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The influence of powerlifting on pain frequency in the musculoskeletal system

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Abstract

Introduction

Powerlifting consists of exercises (squat, bench press, deadlift) that are corresponding to the three popular movement patterns. Working on proper functioning of muscles involved in

these movements should have a positive impact on their performance in everyday life. However, on the other hand, significant workout strain may cause overloading and lead to musculoskeletal pain.

Aim

To determine the impact of regular powerlifting training on the movement organ functioning.

Material

Study group consisting of 185 people who regularly train powerlifting. Control group consisting of 193 people who declared lack of any physical activity in terms of strength training.

Methods

The research was conducted with the diagnostic poll method using author's questionnaire.

Results

People who train experience pain in lower spine less often. There were also significant differences in the number of people experiencing pain when walking on a flat surface, lifting items from the floor, and moving objects above the eye level between the study and the control group for the benefit of the study group. There were no statistically significant differences found between these two groups regarding joint pain or the number of people who feel pain while sitting down.

Discussion

People who train powerlifting are less likely to experience back pain, what suggests beneficial effect of strength training on spine functioning. Powerlifting training positively affects the quality of movement during lifting objects from the floor and moving them above the eye level, but it does not have a significant influence on the frequency of pain in peripheral joints or while sitting down.

Key words: Resistance Training, Back Pain, Joint Diseases

Introduction

Powerlifting is a discipline based on three movement patterns commonly known from everyday life. Squat, which is practised every day when sitting down, deadlift more or less successful modifications of which are performed during lifting object from the ground, and bench press - this movement is similar to the one performed while pushing doors. It may seem that perfectioning these movements positively affects the movement organ functioning in everyday life. Doing strength training in the correct way is connected with movement economisation and the right balance of muscle tension. That is why strength exercises are considered to be an effective prevention of musculoskeletal pain [1,2,3,4]. It is also indicated that resistance trainings have a beneficial effect on the whole body [5,6].

However, specialist training in powerlifting is based on the use of significant, often submaximal, loads during each of the several training sessions in a week [7]. It arouses doubts, and the question arises, if such heavy loads do not cause excessive physical pressure on the musculoskeletal system leading to its dysfunction.

Daily work with a significant load connected with the extreme strain during competition that determine maximum capacity of the competitor are connected with an increased risk of injury. It applies not only to serious, disqualifying from sport injuries, but also to microtraumas that cannot be properly cured because of numerous trainings. Such condition may in consequence lead to chronic pains. However, the risk of injury in powerlifting is almost the same as in the non-contact sports [8].

The three exercises that consist to powerlifting are thoroughly described with very detailed guidelines. Each of the events is defined in Technical Rules Book of The International Powerlifting Federation [9].

Squat

Correctly done squat begins in standing position with the knee joints locked, the bar shall be held horizontally across the shoulders, the hands may be positioned anywhere on the bar. Then the lifter bends the knees and lowers the body until the top surface of the legs at the hip joint is lower than the top of the knees. After that the lifter recovers to the starting position. Double bouncing or any downward movement during the ascent are forbidden.

Bench press

The bench shall be placed horizontally and shall conform to the following dimensions: length - not less than 1.22 m, width - not less than 29 cm and not exceeding 32 cm, height - not less than 42 cm and not exceeding 45 cm. The squat racks height shall be between 75 and 110 cm and shall be designed to adjust the height in accordance with the lifter's request. During this exercise the lifter's head, shoulders and buttocks shall be in contact with the bench surface, and the feet must be flat on the floor. Blocks not exceeding 30 cm in total height and place may be placed under the feet. The lifter holds the bar, and the spacing of hands shall not exceed 81 cm measured between the index fingers. Then, the lifter moves the bar from the racks and waits in the starting position with the elbows locked. The bar must be lowered to the chest or abdominal area (the bar shall not touch the belt) and held motionless. After that the lifter shall return the bar to straight arms and elbows locked. Just like in squats the downward movement during the ascent is forbidden.

Deadlift

The bar is placed on the floor and the lifter grips it with an optional grip. Taking under consideration fact that the diameter of the biggest discs shall not exceed 45 cm, the bar is about 22 cm above the floor. The lifter raises the bar and on completion of the lift the knees shall be locked in a straight position and the shoulders back. Lowering the bar or supporting it on the thighs during the performance of the lift is forbidden. When the bar returns to the platform it shall be held with both hands up to the end of the movement.

The reason for carrying out these studies were dilemmas on the impact of heavy trainings performed by powerlifters on the condition of their movement apparatus. The survey on pains felt outside the training room was used to determine what pain problems are experienced by the powerlifters in their everyday life comparing to people who do not train professionally.

