Assessment of spine pain presence in children and young persons studying in ballet schools

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Abstract. [Purpose] Spine disorders affect various sections of the spine and have a variety of causes. Most pain occurs in the lumbo-sacral and cervical regions. Dance is associated with exercise. High levels of physical activity predispose to back pain occurrence. [Subjects and Methods] The subjects were 237 ballet learners; 80 children (primary school level), mean age 11.24±0.77, mean of years of training ballet 2.14±0.74; 93 students (junior high school level), mean age 14.01±0.84, mean of years of learning ballet 4.64±1.24; 64 students (high school) mean age 17.01±0.77, mean of years of learning ballet 7.47±1.54. Numeric rating scale was used to determine spine pain. [Results] Feelings of pain were analyzed on the basis of “now” and “before” between levels education by using point statistics and statistical tests to compare groups. “Now” exhibited weaker back pain feelings than “before” at all the education levels. There were statistically significant differences in pain feeling for “before” (at any time of learning) and “now” (the day of survey). [Conclusion] All patients reported pain “before” and “now” in cervical, thoracic and lumbar spine. At all levels of education there were statistically significant differences in feelings of pain between “before” and “now”.

Key words: Back pain, Ballet

INTRODUCTION

Spine disorders affect various sections of the spine and have a variety of causes1, 2). Most back pain occurs in the lumbo-sacral and cervical regions of the spine. Low back pain is defined as pain localized between the ribs and the gluteal folds, with or without symptoms in a lower limb. Pain in the upper part of the spine usually means pain in the cervical spine and upper thorax, with or without syndrome in an upper limb3). Back pain is divided into two groups that differ in pathogenesis and in therapeutic procedure. The first group consists of specific pain in the spine. It is caused by a specific disease of the motor system or injury due to external causes. The second group consists of non-specific low back pain which does not have a specific cause and may be caused by musculoskeletal disorders or injury due to other reasons. Non-specific low back pain occurs in 90% of people who suffer from back pain4). According to the duration of the pain, back pain is divided into acute—up to six weeks, sub-acute—from 6 to 12 weeks, and chronic—lasting more than 12 weeks5). The International Association for the Study of Pain states that chronic pain is a condition lasting more than three months6). The frequency of pain increases with age7). The occurrence of pain in the cervical and lumbar spine in children and adolescents is influenced by: anthropometric, lifestyle, mechanical strain on the back, psychological, social and behavioral factors7, 8). Dance learning is associated with physical effort. High levels of physical activity can lead to back pain6–9). Pain in the lumbar spine is most frequently associated with sports activities such as judo, golf, rugby, basketball, baseball, soccer, athletics and volleyball9). Pain also experienced by ballet learners9). Pain warns the body from harmful activities and dysfunctions. Pain causes a change in the muscle tension of particular muscle groups, contributes to changes in body shape, disturbs motor control and causes abnormal motion patterns10, 11). Taking into consideration the universality of the back pain problem in children and adolescents we decided to check if symptoms occur in children and young people studying in primary, junior high and high schools of ballet.

SUBJECTS AND METHODS

The predetermined objectives of this research were to assess in which segments of spine pain arises most frequently “before” and “now” and to investigate whether there was a statistically significant difference in the range of pain sensation between “before” and “now”. Our hypothesis was that the feeling of back pain is weaker “now” than “before” at particular levels of education (primary school level, junior high school and high school).

The subjects were 237 children and young people learn-
ing in ballet schools in Gdansk and Lodz in Poland. Eighty children were examined from two primary ballet schools. The average age of the respondents at this school level was 11.24±0.77 years (mean ± standard deviation), and their time of study in ballet school was 2.14 ± 0.74 years. Ninety-three junior high school students were included in this research. Their average age was 14.01± 0.84 years, and their mean time of study in ballet schools was 4.64±1.24 years. At the high school level 64 students were included in this research. Their average age was 17.01±0.77 years, and their mean time of study in ballet school was 7.47±1.54 years.

A numeric rating scale (NRS) was used to determine the sense of pain in the cervical, thoracic and lumbar spine12). Students were asked to point to the level of pain on the day of research “now” using a numerical scale for cervical, thoracic and lumbar spine pain, (mark in red), and then to mark the feeling of pain for each section of the spine at any time during school attendance, “before” (check in green). The assessment of pain using the NRS was performed once. For analyzing the result, the reported of pain feelings was only taken into account in terms of “before” and “now” for the various sections of the spine. The children and young people did not report the occurrence of musculoskeletal injuries and did not report pain as meningeal or radicular. The feelings of back pain were analyzed using, percentage assessment, point statistics and statistical tests to compare the groups. The results were statistically analyzed using the statistical package R13). This research was carried out with the permission of the Local Bioethics Committee of Poznan University of Medical Sciences, and after receiving the consent of the subjects’ parents or guardians.

