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INFLUENCE OF THE LEVEL OF PHYSICAL FITNESS ON THE SYMPTOMS OF BACK PAIN SYNDROME

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Abstract

Introduction: Spine pain syndrome, which significantly limits everyday functioning, is one of the most common symptoms of musculoskeletal disorders. The aim of this study is to assess the impact physical fitness has on the symptoms of back pain syndrome.
Material & Methods: A EUROFIT fitness testing battery was used to assess the fitness level of 34 participants with back pain. Measurements of aerobic fitness, lateral and sagittal mobility, strength, movement speed and precision were recorded, and the pain levels of the participants were taken into account.
Results: No statistically significant impact of physical fitness on back pain was noted.
Conclusions: Physical activity and fitness do not impact on the symptoms of back pain syndrome in any significant way. Further research into back pain syndrome is required in the future.
Key words: back pain, physical activity, fitness

Introduction

Back pain syndrome (BPS) is one of the most common ailments reported by patients for medical attention. It is estimated that as much as 85% of the world's population will experience an episode of BPS [1] at least once in their life. These ailments may concern any part of the spine, they can be either acute or chronic, and in up to 80% of patients with back pain, the condition is recurrent. According to estimates from previous years, about 15% of such cases become a chronic disease, although more recent studies suggest that this percentage is higher. BPS is usually associated with the elderly (the highest rate is in patients over 55) and manual workers, although it is affecting young people and office workers more and more often [1,2]. In studies conducted on the Scandinavian population, the occurrence of BPS was found in as many as 5% of 15-year-olds and 50% of 20-year-olds [3].

The causes of BPS may be mechanical in origin (damage to muscle tissue, bone or spine joint), degenerative, inflammatory, oncological or even infectious, but in 85% of cases it is not possible to establish the exact cause of the ailment [1,2]. Staying as active as possible is often recommended. In the literature, one can find a lot of information about the preventive nature of active forms of recreation, such as doing sports, walking and other activities aimed at increasing or staying physically fit [4]. However, the importance of specific areas of physical fitness for the symptoms of back pain is not yet fully understood [1]. The aim of this study is to investigate the effect of the level of physical fitness on the occurrence of BPS and the severity of related ailments.

Material and methods

Characteristics of the study group

This study was carried out in the city of Krakow among patients of the "Sana-Med" clinic undergoing outpatient rehabilitation due to spine pain. The only inclusion criterion for the study was the occurrence of back pain occurring within one month of the start of the study. The exclusion criteria were any contraindications to exercise, lack of consent to participate in the study, and fractures and injuries in the lower and upper limbs. 34 people (19 women and 15 men), aged between 22 and 61 years old, participated in the study. The average age of the respondents was 39±15.38 years, of which no less than half of the respondents were under 35.5 years of age. Among the respondents, over two thirds (N = 23, 67.65%) described the position most often taken at work as sitting, of whom only one person declared that they performed manual work while sitting. Multiple position changes (for simplicity referred to as "in motion") during work – and thus such work is of a more physical nature – were reported by only 11 (32.35%) of the respondents.

Research methodology

Before admission to the rehabilitation program, each patient underwent a standard functional assessment, which included diagnostic tests. Additionally, the patients underwent a physical fitness test.

Pain assessment according to Domżał

The pain scale according to Domżał was created to assess the advancement of changes in the course of sciatica. It is based on the subject's subjective assessment of pain in relation to his behavior. It is based on choosing one or more of the following five options, scored from 0 to 4:

0. no pain,
1. pain, but it does not interfere with work and walking,
2. pain makes it difficult to work and walk,
3. pain occurs in rest and lying position,
4. the pain is unbearable and forces behavioral changes.

The points from the items selected by the patient are added together to show the final score – the highest logical score is 9 points, and the lowest 0 points [5,6].

Symptom of Otto-Schober

The Otto-Schober sign is used to measure the mobility of the spine by marking specific bony prominences on the skin and determining the change in the distance between them when performing full flexion (forward bend) and extension

(backward bend). In the thoracic region, the C7 spinous process and a point 30 cm from it in the caudal direction are marked. Normal length changes are expected to be an increase of 2 to 4 cm in flexion and a decrease of 1 to 2 cm in extension. In the lumbar region, however, the S1 spinous process and a point 10 cm cranial are marked. The correct values are assumed to be an increase of about 5 cm in flexion, while during extension the distance between the determinant points should decrease by about 1 to 2 cm and reach values of 8 to 9 cm. If the differences in length are less than 1cm, this indicates limited mobility and potential degenerative or inflammatory changes [7].

Spike test

The spine test is used to assess the possibility of blocking in the sacroiliac joint. The researcher, by palpation, searches for the posterior superior iliac spine and the sacral crest at the same height. Then, the patient is asked to raise the lower limb (on the side of the joint being examined) and move it as far forward as possible. In a properly functioning sacroiliac joint, the iliac spine is displaced by 0.5 to 2 cm due to the fall of the iliac bone. If the sacroiliac joint is blocked, displacement is proximal or it does not occur at all [7].

