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BACKPACKS HABITS AND BACK PAIN IN 12 TO 18 YEARS OLD STUDENTS FROM MURCIA

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**ABSTRACT**

Objectives: The purpose of this study was to describe backpack habits and its relation with back pain in Secondary Schoolchildren of the Region of Murcia (Spain). **Methods:** It was a cross-sectional study in which 275 teenagers from 12 to 18 years old were asked about their backpack habits and back pain. **Results:** The results showed that 98.91% of scholars used backpack and also that 65.45% of them thought that their backpacks were too heavy, even though the 70% of pupils didn't know their backpack weight. Back pain was significantly associated with thinking that the backpack is too heavy and with being unaware of the school bag weight. **Conclusions:** In conclusion, most of students used backpacks and carried them in a symmetric way. Feeling that the backpack weights too much and being ignorant of that weight were associated factors to back pain.

**KEY WORDS**

health education, educational materials, secondary schools, teacher attitudes, weights and measures.

**INTRODUCTION**

Healthy physical exercise has been widely used for preventive back care (1)(2)(3)(4). However, postural hygiene has also been shown to be a relevant area for the treatment of back health (5)(6)(7). In fact, different interventions on back care carried out in Physical Education have dealt both with physical exercise Physical Education have dealt with both healthy physical exercise and postural hygiene (7)(8).

Within postural education, the use and carrying of backpacks has been a field that has been extensively studied (9)(10)(11)(12)(13)(14). Numerous studies have found that schoolchildren carry excessive weight when carrying their backpacks, so much so that a large number of studies have found that schoolchildren carry loads of more than 10% of their body weight (6)(15)(16)(18)(21)(22)(23).

Some research has observed a direct relationship between back pain and the relative weight of the backpack, noting that the daily carrying of an excessive load in backpacks (13) leads to increased stress on the structures of the spine (15)(16)(17)(18)(19)(20).

On the other hand, in addition to weight, there are other factors that can influence the health of the back when carrying a load. As for the type of backpack, Motmans, Tomlow and Vissers (24) recommend avoiding the use of a shoulder bag due to the asymmetrical muscle activity it produces and state that the ideal would be to distribute the load between the front and back, carrying a backpack and part of the equipment on the arms. In this line, Yoon (25) determines that the use of a backpack is healthier than the use of a shoulder bag and, in turn, Bort and Simó (22) conclude that it is convenient to use a backpack when its weight is less than 3-4 kg, while it is preferable to use a trolley when the weight is higher.



Regarding the way to carry the backpack, Bort and Simó (22) clarify that the backpack should be adjusted to the back. In addition, different authors have pointed out that the most correct way to carry the backpack is on both shoulders, as unilateral loads are more harmful to the spine (19)(25)(26)(27)(28)(29). Also, Bort and Simó (22) recommend that if a pushchair is used, it should be pushed forward rather than dragged, and that it should be adapted to the height of the schoolchild. Regarding the use of a shoulder strap, Andújar and Santonja (26) recommend that it should always be carried across the shoulder and that the shoulder should be alternated.

Furthermore, a higher prevalence of back pain has been found the longer the backpack is carried (15)(18) (23).

For all of these reasons, authors such as Calvo-Muñoz and Gómez-Conesa in 2012 (9) state that back health education is necessary in the school environment in order to generate prevention strategies. Specifically, they point out that guidelines should be given on how to carry the backpack, how long it should be carried and how heavy the backpack should be in relation to body weight, individualising the recommendations according to the design of the backpack.

In Spain, studies have been carried out in different communities with the aim of analysing the habits of schoolchildren regarding the carrying of school material, the weight of school bags and in some cases their relationship with back pain (30). The aims of the present study are: 1) To describe the use and transport of backpacks by Physical Education students in Compulsory Secondary Education in the Region of Murcia 2) To analyse the association between this and back pain.



MATERIALS Y METHODS

Design and procedure

It was a cross-sectional design.

To carry out the study, three secondary schools in the Region of Murcia were visited during the 2017/2018 academic year. In each of the schools, participants completed a questionnaire in paper format during Physical Education sessions under the supervision and attention of both an expert researcher and the subject teacher. Prior to participation in the study, the legal guardians signed a written consent form. The project respects the principles of the Declaration of Helsinki and was approved by the Research Ethics Committee of the University of Murcia (Spain) (ID 803/2013).

Participants

Initially, a total of 400 adolescents were randomly selected. Following the criteria of Miñana-Signes and Monfort-Pañego (31) and Martínez-Crespo et al. (32), those who did not provide informed consent, did not correctly complete the questionnaire or did not attend the day of data collection were excluded. Finally, the participants surveyed were a total of 275 adolescents aged 12 to 18 years (85 belonging to the first year, 79 to the second year, 57 to the third year and 54 to the fourth year of ESO). Thus, 152



participants (55.27%) were female and 123 (44.57%) were male. The mean age of the participants was 14 ± 1.37 years.

