have shown that a backpack even at the adolescent age may cause the LPS syndrome. All of the above mentioned is becoming an issue with parents, educators, and lately even media and in particular institutions which could try to solve the stated problem.

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# Mogući utjecaji težine školske torbe na bolni sindrom kralješnice u djece razredne nastave

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## Sažetak

Djeca u odrastanju prolaze kroz faze rasta i razvoja te često zbog utjecaja različitih nespetsificiranih vanjskih čimbenika bivaju preopterećena. Proteklih se godina sve češće govori o problemu teške školske torbe i njegovoj povezanosti s različitim tipovima nepravilnog držanja, te pojavi boli u pojedinim dijelovima kralješnice. Cilj ovoga istraživanja bio je utvrditi postotak težine školske torbe u odnosu na tjelesnu težinu učenika razredne nastave i odgovoriti na pitanje postoji li povezanost utvrđenog postotka težine školske torbe u odnosu na tjelesnu težinu i intenziteta prijavljene boli za vrijeme nošenja školske torbe. Istraživanje je provedeno na uzorku od 252 učenika i učenica razredne nastave. Izmjerene su vrijednosti težine tijela i težine školske torbe, proveden je kratak intervju koji se odnosio na osjećanje, intenzitet i lokaciju boli za vrijeme nošenja školske torbe i način nošenja školske torbe. Rezultati ukazuju na to da su prosječne vrijednosti odnosa težine torbe i tjelesne težine (%), u usporedbi s dopuštenom maksimalnom granicom od 10%, u svim razredima u prosjeku (16,72%) više od te granice, odnosno da maksimalni postotak u prvom razredu iznosi čak 29,17%. Od ukupnog broja učenika 93,1% učenika odgovorilo je da torbu nose na oba ramena. Od cijelog uzorka njih 87 (31,4%) odgovorilo je da osjeća bol dok nosi školsku torbu. Najveći dio učenika, njih 18,4%, osjeća bol u donjem dijelu leđa. Najmlađa djeca u uzorku, ona koja pohađaju prvi razred, najviše osjećaju bol, i ukazuju na to da je bol velikog intenziteta. Može se pretpostaviti da je razlog takve boli činjenica da je njihova torba, u odnosu na njihovu tjelesnu težinu, preteška.

