

Article

# Back Pain and Knowledge of Back Care Related to Physical Activity in 12 to 17 Year Old Adolescents from the Region of Murcia (Spain): ISQUIOS Programme

# Alba Aparicio-Sarmiento <sup>1</sup>, Olga Rodríguez-Ferrán <sup>1</sup>, María Teresa Martínez-Romero <sup>1</sup>, Antonio Cejudo <sup>1</sup>, Fernando Santonja <sup>2</sup> and Pilar Sainz de Baranda <sup>1,\*</sup>

- <sup>1</sup> Department of Physical Activity and Sport, Faculty of Sport Sciences, Regional Campus of International Excellence "Campus Mare Nostrum", University of Murcia, 30720 San Javier, Murcia, Spain; alba.aparicio@um.es (A.A.-S.); olga.rodriguez@um.es (O.R.-F.); mariateresa.martinez13@um.es (M.T.M.-R.); antonio.cejudo@um.es (A.C.)
- <sup>2</sup> Department of Medicine and Orthopaedic Surgery, Faculty of Medicine, University of Murcia, 30720 San Javier, Murcia, Spain; fernando@santonjatrauma.es
- \* Correspondence: psainzdebaranda@um.es; Tel.: +34-868-88-8824; Fax: +34-868-88-8672

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**Abstract:** Knowledge on back care is important to prevent back problems. The purpose of this study was to a) describe back pain and knowledge on back care related to physical activity in adolescents and b) determine the association between these two factors. This was a cross-sectional study. A total of 276 students (aged from 12 to 17 years old), from three Spanish public secondary schools, had to complete a survey about back pain and another one about their knowledge on back care related to physical activity. The results showed a mean score of  $2.54 \pm 1.85$  (out of 10), and 90.58% of students failed the knowledge test. Those who suffered from back pain in the week before scored higher ( $2.91 \pm 1.66$ ) than non-sufferers ( $2.42 \pm 1.90$ ), with statistically significant differences (Z = -2.109; p = 0.035; r = 0.127), although with no academically relevant differences. Finally, despite the relationship between a higher mean score in the knowledge test and back pain within the previous week, it has been found that there was not a significant association because most of the students got very low scores in the knowledge test. It also shows an important lack of knowledge about physical activity for back care in adolescents.

Keywords: low back pain; education; health promotion; primary prevention

# 1. Introduction

Back pain, reduced range of joint movement, hamstrings and iliopsoas tightness, insufficient strength and stability in the core muscles, and unbalanced sagittal spinal morphology are common and important problems among schoolchildren [1,2]. Poor posture in scholars has also been identified as an important issue in the literature [3].

Significant research has found that there is a high prevalence of back pain among children and adolescents [4–7]. Back pain has been associated with a lower quality of life and an increase in the use of medical services [8]. Miñana-Signes and Monfort-Pañego (2015) [9] found that 29% of adolescents visited a health professional due to lower back pain in the preceding year, while in 2016 the same group reported that 25.2% of adolescents in their study visited health services because of the lower back pain in the previous year [10]. Kjaer, Wedderkopp, Korsholm and Leboeuf-Yde (2011) [11] found that, in their prospective study with children, the number of visits to the doctor due to back pain increased from 6% at the age of 9 to 8% at the age of 13, and reached a maximum of 34% at the age of 15.

The formation of a healthy lifestyle in adolescents is a relevant issue [12]. Because physical activity and exercise can improve back health, many authors have recommended postural education development during physical education lessons at school as a preventive method [1,2,13–15]. However, it should be noted that a secondary school physical education curriculum emphasizes the development of healthy habits and teaches students the basis for an active and healthy lifestyle in order to have a healthier adult population in the future and a more sustainable health care system; the curriculum is not designed solely to keep students active during their school years [16]. Furthermore, other education mandates point out that physical education should provide relevant knowledge which schoolchildren can extrapolate to their lives to generate responsible attitudes [17].

While some authors have observed that knowing the consequences of unhealthy habits does not ensure a correct behaviour pattern in the future [18–20], several studies support the idea that knowledge is necessary to protect one's health by correcting posture or adjusting the way that one performs exercises [2,21,22]. In addition, previous research substantiates the importance of knowledge and using opportunities to correct improper habits [23–26].

Consciousness has proven to be a good trade-off for behavioural change. In fact, non-specific information together with tailored information and persistent feedback can lead to a change in habits [27]. Education in physical activity for back care might provide students with the ability to manage their own physical activity in a healthier way, since it is a significant learning based on knowledge which adolescents can put to practical use [10,13]. This competency might let schoolchildren practise a more sustainable physical activity in order to have better back health, and thus a better quality of life [8].