Variables and instruments

Data on backpacking and back pain were collected by adapting the validated questionnaire used in the study by Martínez-Crespo et al. (32). The questionnaire is composed of items that ask about back pain in the past year and in the week prior to the study, as well as other exposure variables such as the type of backpack used, the way of carrying it, knowledge of the weight of the backpack, subjective perception of the weight of the backpack, as well as the way and time spent going from home to school.

Data analysis

The data were processed using descriptive and inferential statistics using the SPSS statistical programme (version 24.0). A descriptive analysis was carried out using frequencies and percentages. To represent prevalence percentages, 95% confidence intervals were used.

Subsequently, the chi-square test was used to analyse the relationship between having suffered back pain and knowledge of the weight of the backpack, to determine the association between back pain and the subjective perception of the weight of the backpack, as well as to analyse the association between having suffered back pain and the time it takes to walk from home to school. A significance level of $p < 0.05$ was established.



RESULTS

Table 1 describes the use and transport of the backpack by P.E. students, as well as data on the weight of the backpack.

Table 1. Descriptive data on the backpack.

Questions and answer options		N	%	IC (95%)	
				Lower	Upper
Which backpack do you use?	Backpack	272	98.91	98,90	98.92
	Trolley	3	1,09	1,08	1,10
	Bandolier	0	,00	,00	,00
	Total	275	100	100	100
How do you usually carry your backpack?	On both shoulders	248	90,18	90,14	90,22
	On one shoulder	24	8,73	8,70	8,76
	On the hand	2	0,73	,72	,74
	Shoulder strap or cross-body	0	,00	,00	,00
	Others	1	,36	,35	,37
	Total	275	100	100	100
Do you think the backpack is too heavy?	NO	95	34,55	34,49	34,61
	YES	180	65,45	65,39	65,51
	TOTAL	275	100	100	100
Do you know how much the backpack weighs with the school supplies inside?	NO	198	72,00	71,95	72,05
	YES	77	28,00	27,95	28,05
	TOTAL	275	100	100	100

As shown in table 1, up to 272 out of 275 participants (98.91%) reported using a backpack and 90.18% reported carrying it on both shoulders on a regular basis, while 8.73% reported carrying it on one shoulder. Furthermore, up to 180 out of 275 participants (65.45%) thought that their rucksack was too heavy, however, 72% of students did not know how much their rucksack weighed with school material inside.

On the other hand, a total of one hundred and fifty-two students out of 275 (55.27%; CI (95%): 55.21-55.33) responded that they had suffered from back pain in the past year and 71 students (25.82%; CI (95%): 25.77-25.87) stated that they had suffered from back pain in the week prior to the study.



Table 2 shows that of the schoolchildren who reported back pain in the previous year, a total of 100 (65.79%; 95% CI 65.73-65.85) indicated that their backpack was too heavy, while only 52 schoolchildren (34.21%; 95% CI 34.15-34.27) reported that their backpack was not too heavy. The Chi-square test showed that the association between having back pain in the past year and feeling that the backpack was too heavy was statistically significant ($X^2=13.784$; $p=0.0002$).

Table 2. Backpack weight as a function of back pain in the past year and in the previous week.

Backpack		Back pain in the past year				Back pain in the previous week			
		NO		YES		NO		YES	
		N	%	N	%	N	%	N	%
Do you think the backpack is too heavy?	NO	43	34,96	52	34,21	77	37,75	18	25,35
	YES	80	65,04	100	65,79	127	62,25	53	74,65
	Total	123	100	152	100	204	100	71	100
Do you know how much the backpack weighs with the school supplies inside?	NO	86	69,92	112	73,68	145	71,08	53	74,65
	YES	37	30,08	40	26,32	59	28,92	18	25,35
	Total	123	100	152	100	204	100	71	100

Among those who suffered from back pain in the previous week, a total of 53 students (74.65%; CI (95%): 74.58-74.72) indicated that their backpack was too heavy, while only 18 students (25.35% CI (95%): 25.28-25.42) stated that their backpack was not too heavy, the association between suffering from back pain in the previous week and feeling that their backpack was too heavy being statistically significant ($X^2=13.883$; $p=0.0002$).

On the other hand, of the students who suffered from back pain in the previous year, a total of 112 students (73.68%; CI (95%): 73.61- 73.75) stated that they did not know the weight of their backpack, while only 40 students (26.32%; CI (95%): 26.25-26.39) indicated that they knew how much their backpack weighed. Furthermore, it was found that suffering back pain in the previous year and not knowing the weight of the backpack were significantly associated ($X^2=27.845$; $p=0.0001$).



Thus, among the students who claimed to suffer back pain in the previous week, a total of 53 students (74.65%; CI (95%): 74.55- 74.75) claimed not to know the weight of their backpack, while only 18 students (25.35%; CI (95%): 25.25-25.45) indicated that they knew how much their backpack weighed, the association between having suffered back pain in the past week and not knowing the weight of their backpack being significant ($X^2=13.883$; $p=0.0002$).

