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Low back pain and associated disability in Swedish adolescents

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Introduction: Low back pain (LBP) defined as ache or pain in the lowest part of the back is a common experience among people all over the world. The lifetime prevalence is reported to be as high as 84%, and the prevalence of LBP seems to be almost the same among adolescents as among adults. The risk for having LBP later in life if you experienced LBP in adolescence is high.

Material and Methods: In this cross-sectional study of 2550 students aged 16-20 years, we used the Standardized Nordic Questionnaire for the analysis of musculo-skeletal symptoms. We studied gender difference, prevalence, and disability of Low back pain. We also studied differences in LBP in adolescent athletes depending on hours spent on sports or physical activity.

Results: Significantly, more girls than boys had had problems sometimes during their life. Those who participated in sports reported LBP to a significantly higher extent than those who were physically inactive in their spare time. Gender and spare time sports were important risk factors for getting LBP some time in life. There was a higher risk for girls to have low back pain problems more than 30 days or daily the last year if they had had low back pain some time earlier in life.

Conclusion: This study shows that low back pain (LBP) is common among Swedish adolescents, more common among girls than boys. High sport activity was associated with the risk of having LBP, length of time with LBP, and disability due to LBP.

KEYWORDS
back trouble, epidemiology, female, male, sports, Swedish, young people

1 | INTRODUCTION

Low back pain (LBP) is defined as ache or pain in the lowest part of the back and is a common experience among people all over the world.[1] The lifetime prevalence is reported to be as high as 84%, disability rates 12%, and the prevalence of LBP seems to be almost the same among adolescents as among adults.[2] There are different opinions as to whether low back pain is a normal life experience in adolescents not related to low back pain in adulthood[3] or whether previous LBP in adolescence relates to LBP in adulthood. Hellsing et al found an odds ratio of 4.29 for LBP later in life if there was an experience of LBP in adolescence,[4] and other authors have also found a relationship between LBP in adolescence and LBP in adulthood.[5,6] In an 8-year follow-up study, from baseline at the age of 41, Kjaer et al found an odds ratio of >18 for people to have recurrent pain after eight years, especially if they reported severe pain at baseline.[1] In China, a 3-month LBP prevalence of about 40% in subjects 14 years of age was found,[7] and in Norway, in the same age group, in a 3-year follow-up study, an odds ratio of 4.7 for LBP was found.[8] Some authors have tried to clinically subclassify low back pain in adults into more severe and less severe LBP.[9] Adolescent competitive

athletes seem to have more LBP than nonathletes. In Japan, in a cross-sectional study, an odds ratio of 1.57 for LBP in a sport active group (9.8 hours/wk) compared to a nonsport group was found.[10] Risk factors are back strenuous sports, high level of competition, and high amount of time spent on physical activity.[10,11] The purpose of this study was to evaluate the prevalence of low back pain (LBP) and associated physical disability in an adolescent population in relation to sport activity level, age, and gender.

2 | SUBJECTS AND METHODS

2.1 | Study area and study population

The survey was performed in a municipality in the north of Sweden, with 74 000 inhabitants. Half of the population lives in small communities around the city. The main occupations are agriculture, small industries, mining, and public service. All students attending high school participated in the study (ages 16-20 years). A total of 3076 students were registered at the official school administration. The response rate was 82.8% (n = 2550). The study was approved by the Regional Ethical Board of Umeå University, Sweden (No. 97-248 FEK). The respondents' replies were treated anonymously.

2.2 | Questionnaire

This study comprises 23 items from a total of 73 items from the Standardized Nordic Questionnaire for the analysis of musculo-skeletal symptoms,[13] modified for students. The first page contains individual characteristics and questions about physical activity level in hours/wk and kind of sport performed. The two following pages are questions about symptoms from the musculo-skeletal system in general, related to a drawing that explains the areas referred to.

The following questions were used:

1. "Have you ever had pain, ache or felt unpleasantness in your low back?"
2. "Have you had pain or ache, or felt unpleasantness in your low back anytime the last 12 months?"

