The Relationship between Low Back Pain and Sport Practice in Young People

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Abstract: The purpose of the present study is to analyse the incidence of back pain in young people aged 10–12, considering participation in sport, the type of sport practised, the frequency of practice and the possible differences between genders.

The study covered 2,270 students (1,214 boys and 1,056 girls) aged 10–12 in Majorca. The sample was selected from different clusters (schools) by means of convenience sampling. The questionnaire and data collection method were validated beforehand through test-retest.

The results obtained show that the incidence of back pain reaches 38.3% (34.5% for boys and 42.8% for girls). There were significant relationships between back pain and sport practice, a positive one in boys and a negative one in girls, which can be explained by the fact that the two groups practised different sports. The highest incidence of back pain was detected among children who practised volleyball, gymnastics and swimming for over 4 hours a week, as well as among those who practised rhythmic gymnastics.

Based on the results obtained, the study suggests that back pain is a malaise affecting the young population, especially females, in a considerable way, and that the type of sport as well as the frequency of practice determined whether a given sport can be a risk factor associated with back pain.

Keywords: Low back pain, physical activity, sports practice, schoolchildren.

INTRODUCTION

Low back pain is defined as pain and discomfort, localised below the costal margin and above the inferior gluteal folds, with or without leg pain. Nonspecific (common) low back pain is defined as low back pain not attributed to recognisable, known specific pathology [1]. At present, back pain is a common phenomenon with great relevance in public health [2], and yet, it has been described as a public health problem in children and adolescents only on a few occasions [3].

Non-specific back pain is very infrequent among children under the age of 7 [4]; nevertheless, a study with a broad methodological approach carried out in Majorca proved that as many as 59.9% of boys and 69.3% of girls aged 13–15 have already experienced it [5]. Different studies [6,7] show that back pain incidence in the adolescent period has risen by 10 to 13%. The existence of a back pain episode is a sign foretelling future problems of this type [8,9], and therefore the prevention of back pain among young people should be central to tackling this problem.

The risk of developing back pain depends on multiple factors. Variables such as gender [5,10], age [6,7], body mass index [11], psychosocial factors [9,12], time spent sitting or watching TV [13,14], physical fitness [15,16] and carrying excessively heavy school backpacks [17,18] have been suggested and identified as related factors, even though the findings of some studies concerned with their actual influence are contradictory.

Another factor associated with back pain is physical activity. The relationship between the two is curvilinear in adolescents, considering that low and high values of physical activity are associated with an increased risk of back pain [19], but some studies presented different results [4,20].

Certain types of physical activity have also been linked to risk of back pain in adolescents. Namely, the risk is greater for activities placing increased stress on the lower back, such as gymnastics, rowing, wrestling, diving and American football [21]. It must be noted that there are certain physical activities, such as team sports, in which the participants' age is taken into account and, consequently, the rules are adapted. However, there are also activities, such as gymnastics, in which adaptations to children's needs are limited.

Determining which particular sport can represent benefit or risk with respect to back pain would allow a preventive selection according to a person's characteristics (age, gender or other existing associated risk factors). The objective of this study is to

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E-ISSN: 2313-0954/14

analyse the incidence of back pain among children aged 10–12, depending on participation in sport, the type of sport practised, the frequency of practice and possible differences between genders.

MATERIAL AND METHODS

The population participating in the study was 5th and 6th grade primary school students from Majorca. The sample size calculation for an infinite population has determined a theoretical sample of 1,066 participants, with a reliability level of 95% and pre-determined sampling error of 3%. The study covered the final sample of 2,270 participants (sampling error of 2%) aged 10–12, of whom 1,214 were boys (53.5%) and 1,056 were girls (46.5%), with a mean age of 11.1 (24.1% were 10 years old, 43.3% were 11 years old and 32.6% were 12 years old) (Table **1**).

The sample was selected from different clusters (schools) by means of convenience sampling. All schools in Majorca received a letter inviting them to participate in the study and informing them about the characteristics and objectives of the study. All participants (students, teachers and parents) were informed about the purpose of the study and its procedure. Moreover, students' parents or tutors were requested to give their consent for children to participate in the study.