Finally, table 3 shows that 154 (56%) out of 275 students walk to school, while 61 (22.18%) and 54 (19.64%) travel by car or bus respectively.

Table 3. Count and percentage of means of transport used by schoolchildren to get to school.

How do you go to school?	N	%	IC (95%)	
			Lower	Upper
Car	61	22,18	22,13	22,23
Bus	54	19,64	19,59	19,69
Moto	3	1,09	1,08	1,10
Bicycle	3	1,09	1,08	1,10
Walking	154	56,00	55,94	56,06
Total	275	100	100	100

In table 4, it can be seen that 40.26% of schoolchildren who walk take between 5 and 10 minutes to get to school, 29.22% take less than 5 minutes, and 20.13% take between 10 and 15 minutes.

Table 4. Time taken by schoolchildren to walk from home to school.

How long does it take to get from home to school?	N	%	IC (95%)	
			Lower	Upper
Less than 5 min	45	29,22	29,15	29,29
5-10 min	62	40,26	40,18	40,34
10-15 min	31	20,13	20,07	20,19
15-20 min	12	7,79	7,75	7,83
+20 min	4	2,60	2,57	2,63
Total	154	100	100	100

When analysing the relationship between travel time from home to school and back pain, no association was found between having suffered back pain in the past year or



the previous week and the number of minutes it took schoolchildren to walk from home to school ($X^2=7.518$, $p=0.111$ and $X^2=3.494$, $p=0.479$, respectively).



DISCUSSION

The first objective of the present study was to describe the use and transport of backpacks by Physical Education students in Murcia. Thus, the vast majority of students used a backpack, while only a few reported using a trolley or shoulder bag. Similarly, Ramos-Espada et al. (33), as well as Mwaka et al. (34), found that the most common means used by adolescents to transport school material was the backpack.

Moreover, the vast majority of schoolchildren reported carrying their backpacks symmetrically (on both shoulders). Along these lines, Casimiro (35) observed that although the unilateral carrying of the rucksack increased with age, more than 50% of the schoolchildren carried their rucksacks symmetrically. However, Korovessis et al. (18) found that the majority of schoolchildren in their study carried their backpacks asymmetrically, perhaps because the authors recorded this by observation rather than through a questionnaire.

On the other hand, most of the students (65.45%) thought that their school bag was too heavy, but 72% of the students did not know how much their school bag weighed with the school material inside. This may be due to a lack of school awareness about the appropriate weight of the backpack, since, as some authors state, there is a great lack of knowledge among teachers about backpack-related issues (22).

A second objective was to analyse the association between the use and carrying of backpacks and back pain. In this respect, it is worth noting a high prevalence of back pain. In this respect, a high prevalence of back pain among schoolchildren should be noted. However, as in the study by Korovessis et al. (18), it was not possible to analyse whether back pain was associated with the type of backpack or the way it was carried, since only three schoolchildren used a trolley and none of the participants reported using a shoulder bag. Moreover, up to 90.18% of the schoolchildren said they carried their rucksacks on both shoulders, so it was not possible to compare back pain according to the way the rucksack was carried.

Regarding the analysis of the association between the perceived weight of the backpack and the back pain suffered, it was observed that most of the schoolchildren



who suffered back pain in the past year (65.79%) and in the previous week (74.65%), stated that their backpack was too heavy, the association being significant. Authors such as Negrini, Carabalona and Sibilla (23) and Al-Saleem et al. (21) have found that the average load carried by schoolchildren in their backpacks is greater than the recommended maximum of 10-15% of their body weight (9).

Negrini and Carabalona (36) found similar results, finding that backpacks were heavy for 79.1% of students and that this load was associated with back pain. Similarly, Mwaka et al. (34) found that 35.4% of schoolchildren indicated that carrying a backpack was the cause of their back discomfort.

On the other hand, it was found that the majority of students who suffered from back pain in the past year (73.68%) and the previous week (74.65%), stated that they did not know the weight of their backpack, and the association was significant. These findings seem to indicate the need for teachers, especially Physical Education teachers, to record and transmit the weight of their students' backpacks in order to address the problem in a preventive manner.

Finally, it was found that most of the pupils walked to school and it took them 5 to 10 minutes to get there. However, no association was found between back pain and the time it took the pupils to get from home to school. However, Negrini and Carabalona (35) stated that daily backpack carrying was a frequent cause of discomfort for schoolchildren and Mwaka et al. (34) found that back pain was associated with long walks while carrying a backpack.



CONCLUSIONS

Most of the students of Physical Education in Compulsory Secondary Education use a backpack to carry their school material and carry it symmetrically, on both shoulders.

Most of the participating students think that their rucksacks are too heavy. However, almost all students do not know how much their rucksack weighs with their school material inside.

There is an association between having suffered from back pain the previous year or the past week and feeling that the school bag is too heavy, as well as between having suffered from back pain and not knowing the weight of the school bag.

Finally, there is a need for Physical Education teachers to record and make known the weight of their pupils' backpacks in order to address back care in a preventive way.

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