### RESULTS

Among the 80 children at primary level, 14 students reported pain in the cervical spine, 6 in the thoracic spine and 15 in the lumbar part of the spine. Regarding pain “now”, 12 children declared feelings of back pain in the cervical spine, and 10 declared pain in the thoracic and lumbar regions of the spine (Table 1). At the junior high level, among the 93 tested students, 19 reported “before” pain in the cervical spine, 9 in the thoracic spine and 31 in the lumbar section of spine. Regarding pain “now”, 7 students reported pain in the cervical spine, 5 in thoracic spine and 15 in the lumbar part of the spine. At the high school level, among the students 64, 20 reported pain “before” in the cervical spine, 10 in thoracic spine, and 41 in the lumbar spine. Regarding pain “now” 7 students reported pain in the cervical spine, five in the thoracic segment, and 30 in the lumbar part of the spine.

The assessment of pain at the primary, junior high and high school levels showed that reported pain occurred in a smaller number of respondents “now” rather than “before” in each part of the spine. Considering the occurrence of pain in each section of spine for the whole group of students, it should be noted that 53 pupils reported pain “before” in the cervical spine but only 26 respondents “now”. In the thoracic spine 25 students felt pain in the lumbar spine “before” but only 12 students reported pain “now”. Eighty-seven pupils reported pain in the lumbar spine “before”, but only 55 students reported pain “now” (Table 1). However, it should be pointed that the most reported location of feelings of pain was the lumbar spine both “before” and “now”. It can be seen that for learners at the primary level, pain sensations were reduced in different sections of the spine. In the cervical spine pain, it was reduced by 20%, in the thoracic spine by 66.67%, and in the lumbar section of the spine by 33.33% (Table 2).

Reduced pain sensations were also reported among junior high school students. For the low-cervical spine segment, pain decreased by 60.00%, in the thoracic spine by 44.44%, and in the lumbar spine by 40.63% (Table 2).

Respondents at the high school level, students also reported a reduction in pain: in the cervical part by 65.00%, in the thoracic spine by 54.55%, and in the lumbar spine by 54.55%.

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**Table 1. Number of students reporting pain “before” and “now” in different sections of the spine at the primary, junior high, and high school levels**

|                      | C: cervical spine | Th: thoracic spine | L: lumbar spine |
|----------------------|------------------|--------------------|-----------------|
| Primary school level | 14 “before”      | 6 “before”         | 15 “before”     |
|                      | 12 “now”         | 2 “now”            | 10 “now”        |
| Junior high school level | 19 “before” | 9 “before”       | 31 “before”   |
|                      | 7 “now”         | 5 “now”            | 15 “now”        |
| High school level    | 20 “before”      | 10 “before”        | 41 “before”     |
|                      | 5 “now”         | 7 “now”            | 30 “now”        |
| Number of people     | 53 “before”      | 25 “before”        | 87 “before”     |
|                      | 26 “now”        | 12 “now”           | 55 “now”        |

**Table 2. The percentages of students at the primary, junior high, and high school levels reporting pain both “before” and “now”**

|                      | Primary school level | Junior high school level | High school level |
|----------------------|----------------------|--------------------------|------------------|
| C: cervical spine    | A: 80.00%            | 33.33%                   | 66.67%           |
| Th: thoracic spine   | 55.56%               | 59.38%                   | 40.00%           |
| L: lumbar spine      | 44.44%               | 40.63%                   | 60.00%           |
|                      | 35.00%               | 45.45%                   | 55.56%           |
|                      | 65.00%               | 54.55%                   | 24.39%           |

A: % of people declaring pain “now” to declaring pain “before”, B: percentage % of people reporting fewer pain sensations “now” than “before”, C: cervical spine, Th: thoracic spine, L: lumbar spine.
The basic characteristics of the primary, junior high and high school students are shown in Table 3.

At the primary level all the results are the same for pain feeling “now”, and “before” with the exception of the mean. The mean value for feeling pain “before” is 0.45 and that for “now” is 0.30 (Table 3).

