STUDY REGARDING THE LEVEL OF KNOWLEDGE AND THE METHODS OF LEARNING THE SQUAT AS A PHYSICAL EDUCATION AND SPORTS MEANS IN THE CITY OF BACAU

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Abstract
A physical exercise at least as famous as push-ups, the squat is representative for the strength and shape of the lower limbs, in both men and women.The "celebrity" of the exercise comes from the fact that it is extremely popular among children and young people, being a part of the physical education teacher and professional coach's arsenal. It is an excellent fast means of developing the motor skills, including spring. The regular practice of squatting correctly induces over time modifications in the development of muscle strength in the main muscle groups. The advantages are also in regards to preventing certain physical deficiencies in the lower limbs, or even correcting them.
Key words*: squat, physical education, student, training*

INTRODUCTION

One of the simplest physical education exercises, the squat raises an increasing number of problems regarding either the concept of squatting, or the positive and negative aspects that it can have on the athlete's body if not performed correctly.

Even though squatting is a basic element in weightlifting, it was the object of considerable controversy in the last few years. Some authors state that squatting is often to blame for spine and knee injuries, while others continue to promote squatting as the best exercise for developing the muscle mass and strength.

Squats performed incompletely or superficially, with a very heavy load, can lead to injuries. It is important that the weights that are used are configured in such a way that the performance would be complete, offering the necessary safety for the knees and eliminating the pressure in the lower lumbar region. The back must be kept straight throughout the movement, the knees must not touch each other when going up, the rhythm must be the same throughout the performance - medium to slow.

The following tempo is recommended: 2 seconds going down, 2 seconds going up, and one second in the starting position. There is no stopping in the low position. Correct squatting performed at a high intensity can develop the thighs, or it can lead to injuries if performed incorrectly. Many athletes and students squat incorrectly, bending their core too much forwards, this adding extra pressure on the spine, which may lead to a spinal disc herniation. The performer must not go down too fast because this may lead to an impossibility to stand up and forces the joints. Correct breathing is very important. During the negative phase (going down), the performer must take deep breaths, during the positive phase (going up) the performer holds the air, and breaths out when close to the end of the movement. Leg splitting does not have a significant effect on the muscle activity in the hips and thighs, but through electromyography it has been proven that squatting with the legs apart activates the gluteus maximus muscle better than squatting with the legs close to each other.

Warm-up must not be neglected. Injuries appear especially after the combination of the following factors: an incorrect performance, weights that are too heavy, and insufficient warm-up. An effective warm-up must be at least 15 minutes long, and must include aerobic exercises, stretches, running or pedaling, and a few sets of exercises with light weights for all the muscles that will be trained.

Squatting is one of the most frequently used exercises in sports, in school and during the physical education lessons, there are also amateurs who use these exercises in leisure time activities, they can also be used for the rehabilitation of children and elderly people.

Here are five reasons to use squatting in school, or in professional sports:

1. Squatting - to strengthen the body: the squat does not work only the leg muscles, but also the gluteus muscles, the lower back muscles, or the abdomen muscles. More than that, squatting contributes to the regulation of the glucose level and the proper functioning of the lipid metabolism, diminishing the risk of diabetes, cardiovascular diseases, or obesity.
2. Squatting - to develop the gluteus muscles. Squatting is ideal for shaping the buttocks, the effect being even more powerful if the gluteus muscles are activated.
3. Squatting - to accelerate the burning of calories: if performed correctly, squatting

improves the release of testosterone and growth hormone, both vital for the development of muscles, while the development of muscles is directly proportional to the number of burnt calories.

4. Squatting - to prevent injuries: regularly performed squats strengthen not only the muscles but also the ligaments, improving at the same time the balance and flexibility of the ankles, knees, hips, and back, and diminishing the risk of injury.
5. Squatting - for a better performance: not only is squatting a functional exercise that helps us deal better with everyday movements, it also improves the athletes' performances, helping them run faster and jump higher.
6. An optimal model of squatting can be described as a movement performed without pain and discomfort, but also as an adequate behavior of the joints both for the muscle coordination and for the adequate support of the body posture.
7. An incorrect squatting leads to an imbalance, a limitation of the adequate support of joints and muscles, while its regular repetition leads to a consolidation in the nervous system of a bad movement habit.