The contribution of sport, physical education and physical activity to sustainable development goals is clear. To be more specific, physical education and physical activity make a direct contribution to health and well-being of all, as well as on quality education and lifelong learning for all [28]. In this sense, physical education, physical activity and sport in childhood and adolescence seems to be an important tool to promote the sustainable development of societies, and plays an essential role in strengthening each of the eight Millennium Development Goals (MDGs) [29,30]. In fact, the resolution 70/1 adopted in 2015 entitled "Transforming our world: the 2030 Agenda for Sustainable Development", recognizes the role of physical education and sport in the promotion of social progress [31].

Few studies have investigated risk factors associated with the level of back care knowledge in relation to physical exercise [10]. It is important to understand how knowledge of back care related to physical activity can help prevent back problems in the long-term. The aim of this study was to describe back pain and the level of knowledge of back care related to physical activity in adolescents, and to determine the association between these two factors.

#### 2. Materials and Methods

#### 2.1. Data Collection and Subject Population

This was a cross-sectional study. A variety of public secondary schools were visited throughout the 2016–2017 school year in the region of Murcia, Spain. The schools under study were selected through a convenience sample. Students were randomly selected from each school.

Students filled out two questionnaires during physical education lessons. An experienced researcher presented the questionnaires to the students, explained the procedure for filling in the survey, and personally dealt with all participant questions.

The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics and Research Committee of the University of Murcia (Spain; Protocol Number 1428/2017). Headmasters, physical education teachers, and legal tutors were informed about the study, and legal tutors expressed written consent.

The study included a total of 397 adolescents who met the inclusion criteria. Participants were required to be 12–17 years old, attend at the secondary school stage (from 1st to 4th course), and to

present no intellectual or physical disability. Participants who did not attend school the day of the test or did not properly fill in the survey were excluded [7,10] (Figure 1).



Figure 1. Flow diagram of the sample selection.

# 2.2. Evaluation Methods

2.2.1. Measurement of the Specific Knowledge of Back Care Related to Physical Activity

In order to assess the specific level of knowledge related to physical activity and back care, a previously validated test-based evaluation was used [32]. It consisted of 13 multiple-choice questions about physical abilities such as strength, endurance, and muscular flexibility, and proper exercises regarding posture and duration. The total score was calculated using a 10-point scale Equation (1) [32]. Students who achieved a score of  $\geq$ 50% passed the test.

$$P = 10 \cdot 1 / N \cdot (1 \cdot A + 0 \cdot B - 1 / 2 \cdot F).$$
<sup>(1)</sup>

Equation (1) shows the formula used to calculate the score out of ten [*P*: score out of ten; *N*: total questions; *A*: number of right answers; *B*: number of blank answers; *F*: number of wrong answers].

### 2.2.2. Prevalence of Back Pain

An ad-hoc questionnaire composed of eight questions based on previous studies was used to evaluate back pain (BP) prevalence among participants [7,33].

The survey covered socio-demographic issues including sex, age, school, course, and disabilities. Additional questions included those concerning the presence of BP during the preceding one week or one year. Back pain was defined as aching, pain, or discomfort in some part of the back that was not related to trauma or menstrual pain. The questionnaire included a drawing of the back.

#### 2.3. Data Analysis

Statistical analysis was conducted using SPSS v.24. Descriptive statistics as means, standard deviations, frequencies, and percentages were used to describe prevalence of back pain and the level of knowledge of back care. In addition, 95% confidence intervals (CIs) were performed to represent specific knowledge and back pain data.

To compare specific knowledge data between gender and age groups, the non-parametric tests "U of Mann-Whitney" and "H of Kruskal Wallis" were performed, respectively, as the specific knowledge data was not normally distributed. The chi-square test was used to analyse prevalence of back pain between gender and age groups.

Finally, to determine the association of the prevalence of back pain with the score on the knowledge test, a means comparison through the non-parametric "U of Mann-Whitney" test was carried out. Furthermore, "Phi", "V of Cramer" and "r" ( $r = Z/\sqrt{n}$ ) statistics were calculated to determine the effect size (ES). For all tests, the significance level was set at p < 0.05.

#### 3. Results

#### 3.1. Level of Knowledge of Back Care Related to Physical Activity and Prevalence of Back Pain

In order to describe back pain and the level of knowledge of back care related to physical activity, Table 1 shows descriptive statistics in relation to the prevalence of back pain and knowledge of back care physical activity.