For the junior high school level, the minimum, 1st and 3rd quartile values of pain are the same for “before” and “now”. However, the median value for the feelings of pain “before” is 1.00 and that of “now” is 0.00. The values for the mean of “before” and “now” are different: the value of 0.66 for “before” is bigger than the mean of “now”, 0.34 (Table 3). Also the maximum value for “before”=3.00, is bigger than the maximum value of “now”=2.00.

All values for “before” are bigger than “now”, except for the minimum (0.00) and median (1.00). The 1st quartile value of “before” is 1.00, and that of “now” is 0.00. The mean value of “now” is 1.13, and that of “before” is 0.67. The 3rd quartile value of “before” is 2.00, and that of “now” is 1.00. The maximum value of “before” is 3.00 and that of “now” is 2.00 (Table 3). Subsequently whether there were significant differences between pains “before” and “now” among the tested groups at the three education levels was determined.

Since the p values of the paired t-test for the primary, junior high and high school levels are less than 0.05, there are a statistically significant differences in pain sensation between “before” and “now”. Moreover, the p value of the t-test between the primary and junior high school ballet students is 0.5926, the p value of the t-test between the primary and high school ballet isn’t significant different (0.5926), the p value of the t-test between the primary and junior high school ballet is significant different (0.0004), and the p value of the t-test between the junior high and high school ballet is also significantly different (0.0015).

Sports activities and, a high level of physical activity affects low back pain occurrence. Wedderkopp and co-authors did not find a relationship between the level of physical activity and back pain presence. Low back pain is more common among females than males. However, in ballet low back pain is more often seen in boys and men. It is related to their requirement to lift and hold female dancers. Pain may predispose them to pain occurrence. Pain report more psychosocial problems in group relationships, be affected by the short height of a child. Shorter children injuries to the lower limbs and lumbar spine in dancers, due to poor stabilization of the lumbo-pelvic complex. Studies show that segmental muscle stabilization training as part of a core stability program decreased low back pain. Yang and co-authors point out that the main cause of pain in the lumbar spine is abnormal function of the core muscles in this segment. Headache, stomach pain and sleeping trouble can have a strong influence on the occurrence of back pain in children. The occurrence of low back pain may also be affected by the short height of a child. Shorter children report more psychosocial problems in group relationships, which may predispose them to pain occurrence. Pain is also a factor that limits function. The musculoskeletal system is connected by a wide system of sensory nerves. Sensory receptors are associated with fast-conductive fibers, Aβ, which are stimulated by harmless stimuli. According to the results of research and observation, daily stimuli which stimulate sensitized nociceptive nerve paths are causes of pain. Nociceptors exhibit, like nerve cells, the phenomenon of adaptability, which is associated with peripheral sensitization in the formation of muscle-skeletal pain conditions. Peripheral and spinal mechanisms are responsible for formation of pain feeling. However, it has been shown in the assessment of pain formation that psychological and social

### Table 3. Basic results of the primary, junior high, and high school level students

|           | PRIMARY | MIDDLE | HIGH  |
|-----------|---------|--------|-------|
|           | “before”| “now”  | “before”| “now”  | “before”| “now”  |
| Min.      | 0.00    | 0.00   | 0.00   | 0.00   | 0.00    | 0.00   |
| 1st Qu    | 0.00    | 0.00   | 0.00   | 0.00   | 1.00    | 0.00   |
| Median    | 0.00    | 1.00   | 1.00   | 0.00   | 1.00    | 1.00   |
| Mean      | 0.45    | 0.30   | 0.66   | 0.34   | 1.13    | 0.67   |
| 3rd Qu    | 1.00    | 1.00   | 1.00   | 1.00   | 2.00    | 1.00   |
| Max.      | 2.00    | 2.00   | 3.00   | 2.00   | 3.00    | 2.00   |

24.39% (Table 2).

DISCUSSION

Our research confirmed the hypothesis feelings of back pain “now” are weaker than “before” at the various levels of education (Table 1). perhaps the reason for was the time of the survey (it was conducted at the beginning of the school year—September 2012). the assessments of pain expressed the survey (it was conducted at the beginning of the school education (Table 1). perhaps the reason for was the time of education (Table 1).
factors are the most important elements that help to predict the presence of pain and the degree of its severity24. Pain in muscles caused by exercise is short and provoked by impaired blood flow to working muscles25. It is possible that pain felt in the cervical, thoracic and lumbar spine reported by the respondents was associated with a weakening of the stabilizing muscles26–28. Davarian and colleagues have shown that there is a correlation between the intensity of pain and disability29.

ACKNOWLEDGEMENTS

The authors thank the Associate Editor and the anonymous reviewers for their invaluable comments and suggestions which helped improve this manuscript.

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