WORKING hYPOTHESES

This study started from the following hypotheses:

Even though squatting is used extensively in the physical education lesson and professional sports, its mechanism is still unknown to some of the people working in the field of physical education and sports.

One needs to clarify what are the most effective ways of using squatting and what are the risks represented by its incorrect execution.

MATERIAL AND METHODS

The research was conducted on multiple groups of coaches and teachers that use squatting as a training means. The study was conducted in 2013, in the city of Bacau, comprising:

- 11 track and field coaches;
- 3 wrestling coaches;
- 2 boxing coaches;
- 6 team games coaches;
- 6 fitness-bodybuilding instructors;
- 12 middle school physical education teachers;
- 12 high school physical education teachers.

In order to emphasize the subjects' level of knowledge, two working instruments were used: an open question test, and a questionnaire comprising both open questions and multiple choice questions.

RESULTS

After recording the results, the knowledge test was analyzed first, in regards to the subjects' knowledge about the methods of teaching correct squatting and the source of this knowledge, resulting that almost **26%** of the subjects do not know how a correct squat looks like, or the correct teaching methodology, either as an independent exercise, or as an element tied to other exercises.

Almost 84% of the subjects said they know the methods of teaching a correct squat, and know what elements are significant in the teaching and performing of this exercise. However, it must be mentioned that the included answers contain incorrect elements.

Table 1. Correct squatting, from the point of view of the subjects
Significant elements in the correct teaching of squatting n = 52

No.	axiom	No	%
1.	When bending the knees and hips (in a sagittal plane) one must not go over the toe line	15	28.84
2.	One can perform a partial squat without performing a complete squat	11	21.15
3.	When bending the knees and hips (in a sagittal plane) one should go over the toe line	6	11.53
4.	The back is straight, and the abdomen is sucked in	10	19.23
5.	When the knee and hip joints are bend, the knees should be moved sideways	8	15.38
6.	The legs cannot go off the ground and should be positioned at hip width level	2	3.84

The subjects stated that they acquired their knowledge regarding the methods of teaching correct squatting while they were enrolled in theoretical and practical courses included in the university curriculum. Six subjects, representing 11.53%, could not identify the source of their knowledge.

Table 2. The source of knowledge regarding the methods of teaching correct squatting (N = 6)

No.	Knowledge source	No	%
1.	Didactic sources	1	0.06
2.	I cannot identify the source of my knowledge	2	1.2
3.	Scientific articles	2	1.2
4.	Internet	1	0.06

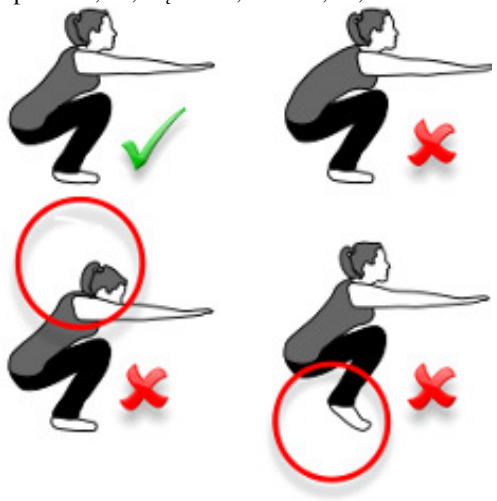
The next subjects were questioned about the consequences of an incorrect squat, and 42 of them, representing 80.76% answered that this could lead to negative effects on the musculoskeletal system of a person performing it, but they could not indicate what these effects are.

DISCUSSIONS

According to the subjects, squatting is a form of exercise that is frequently used both separately and as an element of a motor structure. They recognize also the usefulness of knowing the methods of teaching correct squatting, especially for the physical education and sports lessons. Nevertheless, the fact that the students' knowledge about this is insufficient is worrying. Out of the 52 subjects, 44 said that they know the methods of teaching squatting. Out of these, 90% said that their main sources of information were the university courses.