Variables		Score		Right		Wrong		Blank		Passed		Failed		1 <b>Y-B</b> PP <sup>1</sup>		1W-BPP <sup>2</sup>	
		$\overline{\mathbf{x}}$	SD	$\overline{\mathbf{x}}$	SD	$\overline{\mathbf{x}}$	SD	$\overline{\mathbf{X}}$	SD	Ν	%	Ν	%	Ν	%	Ν	%
Age (years)	12 (n = 48)	2.44	2.03	6.33	1.80	6.31	1.82	0.35	0.91	4	8.33	44	91.67	17	35.42	10	20.83
	13 (n = 83)	2.61	1.99	6.49	1.90	6.19	1.86	0.31	1.58	10	12.05	73	87.95	38	45.78	15	18.07
	14 (n = 74)	2.46	1.67	6.34	1.64	6.27	1.56	0.39	1.51	6	8.11	68	91.89	44	59.46	17	22.97
	15 (n = 31)	2.29	1.82	6.19	1.64	6.42	1.73	0.39	1.15	3	9.68	28	90.32	22	70.97	12	38.71
	16 (n = 29)	2.88	1.63	6.69	1.42	5.90	1.61	0.41	0.98	2	6.90	27	93.10	23	79.31	12	41.38
	17 (n = 10)	2.81	1.96	6.70	1.64	6.10	1.85	0.20	0.42	1	10.00	9	90.00	7	70.00	4	40.00
Sex	Female (n = 153)	2.62	1.86	6.48	1.69	6.15	1.75	0.37	1.21	16	10.46	137	89.54	90	58.82	49	32.03
	Male (n = 123)	2.45	1.83	6.35	1.75	6.32	1.69	0.33	1.45	10	8.13	113	91.87	62	50.41	22	17.89
Total (n = 276)		2.54	1.85	6.42	1.72	6.22	1.72	0.36	1.32	26	9.42	250	90.58	152	55.07	71	25.72
CI (95%)	Lower	Lower 2.32		6.22		6.02		0.20		6.51		86.56		49.17		20.93	
	Upper	2.76		6.62 6		6.4	43 0.52		52	13.44		93.49		60.83		31.19	

**Table 1.** Means, standard deviations, frequency and percentage to describe prevalence of back pain and knowledge of back care physical activity by age, by sex and in total.

<sup>1</sup> 1Y-BPP: Prevalence of back pain in the previous year; <sup>2</sup> 1W-BPP: Prevalence of back pain in the preceding week.

As indicated in Table 1, the mean global score out of ten was  $2.54 \pm 1.85$ . Approximately 90.58% of adolescent participants failed the test. When mean scores were compared by gender and by age, no significant differences between gender (Z = 0.620; *p* = 0.536) or age group ( $\chi 2(gl = 5) = 3.865$ ; *p* = 0.569) were observed.

In relation to prevalence of back pain, 55.07% of adolescents suffered from back pain at least once in the preceding year and 25.72% of students had suffered within the previous week. When prevalence of back pain was analyzed by age, results indicated that one-year prevalence was significantly higher in older adolescents ( $X^2 = 22.733$ ; p = 0.001; V = 0.287). Furthermore, a statistically significant increase in one-week prevalence was observed, increasing from 20.83% at the age of 12 to 41.38% at the age of 16 ( $X^2 = 13.847$ ; p = 0.031; V = 0.224).

When the results were analysed by gender, higher one-year and one-week prevalence were found in girls (58.82% (95% CI 53.02–64.62) and 32.03% (95% CI 26.53–37.53), respectively) than in boys (50.41% (95% CI 44.51–56.31) and 17.89% (95% CI 13.39–22.39), respectively), with a statistically significant association between back pain in the previous week in females vs. males ( $X^2 = 7.135$ ; p = 0.008; Phi = 0.161). No statistical significance between sex and back pain in the preceding year was observed ( $X^2 = 1.952$ ; p = 0.181; Phi = 0.084).

#### 3.2. Level of Knowledge of Back Care Related to Physical Activity and Its Association with Back Pain

Table 2 shows the comparison between back pain and knowledge of back care. Results demonstrate that those who suffered from back pain in the preceding week scored higher (2.91  $\pm$  1.66 (95% CI 2.71–3.11)) than non-sufferers (2.42  $\pm$  1.90 (95% CI 2.20–2.64)), with statistical significance (Z = -2.109; p = 0.035; r = 0.127). Furthermore, sufferers gave significantly more correct answers than non-sufferers (Z = -1.962; p = 0.050; r = 0.118). Nevertheless, the incidence of having suffered back pain in the previous week had little effect on the achieved score. No association between having passed or failed the test and having suffered from back pain in the previous year or week was observed.