If the answers to these questions were YES, the following questions were asked:

3. "Have you had pain or ache, or felt unpleasantness in your low back some time the last 7 days?"

The answer options to these questions were no or yes.

4. "How many days in total have you experienced pain in the low back the last 12 months?"

The answer alternatives to this question were 0 days, 1-7 days, 8-30 days, >30 days but not every day and day in day out.

5. "Have you, due to LBP, reduced your spare time physical activity the last 12 months?
6. "How many days in all have you experienced that you were unable to perform your daily activities due to pain in the low back the last 12 months?"

The alternatives were 0 days, 1-7 days, 8-30 days and >30 days.

7. "Have you, due to low back pain, been examined or treated by a physician, physiotherapist or chiropractor the last 12 months?"

The answer options to this question were no or yes.

Before the investigation, information was delivered to all registered students in high school about the purpose of the investigation. Students younger than 18 years of age were informed that they should take the information home to their parents.

The questionnaires were delivered to each class separately and distributed by the homeroom teacher or by the physical educational teacher. The questionnaires were returned within 2 to 4 weeks. The school nurse delivered questionnaires to those who had not answered the questionnaire during the first round. A total of twenty-eight questionnaires were collected in this manner.

2.3 | Statistical analysis

Analyses were made using SPSS 11.0 for PC. To compare frequency difference between groups, chi-square likelihood ratio was calculated. Differences were considered significant if $P < 0.05$. We also used logistic regression analysis. Percentage of answers to questions 2 and 3 are calculated in relation to the number of "Yes" to question one.

3 | RESULTS

3.1 | Prevalence

The overall prevalence of having LBP sometimes during their life was 46.2% (N = 2522), last year 42.4% (N = 2523), and the last 7 days in 44.7% (N = 1054). Significantly, more girls than boys had had problems sometimes during their life (51.9% and 40.4%, respectively, $P < 0.001$; Table 1) and the last year (girls 48.7% and boys 36.1%, respectively, $P > 0.001$; Table 1). The last 7 days 47.5% girls and 41.9% boys reported problems in the lower back ($P < 0.042$; Table 1). Those who were active in sports reported LBP ever to a

TABLE 1 Prevalence of low back pain in the answering population (n = 2550; 83%) of the 3076 students registered at the official school administration

	Number of answers N	Yes boy N (% yes of boys)	Yes girl N (% yes of girls)	*P* Difference boys/girls
Ever LBP (% of total N of boys/girls)	2513 Boys 1287 Girls 1225	520 (40.4)	636 (51.9)	<0.001
LBP 12 mo (% of total N of boys/girls)	2514 Boys 1288 Girls 1224	465 (36.1)	596 (48.7)	<0.001
LBP 7 d (% of total N of boys/girls/% in relation to ever LBP)	1023 Boys 458 Girls 577	192 (14.9/41.9)	274 (22.4/47.5)	<0.042

Ever LBP, low back pain sometimes during life; LBP 12 mo, low back pain sometime the last 12 mo; LBP 7 d, low back pain sometime during the last 7 d.

TABLE 2 Sports activity and low back pain in the answering population (n = 2513; 82%) of the 3076 students registered at the official school administration

	Number of answers N	Yes—LBP 12 mo N (% yes in the group of not active/active, respectively)	No—LBP 12 mo N (% no in the group of not active/active, respectively)	*P*
No, physical activity	805	303 (37.6)	502 (62.4)	<0.001
Yes, physical activity	1708	755 (44.2)	953 (55.8)	

LBP 12 mo, low back pain sometime the last 12 mo; physical activity 6 h/wk.

significantly higher extent than those who were physically inactive in their spare time (not-active in sports in their spare time 41.6% and active in sports in their spare time 48%, $P < 0.003$).

3.2 | Duration

In the group that had ever experienced LBP, girls experienced a longer duration in their problems than boys. The relative frequency of LBP problems lasting more than 30 days was 51.9% in girls and 40.4% in boys ($P < 0.001$), and the annual experience of LBP was 27% in girls and 21.3% in boys ($P < 0.030$).