Correct squatting brings a variety of benefits for the person performing it, developing the running speed, improving the high jump and long jump, and the running long jump. It is a functional exercise that provokes a tension twice as high when the kinetic chain is open during the performance.

More than that, squatting on one knee positively influences the stabilization ability, but there are concerns regarding the prophylaxis of back pains caused by an abusive performance using weights. The most frequent mistakes are, according to Czaprowski, D., Kędra A., Biernat, R., 2012:



- The legs are positioned on a wider axis than the shoulders' and this may lead to a greater use of the adductor muscles, and as a consequence, of the overwork of the knees, and hip joint injury.
- By shortening the soleus muscle, the height between the leg and the floor is increased, thus the knee lacks stability.
- An incorrect position of the knee joints in the sagittal plane determines a deformation of the sole, and usually, leads to a lack of control and stability because of pelvic girdle and hip muscle disorders and weakness of the gluteus medius muscle, or the contracture of the hip adductor muscles.
- The lack of control over the sagittal position because the knee joints are prominently above the toe line.
- The lack of control over a low squat during a dynamic exercise, leading to the situation in which the anterior surface of the thigh touches the calf muscles, this leading to the transfer of the rotation axis in the knee joint and to an excessive stretching of the anterior cruciate ligament.
- The lack of control over the neutral position of the lumbar segment of the spine. A typical example of such exercise is squatting with a posterior inclination of the pelvis, maintaining the lumbar segment of the spine.
- The lack of control over the neutral or slightly straight position of the thoracic segment of the spine, which leads to a possible thoracic kyphosis getting worse.
- There is not a constant trunk inclination angle in every phase of the squat, indicating a lack of stability in the lumbar segment of the spine.
- Forming a curvature in the cervical area, leading to the worsening of a thoracic kyphosis.

The facts mentioned above indicate that there are numerous ways to make a mistake during squatting. Thus, it is very important to learn the correct way of squatting since the physical education lessons in primary school. Also, the coaches training beginner athletes should take into consideration the right methods of teaching this exercise. Bad performance habits can lead to a higher rate of injuries in the future. As a result, adequate demands are established for the physical education teachers and professional coaches.

According to the methods of teaching squatting, in the first phase the coaches should teach the correct hip flexion. The aim is to transfer the movement and load from the hip to the knee joint, which is often incorrectly demanded during

squatting. This movement improves muscle strength, making the body aware when only one leg is used and allows the reeducation of the left-right asymmetry, the fact that these movements activate the local and the global muscles being significant. It is very important that the antagonist muscles are used during squatting. The quadriceps muscle, together with the vastus lateralis and vastus medialis muscles is the main engine for these movements. A good muscle activity takes place when the body arrives from the knee flexion to a 90 degree angle and no more than that, where the highest tension is in the gluteus muscles. The participation of the quadriceps muscle without the antagonists produces a muscular imbalance, and this may lead to a higher risk of injury. The role of the muscles and their activity increases when the action of the exercises is eccentric and the thighs are in maximum flexion, parallel to the floor. When it comes to prophylaxis, it is significant that during squatting, when the transversal forces appear and lead to the transfer of the force forwards on the tibialis anterior muscle in regards to the load on the femur, they also produce a tension in the cruciate ligament, through co-contraction by performing a correct squat, transferring the center of gravity from the forward hip joint bending to the backward bending.

CONCLUSIONS

Through the complexity of movements and the number of the directly involved muscles (hips, thighs, quads, gluteus), squatting with barbells/dumbbells is the main method of gaining mass and strength, and of course it cannot be excluded from training, but by performing it correctly, one can minimize the pressure on the spine and joints.

Squatting is one of the valuable exercises that one can use. If one aims for a harmonious physical development, squatting must definitely be a part of the training program.

Out of the approximately 400 muscles in the human body, a squat uses about 200. Half of the body muscles are used during this exercise. It also increases the lung capacity, strengthens the heart and joints. In a correct squat the hips go down at least at the same level with the knees, so that a line traced between the knees and hip joint would be parallel to the floor.

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