			1-Year Preva	lence		1-Week Prevalence					
Variables		Non Sufferers	Sufferers	р	ES	Non Sufferers	Sufferers	р	ES		
Score	$\overline{\mathbf{X}}$	2.40	2.66	0.145	0.088	2.42	2.91	0.035	0.127		
	SD	1.92	1.79	0.145		1.90	1.66				
Right	$\overline{\mathbf{X}}$	6.27	6.54	0.150	0.087	6.30	6.76	0.050	0.118		
	SD	1.82	1.63	0.150		1.78	1.49	0.050			
Wrong	$\overline{\mathbf{X}}$	6.30	6.16	0.280	0.052	6.32	5.94	0.071	0.109		
	SD	1.77	1.69	0.369		1.77	1.56				
Blank	$\overline{\mathbf{X}}$	0.43	0.30	0.446	0.046	0.38	0.30	0 701	0.023		
	SD	1.48	1.18	0.446	0.046	1.41	1.01	0.701			
Passed	Ν	10	16			16	10		0.094		
	%	8.06	10.53	0 539	0.042	7.80	14.08	0 155			
Failed	Ν	114	136	0.007	0.042	189	61	0.155			
	%	91.94	89.47			92.20	85.92				

Table 2. Knowledge on health and back care education between back pain sufferers and non-sufferers.

#### 4. Discussion

This investigation aimed to describe the level of knowledge on back care related to physical activity and prevalence of back pain among Spanish adolescents aged 12 to 17 years old from Murcia, Spain, as well as to determine the relationship between back pain and the level of knowledge.

#### 4.1. Level of Knowledge of Back Care Related to Physical Activity

Back care-specific physical exercise has been demonstrated to prevent back problems in schoolchildren [1,15,25]. Physical education represents one of the basic tools to initiate, at an early age, healthy habits that contribute to physical well-being [1,2,10,14,15,21]. However, adolescents generated low mean global scores on the knowledge test (less than 3 out of 10). Ninety percent of students failed the test with a mark of less than five points out of ten. These results demonstrate a low level of back care-specific knowledge related to physical activity among the secondary school students from Murcia, Spain, who participated in the study.

Miñana-Signes and Monfort-Pañego (2016) [10] found similar results with secondary school students from the Valencian Community (Spain), where either girls or boys generated mean global

scores lower than three out of ten using the same knowledge test as in the present study. These authors also demonstrated a high percentage of students who failed the test (80.7%).

According to the current study, Cardon, De Clercq, and De Bourdeaudhuij (2000) found that children aged nine to twelve years old scored a global mean score of 4.65 out of 10 in a postural hygiene knowledge test [34]. In addition, Cardon, De Bourdeaudhuij, and De Clercq (2001) [35] showed that students aged 10–11 years old generated a mean score of 2.67 out of 10 in a postural hygiene knowledge test, whereas Cardon, De Bourdeaudhuij, and De Clercq (2002) [36] showed 5.29 out of 10 was the mean global score in a postural hygiene knowledge test with schoolchildren aged nine to twelve years old. Previous research found similar results through knowledge tests related to back care [19,24,37–39]. These data suggest that adolescents have a low level of knowledge with respect to back care.

No statistically significant differences were observed when the results were compared by gender and age. Two previous studies had also observed no differences between gender groups with respect to level of knowledge on physical activity for back care [10,13]. However, with regard to age, other studies showed that the score in the knowledge test increased with age [10,24]. Despite this, even older students had low mean scores, leading authors to conclude that adolescents had a poor level of back care-specific knowledge, as found in the current investigation.

Most of the knowledge tests used in these studies were not specifically about back care related to physical activity. In fact, many of them were in relation to postural hygiene and were carried out with younger students. For those reasons, direct comparison to the current results is difficult.

#### 4.2. Prevalence of Back Pain

Firstly, the results of the present study showed that more than one-half of the adolescents suffered from back pain in the previous year and that approximately one-quarter of students suffered from back pain in the preceding week.

In the same way, Sheldon (1994) [40] found a lifetime prevalence of back pain in 40% of students. Kjaer, Wedderkopp, Korsholm, and Leboeuf-Yde (2011) [11] carried out a prospective study and observed a one-month prevalence of back pain in 33%, 28% and 48% of participants at the ages of 9, 13 and 15 years old, respectively. These percentages are slightly lower than the ones found in the present study. It suggests that the differences related to the query time frame could affect prevalence of back pain.