3.3 | Physical disability

Of those that ever had experiences LBP, having experienced physical disability more than one day the last year was more common in the sport active adolescents than in physically inactive (46.7% and 39.4%, $P < 0.040$). Physical disability eight days or more was experienced in 17% of the subjects, and disability more than 30 days was reported in about 4% of the subjects, irrespective of gender in those who reported low back pain sometimes during their lives. Of those who reported LBP the last year almost one out of three girls (32.4%) and slightly more than one out of three boys (38.1%) reported this LBP to have had impact on their physical activity.

3.4 | Sports and low back pain

Spare time sport activity more than 6 hours/wk correlated with lifetime LBP ($P < 0.001$), annual disability more than 8 days ($P < 0.017$), and LBP the last year ($P < 0.001$; Table 2). When separated into gender, both boys and girls who were sports active more than 6 hours/wk in their spare time experienced more LBP than boys and girls with a physical activity of less than 6 hours/wk. In Table 3, the number and percentage of subjects that participated in the ten specific sports with the highest number of participants, taking part more than 6 hours/wk in these sports are listed. The number of these subjects that ever or during the last 7 days had experienced LBP is also listed.

3.5 | Consequences

Of those who reported that they had experienced low back pain sometimes the last year, one out of three girls (33.6%) and boys (34.9%) had visited health centers due to low back pain problems. Of those with low back pain sometimes during their life, boys that were physically active for 6 hours/wk or more were those who sought help most frequently for their low back pain (17.2%). In girls who had experienced LBP, there was an increase in the relative number who had visited health care in relation to increasing hours of spare time sports. In boys, the pattern was not as clear, only in the

TABLE 3 Sports participation and low back pain

Sport	Number of sports participants n	Yes sports>6 h/wk N (% yes of Sports)	Yes ever LBP N (% yes of Sports >6 h/wk)	Yes LBP 7 d N (% yes of ever LBP/ % yes of Sport>6 h/wk/% yes of N)
Soccer	441	102 (23)	54 (53)	19 (35/19/4)
Floorball	296	23 (8)	14 (61)	6 (43/26/2)
Strength training	241	48 (20)	20 (41)	6 (30/13/2)
Ice hockey	207	84 (41)	49 (58)	12 (24/14/6)
Aerobics	170	2 (1)	1 (50)	1(100/50/1)
Judo sports	97	33 (34)	14 (42)	2 (14/6/2)
Swimming	92	7 (8)	3 (43)	2 (67/29/2)
Equestrian	90	31 (34)	16 (52)	8 (50/26/9)
Athletics	77	13 (17)	7 (54)	1 (14/7/1)
Gymnastics	57	3 (5)	1 (33)	1(100/33/2)
All sports	1708	700 (41)	365 (52)	138 (37/20/—)
All sports	1708		819 (48)	314 (38/—/18)
Non-active	803		334 (42)	152 (45/—/19)

Number of sports participants in each sport, sports 6 h or more/wk (sport >6 h/wk), low back pain ever during life (Ever LBP), and low back pain sometime the last 7 d (LBP 7 d).

group with 6 hours/wk or more of spare time sports there was an increase in the relative number of who had visited health centers.

3.6 | Risk factors

Gender was the risk factor with the highest risk ratio for LBP some time in life (girls/boys; OR 1.60, CI 1.351-1.898). Spare time sport activity was the second most important risk factor for getting LBP some time in life (spare time sport/no spare time sport; OR 1.13, CI 1.068-1.194). To be active 6 hours or more in spare time gave us the odds ratio to have LBP sometimes in life of (spare time sport >6 hours/wk/no spare time sport; OR 1.29 CI 1.061-1.576). Also, LBP symptoms the last year were more frequent in girls in relation to boys and active compared to those less active in their spare time (>6 hours vs <6 hours per week). There was also a higher need for and use of healthcare services due to lower back pain among those with a high activity in sports in their spare time than among those who were less active (OR 1.21, CI 1.10-1.32). There was a higher risk for girls to have low back pain problems more than 30 days or daily the last year if they had had low back pain some time earlier in life (OR 1.46, CI 1.08-1.971).