The questionnaire and data collection methodology were validated beforehand in a two-phase study [22]. The pilot phase focused on the questionnaire's understandability and the viability of data collection methodology. The validation phase, on the other hand, focused on reliability, internal coherence and validity of the questionnaire. Interclass Correlation Coefficients with values between 0.83 and 0.88 were employed in order to compare different quantitative variables, and kappa values in the range of 0.88 to 1 were calculated to evaluate the consistency of qualitative variables.

The questionnaire students filled in was based on one used in a previous study in Majorca [23], and data were included about the prevalence of back pain understood as the percentage of individuals from a given population who have suffered from back pain during a determined period of time [24].

The data related to back pain included lifetime and last 7-day prevalence (never/just once/sometimes/ frequently/almost constantly).

The main data concerning potential risk factors included: gender (male/female), age (the year of birth), sport practice (football, basketball, swimming, cycling, tennis, rhythmic gymnastics/gymnastics, futsal, athletics, volleyball, martial arts, handball and three additional open options), frequency of sport practice (less than 2 hours a week, 2–4 hours, more than 4 hours), federated sport practice (yes/no), weight (kg) and height (cm).

In order to compare qualitative variables, chi-squared test and t-test were used for continuous variables. The established significance level was

Table 1: Characteristics of the Sample by Gender

	Boys	Girls	Total	Sign.
Participants	1,214	1,056	2,270	
Age (mean)	11.10	11.07	11.09	χ^2=1.053 P=0.591
LBP Prevalence				
- Lifetime	34.5%	42.8%	38.3%	χ^2=16.138 P=0.000
- Last 7 days	11.8%	15.8%	13.6%	χ^2=7.624 P=0.007
Sport practice:				χ^2=143.597 P=0.000
No	18.2%	38.3%	27.5%	
< 2 hours/week	21.2%	22.7%	21.9%	
2-4 hours/week	27.5%	21.3%	24.6%	
> 4 hours/week	33.1%	17.7%	25.9%	

$p<0.05$. In cases where the normality assumption was not met, relevant non-parametric tests were employed. All the analyses were carried out using SPSS-21 statistics package for Windows.

RESULTS

The results obtained from the questionnaire demonstrated a lifetime prevalence of back pain of 38.3%, which means that 1,450 out of 2,223 participants stated that they had suffered from back pain at least once in their lives. Last 7-day prevalence reached 13.6%. The results show that 65.5% (n=778) of boys had never suffered from back pain, compared to 57.2% (n=593) of girls (χ^2=16.138, $p<0.001$) (Table **1**).

With respect to leisure sport practice, 72.5% of participants indicated that they practised at least one sport regularly: 21.9% for less than 2 hours a week, 24.6% for 2–4 hours a week, and 24.6% for more than 4 hours a week. The difference between genders was quite significant—sport practice was more widespread among boys, reaching 81.8%, compared to 61.7% in the case of girls (Table **1**).

When current or past back pain is associated with sport practice or the lack of physical activity, the results are not significantly different (p=0.591). However, Table **2** presents the results associating back pain and sport practice by gender. In the case of boys, 32.8% of those who practised sports had experienced back pain, compared to 41.9% of those who did participate in any sports (p=0.014). The opposite occurs in the case of girls; the ones who practised sports suffered from more back pain (45.8%) than the ones who did not engage in any activity (37.8%) (p=0.014).

Given the results, it is essential to analyse the type of sports practised by boys and girls. The most popular sports among boys were: football (n=576, 47.4%), basketball (n=158, 13%), tennis (n=123, 10.1%), martial arts (n=109, 9%), swimming (n=136, 12.9%), cycling (n=61, 5.8%), futsal (n=62, 5.1%), handball (n=45, 3.7%), gymnastics (n=27, 2.2%), volleyball (n=17, 1.4%), athletics (n=15, 1.2%) and other sports (n=36, 3%).