Aim

The purpose of this resear is to determine the influence of a regular power lifting training on the movement system functioning. This research will also help to answer the question if performing particular movement patterns during trainings results in improved physical fitness in everyday life.

Materials and methods

The research was conducted with the diagnostic poll method using author's questionnaire. The studied group (G1) consisted of 185 people (average age: 23.94 ± 5.02 years), including 18 women and 167 men. Everyone declared that they regularly do powerlifting trainings (minimum 3 trainings per week), and the number of training sessions indicated most often was 4 sessions per week (45.95% respondents). 79.46% respondents have been practising powerlifting for at least a year.

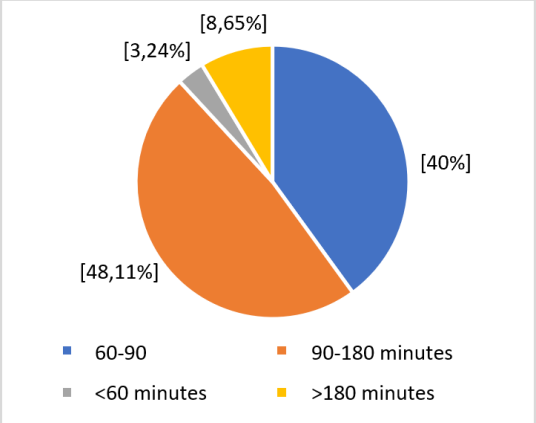

Figure 1. The average duration of the training unit

The control group (G2) consisted of 193 people. They declared lack of any physical activity in terms of strength training. This group included 46 women and 147 men (average age 24.89 ± 5.27 years). The characteristic feature of the control group was their relatively low physical activity. On a scale 1-5, where 1 is a minimum amount, and 5 is a very high amount of physical activity, as much as 94.82% of respondents chose 3 points or less. None of the respondents chose 5 points.

The collected material was analysed with the RStudio 1.1.463 tool.

Results

A statistically important difference ($p<0,05$) between the studied groups in the frequency of back pain was demonstrated. In the group G1 43.2% respondents declared the occurrence of

back pain, while in the group G2 it is 54.4%. Amongst people who complain about back pain, lower back pain prevailed in both groups. In the control group it was declared by 88.6% of people experiencing back pain while in the studied group it was 90%. The statistically significant difference ($p<0.001$) can also be noticed in the number of people reporting pain in more than one part of their spine. In the group of non-training people (G2) it is 14.5 % of respondents and in the group of training people (G1) it is 3.24%.

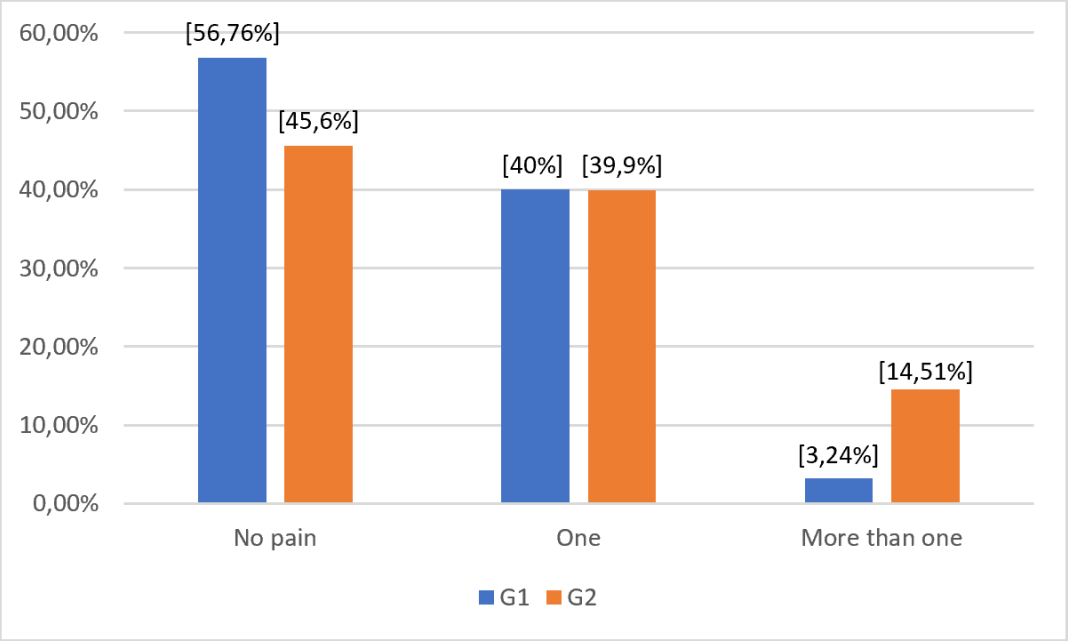

Figure 2. The number of painful spinal regions.