**Ključne riječi:** bolna leđa; razredna nastava; školska torba

## Uvod

Proteklih se godina sve češće govori o problemu teške školske torbe i njegovoj povezanosti s različitim tipovima nepravilnog držanja, te pojavi boli u pojedinim dijelovima kralješnice. Raste i postotak djece s nepravilnim držanjima pa posljednja istraživanja pokazuju da se u djece od 6 do 9 godina taj postotak kreće od 51% do 62% (Paušić, 2005), odnosno u dječaka dobi od 10 do 13 godina 10% do 22% (Paušić, 2007). Kada govorimo o nepravilnim tjelesnim držanjima, najčešće mislimo na razne funkcionalne nepravilne položaje kralješnice kao što su kifotična, lordotična ili skoliotična nepravilna držanja. Djeca u odrastanju prolaze kroz faze rasta i razvoja. Često zbog utjecaja različitih nespecifičnih vanjskih čimbenika bivaju preopterećena pa njihov nepripremljeni lokomotorni sustav slabi i popušta, što rezultira nastankom nepravilnih tjelesnih držanja. Zbog navedenih preopterećenja lokomotornog sustava nastaje narušavanje statodinamičkih odnosa, a nakon dužeg vremena pod istim opterećenjima i do nastanka insuficijencije posturalnih mišića. Među navedenim nespecifičnim vanjskim opterećenjima u djece razvojne dobi najčešće se spominju preteška školska torba, nepravilan položaj pri njezinu nošenju, nepravilan položaj tijela pri sjedenju u školskoj klupi, neprilagođene visine školskih klupa, školskih stolica itd. U mnogim istraživanjima različitih autora u svijetu i u Hrvatskoj spominje se upravo problem preteške torbe kao jedan od čestih faktora odgovornih za razvoj nepravilnoga tjelesnog držanja (Hong i Cheung, 2003; Grimmer i sur., 2002; Paušić, 2005). Osim nepravilnih tjelesnih držanja uslijed utjecaja različitih vanjskih faktora dolazi do nastanka boli u području vrata – ramena i drugih dijelova leđa. Upravo zbog dužeg opterećenja kralješnice i tijela nošenjem preteške torbe u doba adolescencije pojavljuju se prvi znakovi lumbalnog bolnog sindroma (LBS). Razni autori zaključuju da postoji pojava SBS u adolescenata i da se javlja u 30% do 51% adolescenata, a od njih medicinsku skrb potraži 4 do 31% (Balague i sur., 1999). Podložno SBS dijete sve više postaje s godinama (Burton, 1996). Po nekim istraživanjima SBS se pojavljuje u djece predadolescencata u 5% do 19% (Harreby, 1999). Upravo težina školske torbe i njezino nepravilno nošenje na jednom ramenu dokazani su kao važni čimbenici u nastanku SBS u djece adolescenata (Skoffer, 2007). U nekim zemljama Europe zakonom je propisano kako težina školske torbe ne smije biti veća od 10% tjelesne težine djeteta (Fošnarič, 2007; Gent i sur., 2006). Mnoga istraživanja provedena po cijelom svijetu ukazuju na to da težine školske torbe u prosjeku premašuju tu dopuštenu vrijednost i da se kreću od 10% do 14% (Whittfiel, 2001; Fošnarič, 2007). Nedavna istraživanja u nekim dalmatinskim osnovnim školama, među učenicima svih razreda razredne nastave, pokazala su da se prosječna težina školske torbe u odnosu na težinu učenika kreće od 12,5% do 13,8% (Paušić i Kujundžić, 2008).

## Cilj istraživanja

Cilj ovoga istraživanja bio je utvrditi postotak težine školske torbe u odnosu na tjelesnu težinu učenika u djece razredne nastave, a zatim utvrditi postoje li razlike

između učenika prvog, drugog, trećeg i četvrtog razreda osnovne škole. Slijedeći je cilj bio odgovoriti na pitanje postoji li povezanost utvrđenog postotka težine školske torbe u odnosu na tjelesnu težinu i intenzitet prijavljene boli za vrijeme nošenja školske torbe, zatim razlike između učenika različitih razreda u varijabli intenziteta boli.

## Metode rada

Istraživanje je provedeno na uzorku od 252 učenika i učenica razredne nastave koji su pohađali razrednu nastavu od 1. do 4. razreda. U prvom razredu izmjerena je težina školske njih torbe 58, u drugom razredu njih 78, u trećem razredu njih 52, i u četvrtom razredu njih 64. Izmjerene su vrijednosti težine tijela i težine školske torbe i proveden je kratak intervju. Mjerenja tjelesne težine i težine torbe provedena su u jednom nasumce odabranom školskom tjednu, a vrijednosti su mjerene svih pet dana na početku prvog sata. Uzete su srednje vrijednosti svih pet mjerenja (5 školskih dana). Intervju s učenicima proveden je odmah nakon mjerenja tjelesne težine i težine torbe postavljanjem pitanja svakom učeniku. Kako se radi o djeci od 6 do 9 godina, vrlo je bitno ne provoditi klasičnu anketu (upitnik), već upotrijebiti metodu intervjua, kako bismo djeci pobliže objasnili pitanje, odnosno na što ciljamo u određenom pitanju. Pitanja su se odnosila na osjećanje boli dok se nosi školska torba (da, ne); na način nošenja školske torbe (na oba ramena, na jednom ramenu, u ruci, vučem na kotačićima, roditelji nose); na intenzitet boli dok se nosi školska torba (svaki put kad nosim torbu, često, rijetko); na predio u kojem se bol osjeća (vrat i ramena, srednji dio leđa, donji dio leđa, cijela leđa). Dobiveni rezultati obrađeni su deskriptivnom statistikom i izračunate su ove vrijednosti: AS – aritmetička sredina, SD – standardna devijacija, min – minimalni rezultat, max – maksimalni rezultat. Izračunat je postotak težine školske torbe u odnosu na tjelesnu težinu (%). Analizom varijance (ANOVA) izračunate su razlike između učenika različitoga školskog uzrasta u varijablama tjelesne težine, težine torbe te postotka težine torbe u odnosu na tjelesnu težinu. Izračunata je tablica kontingencije, koeficijent kontingencije i Hi-kvadrat test. Izračunata je korelativna povezanost putem Spearmanova koeficijenta korelacije ranga između intenziteta boli i postotka težine torbe u odnosu na tjelesnu težinu. Svi rezultati obrađeni su u statističkom paketu SPSS 16.0 (SPSS Inc., USA).