On the other hand, the most frequently practised sports among girls were: rhythmic gymnastics (n=161, 15.2%), basketball (n=127, 12%), tennis (n=87, 8.2%), swimming (n=88, 7.2%), cycling (n=84, 6.9%), football (n=56, 6.2%), volleyball (n=59, 5.6%), martial arts (n=54, 5.1%), handball (n=36, 3.4%), athletics (n=29, 2.7%), futsal (n=11, 1.1%) and other (n=76, 7.2%). The differences between sports practised by boys and girls suggest that the incidence of back pain should be analysed according to the type of sport and the frequency of practice (Table **3**). The sports with the greatest incidence of back pain were rhythmic gymnastics (47.8%), volleyball (47.4%) and handball (45.7%).

As far as the frequency of practice is concerned, it can be observed that in the case of sports such as volleyball, basketball and gymnastics, frequent practice provoked a rise in the incidence of back pain. The most recurrent tendency is that moderate sport practice (2–4 hours a week) resulted in the highest back pain index, as in the case of handball, cycling, martial arts and football. The sports associated with the lowest levels of back pain in moderate practice were: swimming, tennis, athletics and futsal. On the other hand, in sports such as rhythmic gymnastics, frequent practice was associated with greater back pain incidence (Table **3**). It is noteworthy that the greatest back pain incidence indices appear among those participants who practised volleyball, gymnastics and swimming for more than 4 hours a week, and those who practised rhythmic gymnastics.

DISCUSSION

The results of the study show a high lifetime prevalence of back pain; however, they are similar to

Table 2: LBP Lifetime Prevalence by Sport Practice and Gender

Gender	Sport practice	Ever suffered LBP		Sign.
		No	Yes	
Boys	No	125 (58.1%)	90 (41.9%)	χ^2=6.373
	Yes	653 (67.2%)	319 (32.8%)	P=0.014
Girls	No	245 (62.2%)	149 (37.8%)	χ^2=6.348
	Yes	348 (54.2%)	294 (45.8%)	P=0.014
Total	No	370 (60.8%)	239 (39.2%)	χ^2=0.299
	Yes	1001 (62.0%)	613 (38.0%)	P=0.591

Table 3: LBP Lifetime Prevalence by Sports and Practice Frequency

Sport	Total	<2h/w	2 – 4h/w	>4 h/w	Sign.
Rhythmic gymnastics	75 (47.8%)	47 (57.3%)	25 (39.1%)	3 (27.3%)	χ^2=6.793 P=0.033
Volleyball	36 (47.4%)	14 (42.4%)	18 (47.4%)	4 (80.0%)	χ^2=2.459 P=0.292
Handball	37 (45.7%)	17 (45.9%)	18 (47.4%)	2 (33.3%)	χ^2=0.413 P=0.813
Cycling	62 (43.1%)	35 (41.7%)	20 (46.5%)	7 (41.2%)	χ^2=0.300 P=0.861
Swimming	94 (42.9%)	60 (47.2%)	27 (34.2%)	7 (53.8%)	χ^2=4.068 P=0.131
Tennis	85 (41.5%)	43 (43.9%)	30 (38.5%)	12 (41.4%)	χ^2=0.525 P=0.769
Athletics	18 (40.9%)	11 (45.8%)	5 (33.3%)	2 (40.0%)	χ^2=0.599 P=0.741
Basketball	105 (37.4%)	34 (30.6%)	37 (39.4%)	34 (44.7%)	χ^2=4.076 P=0.130
Futsal	26 (36.6%)	16 (41.0%)	6 (30.0%)	4 (33.3%)	χ^2=0.760 P=0.684
Martial arts	57 (35.4%)	18 (26.5%)	34 (44.2%)	5 (31.3%)	χ^2=5.073 P=0.079
Football	191 (30.5%)	72 (30.6%)	67 (32.2%)	52 (28.3%)	χ^2=0.725 P=0.696
Gymnastics	5 (19.2%)	1 (9.1%)	2 (16.7%)	2 (66.7%)	χ^2=5.125 P=0.077

the numbers in the rest of Europe, in spite of possible environmental and cultural differences [25]. It must be emphasised that significant differences were detected between genders, in accordance with the opinions voiced by the majority of the scientific community, who claim that girls exhibit greater incidence values than boys as far as the occurrence of back pain episodes is concerned [5,10,11,14,20]. There are no existing studies demonstrating greater incidence of back pain among boys, but there are some in which no significant differences were found [26,27].