No statically significant differences have been reported between the two groups regarding pain of peripheral joints. 43.2% of people who train and 50.3% of people who do not train complain about such pain. However, there is a statistically significant ($p<0.01$) difference in the amount of joints that hurt. 48.8% of people from the G1 group that reported painful joints feel the pain in more than one joint, while in the group G2 it is 28.9%.

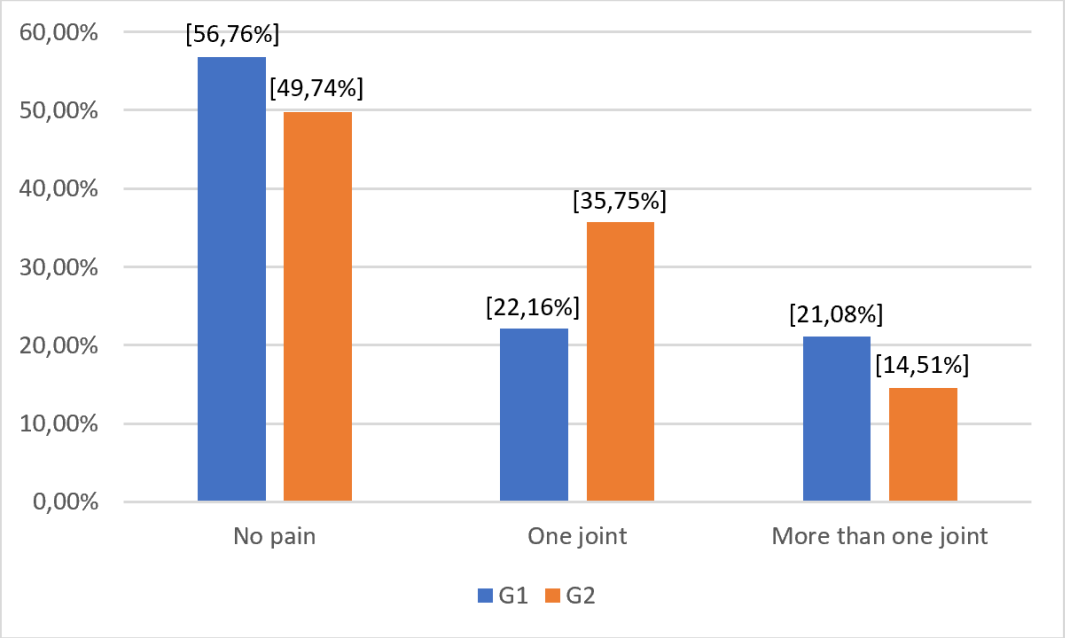

Figure 3. The number of painful peripheral joints.

There have been a statistically significant ($p<0.05$) difference reported between the amount of people experiencing pain when walking on the flat surface. In the group of training people 9.2% answered affirmatively to this question, while in the group of training people it was 18.7%.

Statistically significant ($P<0.01$) difference is also between the number of people who experience pain during lifting objects from the floor. In the control group G2 pain is experienced by 22.3% of respondents while in the study group G1 by 11.4%, regardless of the weight of the lifted object. The difference is generated mainly during lifting heavy objects, then the pain is experienced by 18.7% of non-training people, and 8.6% of people who train, what is also a statistically significant difference ($p<0.01$).