Physical fitness test

The modified EUROFIT test for adults was used to assess the level of physical fitness of the participants. It consisted of five trials using different areas of physical fitness.

Taking the test was preceded by a short warm-up. All pain complaints during the trials were recorded [8,9]. Cardiopulmonary fitness was checked using a 2-minute Step in Place Test. The subjects were asked to raise their knees as quickly as possible, at least to the level of the middle of the other thigh. The number of correctly performed right-left cycles was counted. The time was reported every half minute. Breaks and propping up were allowed during the test [9,10]. The force was assessed with the use of a bending and straightening test of the upper limbs in the front support (Push-Up Test). The starting position for the test was the front support and the movement was carried out by flexion (up to an angle of 90 degrees) and extension of the elbows. The subjects performed movements at a pace selected by them, and the maximum number of correctly performed repetitions was taken as the test result [8,9].

The flexibility was tested twice. The first attempt took place while seated (Sit-and-Reach Test) – the participant was sitting with his legs straightened and with his feet touching the side edge of the stepper and was asked to bend forward, reaching with his hands as far as possible. The result was the maximum distance that the subject managed to reach beyond the edge of the stepper or the distance remaining to the edge. During the second attempt of flexibility, the

subject stood with his back against the wall and was asked to perform a side bend to the right, leading the hand along the thigh (Lateral Side-Bend Test). The distance from the initial to the final position of the longest finger of the right hand was measured, and then the test was repeated for the left side [10]. The speed and coordination of movements were checked using a test of touching the disks alternately (Reaction Tap Test). Two discs were placed on the table at a distance of 60 cm from each other (counting from their centers). The subject rested his non-dominant hand on the table, right between the disks. Then he was asked to alternately touch the disks with his dominant hand, without taking the other hand off the table. The test result was the time needed for 50 touches (25 complete left-right cycles). The test was repeated twice and the better result was selected [8].

Statistical methods

The results were recorded and the statistics were analyzed using the programme Microsoft Excel. In order to check the relationships between the results, the Jarque-Bera test was used and the correlation coefficient was calculated.

Results

The average of the points obtained from the pain rating was 4.44±2.46. The average sum of points using Domżał's pain assessment amounted to 4.78±2.15 for the sitting position, while for those in motion it amounted to 3.72±3.00 (Tab. 1).

Table 1. Results for the Pain Scale Assessment by Domżał

Pain scale	Pain assessment	% of respondents
5	Pain has appeared	35.29%
4	Pain hard to bear. It forces to change body position	17.16%
3	Pain appears in lying down position	70.59%
2	Pain makes it difficult to work and walk	61.76%
1	Pain is present but it does not interfere with working and walking	38.24%
0	No pain	0%

Taking into account the position taken at work by the respondents, these statistics are subject to observable changes.

Both the median and the mode for the sitting position remained unchanged in relation to the whole group (5 and 5 respectively), but it was significantly reduced for people who frequently change their position during work – both parameters take a value of 2. The minimum and maximum values for each group were 1 and 9 (Tab. 2, 3).

Table 2. Comparison of functional test results

Functional test / mobility of the spine	Positive result	Negative result
Spike test	14.7%	85.3%
Symptom of Otto-Schober	37.2%	62.8%

Table 3. Results of the study of mobility of the thoracic and lumbar spine Otto-Schober

Range / Segment	Thoracic section	Lumbar section
Reduction in mobility	20.59%	61.24 %
Restriction during bending	17.65%	62.5%
Restriction during extension	2.94%	37.5%
Excessive mobility in flexion	17.65 %	64.71%
Excessive mobility in extension	2.94%	67.65%

In the 2-minute Step in Place Test, the mean result was 129 cycles (128.8±22.46 cycles), and the median was 127.5 cycles. The most frequent result (three times) was 123 cycles, the highest number of correctly performed right-left cycles obtained by the person being examined was 173 cycles, and the lowest was 92 cycles. For the sample, the correlation coefficient between the results of the two-minute walk test and the pain level was calculated, amounting to 0.038, which does not indicate the statistical significance of this variable. In the Push-Up Test, the subjects obtained an average of 9.65±10.94 repetitions. The median was 6.5 repetitions. The mode value 1 repetition occurred eight times. The maximum result was 36 repetitions, and the minimum result was a lack of correctly performed repetitions. The mean of the results in the first Sit-and-Reach test was -1.79±11.04 cm. The median amounted to -3 cm and the mode -9 cm was four times more common. The highest result obtained was 17 cm, the lowest -28 cm. In the Lateral Side-Bend Test, the mean was 23.03±4.27 cm. The median was 22 cm, and the mode number of 21 cm occurred 8 times. The minimum value was 14 cm and the maximum 33 cm. The results of the entire test were similar to the results divided in terms of the direction of the movement. In the test of speed and coordination of movements (Reaction Tap Test), the mean was 11.63±2.35 cycles. The median constituted 11.35 cycles with the most common result being 11.4 cycles, obtained three times. The highest result was 25 cycles in 7.3 seconds and the lowest 25 cycles in 17.1 seconds.