## Rezultati i rasprava

Izračunate vrijednosti tjelesne težine učenika i učenica i težine njihovih torbi u ovoj se dobi po razredima statistički značajno ne razlikuju (potvrđeno analizom varijance). Prema tome u svim analizama korišten je jedinstven uzorak (uzorak učenika tvorila su oba spola). Daljnjim analizama varijance po razredima utvrđeno je da se učenici razlikuju po tjelesnoj težini ( $p=0,000$ ) i da dolazi do njezina povećanja. U prvom razredu prosječna tjelesna težina iznosi 30,5 kg, a u četvrtom razredu 43,88 kg. I težina torbe se statistički značajno mijenja od prvog do četvrtog razreda ( $p=0,000$ ). Ona u prvom razredu u prosjeku iznosi 4,92 kg, u drugom 5,00 kg, u trećem 4,54 kg i u četvrtom 5,28 kg. Ipak,

vrijednost koja proizlazi iz te dvije varijable, odnos udjela težine torbe u tjelesnoj težini (%), jest vrijednost koja je postavljena u mnogim istraživanjima kao jedini relevantan podatak o težini školske torbe pojedinca. U Tablici 1. prikazane su prosječne vrijednosti navedenog odnosa (%). Uspoređujući dobivene rezultate s dopuštenom maksimalnom granicom težine torbe u odnosu na tjelesnu težinu od 10%, možemo zaključiti da je težina školske torbe u svim razredima u prosjeku iznad dopuštene. Ono što još više zabrinjava jest podatak da prosječna vrijednost navedenog postotka iznosi čak 16,72%, a da maksimalni postotak u prvom razredu iznosi čak 29,17%.

#### Tablica 1.

U sljedećim razredima značajno opada postotak udjela težine torbe u tjelesnoj težini. Bitno je naglasiti da je dijete u prvom razredu, s prosječnom težinom tijela od 30,5 kg, preopterećeno, i u toj fazi rasta i razvoja sigurno nije dovoljno pripremljeno za opterećenja kojima biva podvrgnuto od prvog dana polaska u prvi razred osnovne škole. Prema rezultatima u sljedećim razredima evidentno je postizanje neke vrste uravnoteženosti između tjelesne težine i težine torbe. Bit će korisno vidjeti, a to se predviđa u nastavku ovog istraživanja, kakav će odnos biti u sljedećoj fazi školovanja, u razredima od 5. do 8. Važni podaci prikupljeni su putem intervjua s učenicima. Od ukupno broja učenika 93,1% učenika odgovorilo je da torbu nosi na oba ramena. Malen postotak učenika odgovorio je da torbu nosi dijagonalno (0,8%), da torbu nosi u jednoj ruci odgovorilo je 2,3% učenika, a da im roditelji nose torbu u školu 3,8% učenika.

Primarni faktor koji utječe na pretešku torbu jest nošenje nepotrebnog didaktičkog materijala. U razgovoru s roditeljima djece koja trenutno pohađaju razrednu nastavu, ponajprije djece prvog i drugog razreda, može se zaključiti da je osnovni problem nepridržavanje rasporeda sati. Raspored je uvijek definiran, ali njegovo provođenje nije uvijek po planu. Učiteljice traže od djece da nose sve udžbenike i radne listove, kao i didaktički materijal za predmete koji taj dan nisu po rasporedu. Drugi mogući faktor jest glomaznost i osnovna težina same torbe, koja uopće nije zanemariva. Većina je današnjih torbi teža od 1000 g, čak do 1500 g. Ako uzmemo u obzir da maksimalna težina torbe koju dijete smije nositi iznosi 10% njegove tjelesne težine (Foščarič, 2007; Gent et al., 2006), a to je do 3 kilograma u prvom razredu osnovne škole, jasno je da konačna težina pune školske torbe mora prijeći dopuštenu težinu.