4 | DISCUSSION

4.1 | Prevalence

The lifetime prevalence of nonspecific lower back pain (NSLBP) is high and is estimated to be up to 84% in a general population.[2,14] In a general adolescent population, a lifetime prevalence of 30%-80% has been reported.[15,16] This study showed that adolescents who were sport active, experienced LBP to a significantly higher extent than those who were not sport active in their spare time (active in sports, LBP 44.2%, not active in sports, LBP 37.6%, $P < 0.002$). In a study of 9- to 16-year-old boys and girls comparing a group not active in sports (participating in physical education in school) with a group active in sports >than 6 hours/wk, there was a significant difference in the prevalence of LBP. The prevalence was 34.9% in the group active in sports and 21.3% among those not active in sports ($P < 0.001$), respectively.[10] In this study, we found that adolescents participating in spare time sport activities more than 6 hours/wk reported more annual LBP than those who were sports active less than 6 hours/wk (47.9%, 40%, respectively, $P > 0.001$). There seems to be a higher prevalence of LBP in adolescent athletes at least if they participate in sports activities in their spare time more than 6 hours/wk.

4.2 | Duration

In this study, LBP was more prevalent and lasted longer in adolescents participating in sports. Especially, if the time spent in sports was high, spare time physical activity more than 6 hours/wk correlated with annual disability more than 8 days ($P < 0.017$). This is in line with a study by Sato of adolescent athletes.[10] In our study, we also found a significant difference between boys and girls in the relative frequency of

low back pain with a duration of more than 30 days (21.3% and 27.0%, respectively, $P < 0.030$). The findings indicate that LBP in adolescent athletes should be regarded as an alarming symptom that has to be taken seriously, since it can give long-lasting problems with pain and impact on ADL. This seems to be especially important in girls, as they appear to be more impaired by LBP in their daily living than boys.[8]

Many authors have found that adolescent athletes more frequently report LBP than a general adolescent population, and they suggest that the athletes with LBP should have a careful physical examination and appropriate imaging to explore the cause of their LBP problem.[10,11,14,17,18]

4.3 | Disability

Previous studies have shown that physical disability due to LBP, in a general population (adolescents included), is estimated to be 10%-40%[2,19,20] and that 10% to 15% may develop chronic LBP**.** In this study, there was a higher prevalence of disability more than 30 days in those who were active more than 6 hours/wk compared with those who were active less than 6 hours/wk (20.1%, and 14.7%, $P < 0.05$). Adolescent athletes with disabling LBP have to be carefully examined, since many of those, up to 90%, have serious conditions that need a diagnosis to be treated early in the process.[21]

4.4 | Sports and low back pain

Physical activity is highly recommended in order to preserve health and prevent illness in adulthood as well as in adolescence.[22,23] However, our findings and those of others suggest that boys and girls who are active in sports more than 6 hours/wk in their spare time experience more LBP than those active in sports less than 6 hours/wk.[25,26] Earlier studies of different sports have shown that the highest risk ratio to have LBP is seen in rugby, golf, athletics, volleyball, judo, and gymnastics in this order.[10] In this study, as seen in Table 3, prevalence of ever having experienced LBP, if participating more than 6 hours/wk in the sport, was the highest in floorball and ice hockey, followed by soccer and athletics. However, the number of participants in these groups is small (at least concerning the last 7 days), why this has to be interpreted with caution. The fact that those who participate in sports more than 6 hours/wk report LBP more often may have several explanations, though many authors have shown different structural changes in adolescents with high physically active demands[11,21,27,28] why this still has to be taken seriously.