The present study focused on sport as risk factor associated with back pain among young people without finding a relationship between the two, in line with research conducted by Diepenmaat *et al*. [2006] and Mogensen *et al*. [2007]. In contrast, other studies [21,28-30] established that competitive sports and high levels of physical activity are associated with an increase in back pain. In a recent study [31], the incidence of acute and non-acute back pain in a group of athletes reached 34.9% and 20.1% respectively, compared to 21.3% and 3.2% in a group of non-athletes. A third possibility is that greater amounts of physical activity are associated with lower incidence of back pain [32]. These inconsistent results require a more profound analysis, going beyond the mere presence or absence of physical activity in relation to back pain. Each sport discipline or group of sports should be analysed individually, and the variable of gender should be included in research.

Swimming has been traditionally recommended to prevent and treat back pain based on the proven benefits of aquatic exercise [33]. From the biomechanical point of view, only the butterfly stroke can provoke recurrent back pain or spondylosis [34]. According to a study of professional swimmers [35], there are no differences in back pain prevalence between amateur and professional swimmers. However, a prevalence of degenerative disc disease has been observed among the latter.

Football was the most popular sport among boys and it is associated with the lowest back pain incidence index, not counting gymnastics, for which the sample

was very small. It has been proven that the practice of football as leisure activity (2 hours a week, or 2 sessions of an hour each) reduces the risk of back injury [36]. Nevertheless, intense practice of football is associated with the risk of developing back pain [37].

Rhythmic gymnastics was the most commonly practised sport among girls and, regardless of the frequency of practise, it was also associated with the highest back pain incidence index. This sport discipline exposes the spinal column to repeated hyperextensions and it is related to suffering spondylosis. Gymnastics is regarded as the most dangerous sport for the spine [38,39].

Volleyball, preceded by rhythmic gymnastics, was the second sport with the highest incidence. Previous studies [28] already established a link between volleyball practice and back pain.

On the other hand [31], sports such as judo, gymnastics, rugby, badminton, athletics and golf were associated with acute back pain, while rugby, judo, golf, athletics and volleyball were associated with non-acute pain.

With regard to gender, the results of the present study show an inverse relationship between sport practice and back pain in boys, and a direct relationship in girls. Studies [40,41] demonstrated that men reporting high levels of physical activity had a lower incidence of back pain, in contrast to those leading a sedentary lifestyle, who showed a higher incidence.

In the case of women, a study [42] found that those engaging in infrequent, but intense physical activity manifested the highest incidence index of back pain.

This data proves that the differences between genders are clear and that the type of sport practised as well as the frequency of practice determined whether a given sport discipline can constitute a risk factor associated with back pain. According to the present study, the sports with the highest incidence were rhythmic gymnastics and volleyball, both predominantly practised by women.

One of the strengths of the present study was the sample size, allowing an analysis of back pain incidence for each sport. On the other hand, the limitations of the study included a possibility that some boys or girls suffering from back pain preferred to choose a specific sport discipline, such as swimming. It is essential to perform prospective studies to determine the direction of these associations. Moreover, it is necessary to obtain greater samples for some specific sport disciplines to draw more reliable conclusions that could be contrasted with other studies.

It is clear that effective early prevention programs could have invaluable impact on both social health and the economy, comparable to ‘‘anti-smoking’’ or ‘‘anti-cholesterol’’ campaigns, but current published data involving purely educational programs are not convincing, especially with regard to their long-term effect [43].

Based on the results obtained, this study suggests that back pain is a malaise affecting young population in a considerable way. Schools and sports clubs in their training phase are the most suitable institutions to participate in back pain prevention and health promotion, considering that they stand for constant learning and provide a highly favourable context —a place where children spend most of their time in constant interaction with their peer group. To achieve this, both teachers and sports coaches require appropriate training. Postural education programmes as a preventive measure against back pain are a useful and effective tool, as shown in studies carried out with boys and girls aged 9 [44], 10–12 [45], and 10–11 [3].

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Received on 04-07-2014 Accepted on 25-07-2014 Published on 17-12-2014

DOI: http://dx.doi.org/10.12974/2313-0954.2014.01.02.7