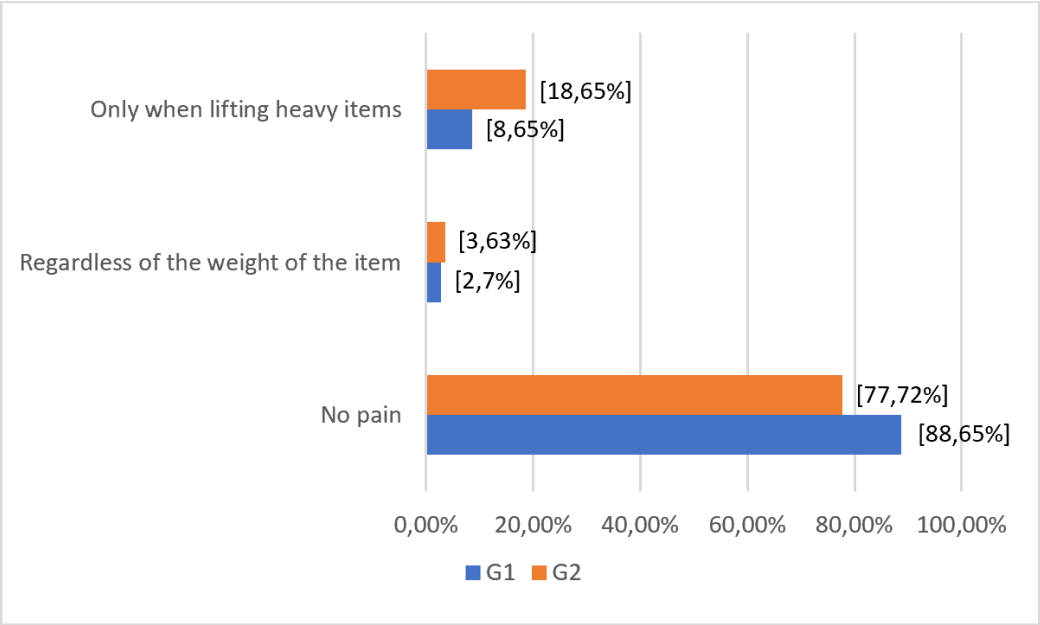

Figure 4. Pain during lifting items from the floor.

In the G1 group, 5.4% of people feel the pain during moving objects above eye level, while in the group G2 it is 13.5% of respondents, and it is a statistically significant difference ($p<0.01$). There is also a significant difference ($p<0.01$) in pain frequency during moving heavy objects above eye level. The pain is experienced by 12.4% of non-training people and 4.3% of people who train.

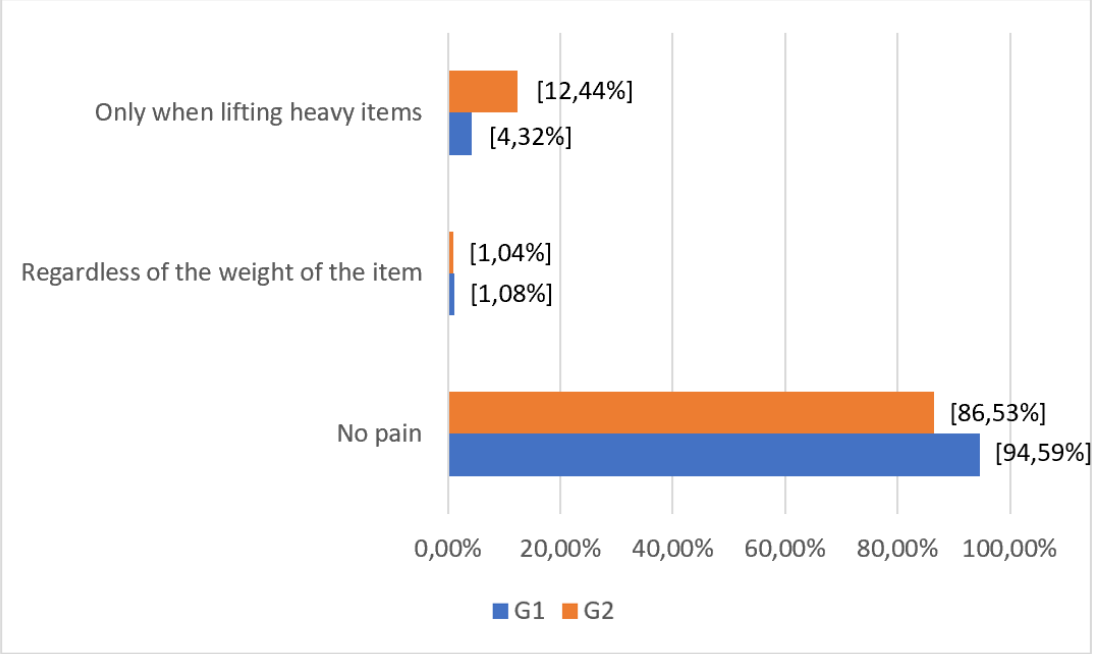

Figure 5. Pain complaints during moving objects above eye level.

There have been no statistically significant differences reported for people experiencing pain when sitting down. 62.7% of non-training people never experience pain, and 30.6% experience it rarely, in the group of people who train, 55.7% never experience pain, and 33.5% experience it rarely. Also, no statistically significant differences have been reported for experiencing pain when walking up the stairs. 12.4% from the G2 group and 7.5% from the G1 group experience it. There is a statistically significant difference ($p<0.05$) in experiencing pain when walking up on the higher floors. 8.8% of people who do not train declared that they feel the pain when walking up higher than the third floor, and in the group of people who train such pain is experienced by 2.7% of respondents.