#### Tablica 2.

Zanimljiva je analiza intenziteta boli koju djeca osjete prilikom nošenja torbe, a provedena je po razredima putem tablice kontingencije i Hi kvadrat testa (Tablica 2.). Od cijelog uzorka 87 djece (31,4%) je odgovorilo da osjeća bol dok nosi školsku torbu. /4,2% djece navelo je da osjeća bol u vratu i ramenima, 18,4% u donjem dijelu leđa, 5,7% u srednjem dijelu leđa i 3,4% u cijelim leđima. U prvom razredu 39,7% (23) učenika osjeća bol, od toga 73,9% svaki put kad nosi torbu. U drugom razredu pokazao se isto tako značajan broj one djece koja osjećaju svaki put bol dok nose torbu. Od 27 onih (34,6%) koji osjećaju bol, njih 74,1% tu bol osjeća svaki put. Visok postotak

djece koja osjećaju bol dobiven je i u četvrtom razredu (43,8%), ali se pokazalo da je ta bol slabijeg intenziteta, odnosno da 60,17% djece tu bol osjeća rijetko. Hi kvadrat test na ovoj kontingencijskoj tablici pokazao je da se dobiveni podatci po razredima statistički značajno razlikuju. Ako se sjetimo zaključka nakon prve tablice, i nakon provedene analize, možemo potvrditi da najmlađa djeca u ovom uzorku, ona koja pohađaju prvi razred, najviše osjećaju bol, da je ona velikog intenziteta i da se može pripisati tome što su njihove torbe u odnosu na njihovu tjelesnu težinu preteške. Kako bi se postavljena hipoteza provjerila, provedena je korelacijska analiza Spearmanova koeficijente korelacije ranga između varijable postotka težine torbe u odnosu na tjelesnu težinu (%) i intenziteta boli za vrijeme nošenja školske torbe (Grafikon 1.). Dobivena je statistički značajna korelacijska povezanost (-0,313) kojom je utvrđeno da su torbe djece koja osjećaju češću bol, odnosno bol koja je prisutna svaki put kad nose torbu, teže u odnosu na njihovu tjelesnu težinu.

Graf 1.

Iako se dosadašnja istraživanja nisu bavila problemom bolne kralješnice u djece koja pohađaju razrednu nastavu, dokazano je da su kod adolescenata izraženi sindromi bolne kralješnice (Balague et al., 1999; Burton et al., 1996; Gent et al., 2003; Skofer, 2007; Pejak et al., 2012). Stoga dobivene rezultate nikako ne smijemo ignorirati i trebaju nam poslužiti pri planiranju sljedećih istraživanja.

## Zaključak

Prema navedenim rezultatima i napisanim objašnjenjima trebalo bi još samo zaključiti kako je veoma bitno omogućiti djetetu manje stresan polazak u prvi razred osnovne škole. Nove obaveze iz kojih proizlaze nova opterećenja, pa uz to i preteška školska torba, postaju limitirajući faktor u adaptaciji djeteta na novi sustav života. Nemalo puta se događa da roditelji preuzimaju nošenje školske torbe u školu i iz škole, ali je pitanje što se događa s onom djecom čiji roditelji to ne mogu činiti. Na kraju, treba misliti i na budućnost rasta i razvoja djece. Istraživanja su pokazala da i sama teška torba u adolescentskoj dobi može izazvati nastanak lumbalnoga bolnog sindroma. Sve napisano u ovom radu problem je koji primarno mogu riješiti roditelji i učitelji, potom mediji te državne institucije koje se brinu za odgoj, obrazovanje i zdravlje djece.