Discussion

Back pain syndrome is a common ailment, which is often a reason for hospitalization or rehabilitation. The proportion of the population showing symptoms of BPS is highly worrying, especially as these statistics are growing year by year (an increase from 11.8% to 33%) [1,4]. The WHO estimates that almost

everyone in the world will experience or has already experienced an episode of back pain. Therefore, the amount of research conducted on BPS is not surprising. More and more modern diagnostic and statistical methods, as well as a fresh perspective, often undermine the previously prevailing assumptions – as has happened with various theories on the origin of BPS – and replace them with more up-to-date data.

The increasing effort of employees from various fields of medicine is contributing to the increase in knowledge of BPS, its diagnostics and therapy [1,4,11]. Extensive research from 1999–2009 by Heneweer et al. confirm high physical stress as a risk factor of the occurrence of BPS. However, they give the same significance to assuming an incorrect posture, even when resting. This seems to be confirmed by the results obtained in the course of this study – a sitting position during work is common among people with BPS and is a potentially significant factor that increases the risk of its occurrence [11]. Shiri and Falah-Hassani make similar observations. They claim that the impact on BPS of spending leisure time actively is, at best, slight. It is repeatedly stated that physical activity is closely related to the occurrence of BPS. However, a significant amount of research conducted in this area is based on questionnaire surveys, without checking specific aspects of fitness. In this study, the level of pain was compared with individual areas of physical fitness (in individual fitness tests), showing no significant effect of fitness parameters on pain [12]. Fares et al. recognized incorrect exercise technique as the main cause of ailments. This example shows that persuading patients with BPS to exercise is insufficient, and may even be harmful if the activity is carried out improperly [13]. This allows for the suspicion that a low level of physical activity is not necessarily a factor predisposing one to the occurrence of BPS, as well as that trying to maintain an excessively high level of physical fitness is burdened with an equally high (if not greater) risk.

Yabe et al. showed a significant relationship between the occurrence of lower limb pain and the occurrence of pain syndrome in the lumbar spine. Furthermore, it is estimated that BPS occurs among as many as 40% of school-age basketball players. Thus, this percentage is much higher than the incidence of back pain in the same age group in general, assumed to be 1%–5% [14]. On the other hand, Jespersen et al. did not notice any positive impact of non-occupational physical activity carried out during the duration of BPS symptoms on their reduction over the following four weeks. The results of these studies confirm those obtained in the research conducted for the purposes of this paper: there is no significant correlation between physical activity and BPS. Over the years, there has been a common conviction that spine pain syndrome mostly affects manual workers [15]. However, research on different professional groups conducted over the years seems to dismiss this assumption. Tavares et al. examined a physically active professional group of officers in the Military Police. The most important observation, according them, is the level of muscle endurance flexors and

extensors of the torso, which differed among the respondents. People with BPS showed significantly lower muscle endurance than individuals reporting no pain at all. However, the muscular endurance of the torso did not influence the intensity of the pain patients felt, but only its occurrence. These observations are in line with the observations made within this research, as neither study showed an effect of the fitness level on pain levels in BPS [16]. Scientists are constantly trying to find more effective diagnostic methods for BPS and its causes, especially in terms of stenosis of the lumbar spine [17]. On the basis of the analysis of the results of this study and the review of the latest literature available, it can be concluded that physical activity, as it is generally understood, is not an important factor in the prevention of BPS.

Furthermore, the load on the back occurring while doing sport may contribute to the increased risk of BPS occurrence. Therefore, the recommendations of the physioprophylaxis of spine pain syndrome should be changed – the "physical activity" advised to patients should be replaced by a more adequate term, such as "targeted physical activity", which focuses on the stabilization and mobilization of the spine tissues.

Conclusions

Back pain syndrome is a significant problem among the world's population and affects almost every person during their lifetime. People with BPS show a normal level of physical fitness for a given age. The level of physical fitness does not significantly affect the symptoms of BPS. Restrictions in mobility occur only in a few patients with BPS and vary from patient to patient.

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Wpływ poziomu sprawności fizycznej na dolegliwości w zespole bólowym kręgosłupa

Streszczenie

Wprowadzenie: Zespół bólowy kręgosłupa, który znacznie ogranicza codzienne funkcjonowanie, jest jednym z najczęstszych objawów schorzeń narządu ruchu. Celem pracy była ocena wpływu sprawności fizycznej na objawy zespołu bólowego pleców.

Materiał i metody: Badaniami objęto 34 osoby cierpiące z powodu bólu pleców. W tym celu posłużono się baterią testów sprawnościowych EUROFIT. Pomiary wydolności tlenowej, ruchomości bocznej i strzałkowej, siły, szybkości i precyzji ruchu zostały zebrane i porównane z poziomem bólu uczestników badania.
Wyniki: Nie stwierdzono statystycznie istotnego wpływu sprawności fizycznej na ból pleców.
Wnioski: Aktywność fizyczna i sprawność fizyczna nie wpływają w znaczący sposób na objawy zespołu bólowego pleców. W przyszłości potrzebne są dalsze badania nad zespołem bólowym pleców.
Słowa kluczowe: ból pleców, aktywność fizyczna, sprawność fizyczna