Three people from the control group are seen regularly by physiotherapist, comparing to 17 people from the study group. It is a statistically significant difference ($p<0.001$). The amount of injuries that exclude from physical activity for more than 2 weeks have also been checked. No statistically significant difference have been reported between the two groups.

Discussion

Decreased incidence of back pain in the group of people who train is in line with existing scientific contributions. The influence of resistance training on pain and functioning of the

lower back is the most widely studied, as it is definitely the most commonly occurring back pain [10]. Own surveys have also indicated this regularity. Strength training is not only very efficient way of preventing back pains, but it can also be one of the method of their reduction [11,12]. There are also reports that indicate not only change in pain intensity, but also the appearance of functional changes that occur in the lower back as a result of regular strength training, and were disclosed during Magnetic Resonance scans [13].

It is worth to refer to the study conducted by David Holmberg et al. in 2011 [14],in which it was revealed that training based on deadlifts may bring measurable benefits in rehabilitation of patients that suffer from discogenic low back pain. Deadlift is one of the disciplines in powerlifting, so it constitutes an extremely important element of powerlifters' trainings. So this attempt indicates the potential direct connection between the lower frequency of back pain and the benefits of regular deadlift trainings.

Deadlift training may also be connected with much lower percentage of people who experience pain during lifting objects from the floor in the group that trained regularly that in the non-training group. Regular and systematic work on this movement pattern and its progressive loading undoubtedly positively translates into its use in everyday life. It is a result of neural adaptation improvement and consequently, the improvement in the activation of muscles that are needed for this type of movement [15].

Considering existing works and results of other studies, there are currently no indications suggesting that technically correct, regular strength training, even with heavy loads, may have a negative impact on the spine, with particular emphasis on the best studied, most problematic lower back.

No difference in pain frequency in peripheral joints indicates that there is a potential lack of benefits in relation to their functioning resulting from strength training. However, it should be remembered that the study group consisted of people who train to achieve the maximum score in powerlifting. They used significant loads and performed systematic repetitions of the same three movement patterns. It is also important to mention the ambition factor - the main goal of powerlifters is to improve their performance, and it may result in overburdening and ignoring possible suggestions to reduce trainings intensity. These reasons are given in the paper by Siewe et al. on injuries and overtraining in powerlifting [16]. At the same time, the authors of this paper point out that the occurrence of injuries in powerlifting training is not higher than

the average in most sports, what excludes powerlifting from high-risk sports. These results are confirmed by Keogh et al. in his paper from 2006 [17], in which he classifies powerlifting as a sport with moderate risk of injury, independent of lifter's age, body mass, competitive standard, or gender. Also, the results obtained in own survey agree with other scientists about the moderate risk of training powerlifting. There were no significant differences indicated between the frequency of injuries excluding from the activity for more than two weeks in both non-training and training people.

The conclusions similar to those for deadlift may be drawn for bench press. Reduced frequency of pain during moving objects above eye level may be connected with increased efficiency of shoulder girdle. The available scientific works indicate that strength increase within the shoulder girdle is an important element in shoulder joint pain prevention [18,19].

There are no scientific reports on the correlation between powerlifting training and the effectiveness of walking or climbing up the stairs. Own survey indicates that this field should be better analysed to determine why do people who practice powerlifting complain less often of pain while walking and climbing up the stairs to high floors. In the light of current knowledge, it is highly likely that this is the beneficial effect of strength training on the functioning of the whole muscular apparatus. This was proven in 1996 in research conducted by Philip A. Ades et al., in which it was proven that by increasing muscle strength and endurance resistance training improves walking efficiency [20]. In general, strength training also supports aerobic endurance [21].

It is worth noting that there is no difference in the frequency of pain while sitting down between the two groups. This may be due to the lack of a direct translation of the powerlifting squat into everyday life. In relation to box squat, which is the closest to the movement of sitting down in everyday life, from the biomechanical point of view the powerlifting squat differs in many aspects [22]. However, an increase in the lower limbs strength together with the correct movement pattern that synchronises movement in the lower limbs with the movement of the torso should positively influence the efficiency of sitting down in everyday life. It can be presumed that lack of benefits results from the powerlifting squat specificity, and this should be examined in more depth in further scientific works.

Conclusions

1. People who train powerlifting are less likely to experience back pain, and those who experience it, feel less pain than people who do not train. It suggests that strength training has a beneficial effect on spine functions.

2. Regular strength training affects the frequency of pain in peripheral joints only to a negligible extent.

3. People practising strength trainings do not suffer serious injuries more often than those who do not train.

4. Strength training positively affects the quality of movement during lifting objects from the ground and moving them above the eye level.

5. Strength training does not affect the quality of sitting down in a way that would reduce the frequency of pain experienced during it.

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