Other studies have found higher prevalence of back pain. Cardon et al. (2002) [36] observed a one-week prevalence of back pain in 31.9% of participants, while Lorenzo-González and García-Soidán [39] observed a prevalence of back pain in 68.4% of participants. A similar study with 12 to 16 year old students found higher prevalence of back pain in the previous year (66%) and in the preceding week (51%) [7].

Additional research has indicated similar prevalence of low back pain in the week before (28.2%), but a higher prevalence of low back pain within the preceding year (76.1%) [9]. It suggests that better methodological quality, including a larger sample size or randomly selected samples, could led to an increase in prevalence rates [5].

The current investigation examined prevalence of back pain by gender and by age. It was found that higher prevalence of back pain in the previous year or week was significantly associated with the oldest students. Previous research found similar results [4,7,9–11,41,42]. Back pain and spinal pathologies have a high prevalence in children and adolescents [3–7] and cause an increase in the number of doctor's visits and the general use of the public health services [8,11].

When the results were compared by sex, a higher one-week prevalence of back pain was detected in girls than in boys. Many previous studies suggest that back pain is significantly more common in girls [7–9,11,42,43]. Low back pain in girls could be related to less endurance of trunk muscles [44], more frequent prevalence of lumbar hyperlordosis [3], or to the pain suffered during the premenstrual period [45].

#### 4.3. Level of Knowledge of Back Care Related to Physical Activity and Its Association with Back Pain

When the level of knowledge was compared between sufferers or non-sufferers from back pain in the preceding year, no statistically significant differences were found. However, when mean scores in the knowledge test were analysed between those who suffered or did not suffer from back pain in the previous week, it was observed that sufferers scored significantly higher than non-sufferers. These results might be explained by sufferers who attended visits to the doctor due to back pain learning more about back care than non-sufferers. Nevertheless, it must be stated that these differences are not necessarily relevant, as both groups' mean score was lower than 30%, which reflects a weak foundation in overall knowledge of back care.

Miñana-Signes and Monfort-Pañego (2016) [10] found no significant association between low back pain and the level of knowledge of back care related to physical activity, although the authors noted that students with low back pain had slightly higher scores than non-sufferers. However, similar to the current study, both groups received poor mean scores.

While sufferers seem to score slightly higher than those who did not suffer from back pain, the differences between groups were not academically relevant because of the poor scores individuals got in any case.

Given the high prevalence of back pain and the important lack of knowledge found in the present study, and the fact that physical education has the potential for preventing back problems [1,3–7,10,13, 15], development of new strategies to promote back care-specific physical exercise from an early age, in order to support an active lifestyle as well as to generate adaptive behaviours and expand responsible attitudes for back care, is necessary [2,9,12,14,21,28,29].

The promotion of physical activity for back care through physical education may have economic and social implications in the long-term. For instance, if the prevalence of low back pain decreased, the future adult population would have healthier backs and a better quality of life [8]. This could in turn result in a decrease in health care system costs.

Finally, it should be noted that this is a cross-sectional study which only demonstrates an association with several risk factors for back pain and does not confirm causality. Prospective studies are needed to analyse how much specific knowledge is required to prevent back pain. In addition, it has not been possible to show what factors are associated with a high level of knowledge of back care due to the insufficient level of specific knowledge found in the current study.

#### 5. Conclusions

This study demonstrated the following conclusions:

- Secondary school males and females at any age from Murcia, Spain, had a low level of specific knowledge of back care related to physical activity.
- There was a high prevalence of back pain in secondary school students and prevalence increased as adolescents' got older. Prevalence of back pain in the preceding week was slightly higher in girls than in boys.
- This study failed to show an association between back pain and specific level of knowledge of back care; no relevant differences were found when mean scores were compared between sufferers of back pain (2.91 ± 1.66) and non-sufferers (2.42 ± 1.90).

The long-term impact of physical activity for back care through physical education on the prevalence of back pain, quality of life, and health care system costs needs to be analysed through additional prospective studies.

#### Implications and Contributions

The content of this paper is significant because it shows an important lack of knowledge about back care among adolescents, and advocates the need to improve adolescents' knowledge of back

care related to physical activity. It remains unknown what the potential effect knowledge of healthy physical exercise may have in the prevention of back problems.

Back care education at school is needed because the promotion of physical activity for back care may have economic and social implications in the long-term. One strategy includes physical education teachers teaching about back care related to physical activity and exercise, but this strategy would require teachers to be previously qualified to teach about back care [37].

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