4.5 | Consequences

In this study, spare time sport activity more than 6 hours/wk also correlated with annual disability more than 8 days ($P < 0.017$). In a systematic review by Lin et al, the authors found a weak relationship between physical activity and disability in acute low back pain (<6 weeks).[29] In another 3-year prospective study in adolescent team sports (basketball and floorball), they found a time loss from full training for lower back injuries with an average of 50 days (±72 days).[30] Globally, LBP seems to be one of five leading causes of years lived with disability (YLD).[20,31] This makes it important to find out more about the causative factors behind LBP early in the process and to find diagnostic markers for conditions like spondylolysis. Spondylolysis has been shown to have a delay of 3-11 years from the first symptoms to diagnosis.[32] Therefore, it is important that adolescent athletes with disabling LBP should be carefully examined since, as many as up to 50%, may have this serious condition that can be aggravated later in life.[21,33,34]

4.6 | Risk factors

If experiencing LBP during adolescence, there is an odds ratio of 3.5 to experience LBP eight years later.[5] Adolescents taking part in sports have been shown to have an odds ratio of LBP that was significantly higher (OR 1.57) for the active group compared with the non-active group.[10] The same was seen in Australia in a general population with a high level of activity (OR 1.63),[26] and also, in Finland, a high odds ratio (OR 1.30) for adolescents with high physical activity was found.[25] Odds ratio for having LBP sometimes in life if physically active in spare time compared with the non-active group was (OR 1.13) in our study, which is lower than earlier studies (10). In the group that was sport active more than 6 hours/wk, the odds ratio for having LBP sometimes in life OR was 1.29 compared with the group active 5 hours or less. Spare time sport activity more than 6 hours/wk was thus the second most important risk factor for experiencing LBP sometime during life, in our study. In a retrospective study, this is a relatively low OR to be considered a real risk factor, why this result must be interpreted carefully, more like a trend. This, thus, needs to be further studied in the future to confirmed or reject this trend.

The most important risk factor for ever having experienced lower back pain in this study was female gender (OR 1.60), which has been described earlier.[35] In this study, we also found a significant difference between boys and girls both in the relative frequency of low back pain with a duration of more than 30 days, as well as the annual experience of LBP with a higher frequency in girls.

Earlier studies have shown a correlation between LBP and structural changes in the lower back in adolescents physically active more than 6 hours/wk in their spare time.[21] There also seems to be a dose-response relationship between the amount of sport activity per week and LBP.[10] In a study of adolescent athletes, LBP seldom was shown to be a nonspecific LBP but

in more than 80% of the cases, a structural explanation was found.[21] It is thus of importance to perform an imaging investigation early in the process. Preventive actions like preparations before entering high level demanding sports activities and sport activities requiring a high number of hours spent in training are also important, as well as looking at the contents of exercises, the intensity, and the possibilities to recover.

5 | CONCLUSION

This study shows that low back pain (LBP) is common among Swedish adolescents, more common among girls than boys. Girls also had LBP more often and for longer periods of time. High sport activity is associated with the risk of having LBP, the length of time with LBP and disability due to LBP.

Future research should thus focus on training regimes, clinical treatment, and clinical diagnostics of female subjects and of adolescent athletes with spare time sport activity more than 6 hours/wk.

6 | PERSPECTIVE

There seems to be a consensus about the fact that adolescents with a high level of sport activity experienced more low back pain than those who were not physically active or physically active to a lower extent. This has to be considered both during training and treatment. However, the knowledge concerning training regimes that do not lead to lower back pain (LBP) or the best practice concerning diagnosing and treatment of LBP in young athletes is spares, implying a great need of further research in this area.

6.1 | Limitation of the study

This is a retrospective cross-sectional study with recollection from the memory of having the experience of LBP and its consequences. This kind of investigations has inherent limitations related to bias effects based on memory. For example, the recollection of the experience of LBP the last 7 days is most likely higher than the recollection of the experience of LBP the last 12 months. There might also be a gender difference in the recollection of LBP, or a difference between those active/non-active in sports. The only possible way to counteract this bias is to perform a prospective study following a group during at least a year. Most often this is not possible in groups as large as the ones in this study, and there will still be recollection bias since even these studies have been shown to have adherence problems instead. Further, the Standardized Nordic Questionnaire for the analysis of musculo-skeletal symptoms has been shown to be reliable for comparison of groups of subjects.[13]

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