Physical education classes at university as a factor in the development of students' speed and strength abilities

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Abstract

Objective of the study is to investigate the effect of incorporating additional exercises into students' training programme on the development of speed-strength abilities.

Methods and structure of the study. The experiment involved 100 students from Don State Technical University aged between 17 and 22. The initial level of speed-strength exercises was assessed for the control and experimental groups of students. The following tests were used for this purpose: 100-metre sprint, long jump (from a standing start and from a running start), standing long jump, and shuttle run.

Results and conclusions. Based on the theoretical and methodological research of other authors, a programme has been developed to improve students' speed-strength abilities, which includes hopping from foot to foot along a gymnastics bench, jumping over an obstacle on both feet, skipping, jumping on the spot whilst throwing a weight from the chest, and shuttle runs. The results of applying this programme showed positive progress in the experimental group across all test exercises: from 2.9% to 7.5% over three months.

Keywords: *speed and strength abilities, students, passing fitness tests, additional exercises.*

Introduction. Of all physical abilities, speed-strength qualities are of particular importance – a set of characteristics that includes the ability to rapidly generate force, maintain high power output during short bursts of effort, and demonstrate high speed and coordination when performing dynamic movements. For students, regardless of their future career path, the development of speed-strength abilities enhances adaptability, stress resistance and overall physical fitness, which in the long term has a positive impact on health and productivity [3, 4]. The methodology for developing speed-strength abilities, as a scientific and practical issue, brings together research in the fields of theory and methodology of physical education, sports training, exercise physiology, biomechanics and occupational psychology. Domestic and international literature presents a variety of approaches to developing these qualities: from classic strength training programmes using heavy weights to specialised methods involving plyometrics, sprinting routines, power training and techniques for improving intermuscular coordination. However, when transferring sports methodologies to the context of mass or optional physical education for students, a number of methodological, organisational and ethical issues arise: optimising training loads to account for initial fitness levels and health status, ensuring safety, adapting exercises to the material and technical conditions of universities, and taking into account the academic timetable and the psychophysiological characteristics of students [1, 2].

The training and development of speed-strength abilities is most effectively carried out between the ages of 10 and 17. The older a person becomes, the more difficult it is for physical abilities, including speed-strength qualities, to form and develop. The development of this quality is necessary and beneficial at all age stages, including the age group of the average student (17–22 years).

Objective of the study is to investigate the effect of incorporating additional exercises into students' training programme on the development of speed-strength abilities.

Methods and structure of the study. The experiment involved 100 students from DSTU aged between 17 and 22. The students were divided into two groups: an experimental group and a control group, each comprising 50 people. The control group took part in the standard physical education programme. The experimental group followed a programme with an additional set of exercises designed to develop speed-strength qualities.

There are quite a few exercises that reflect a person's level of speed-strength abilities. In physical education classes at school, and subsequently at higher education institutions, the standing two-foot long jump is most commonly used. In addition, push-ups, throwing distance and other exercises may be tested.

In general, exercises for speed-strength qualities can be broadly divided into three main and one additional category. These are presented with examples below (Table 1):

Based on the data presented above, a study was designed and conducted on the development of students' speed-strength abilities within the framework of physical education classes at the university.

The study comprised the following stages:

1. Dividing the students into a control group and an experimental group.

2. Conducting speed-strength ability tests for both groups.

3. Conducting specialised sessions in the experimental group to develop speed-strength exercises.

4. Analysis of the results obtained.

5. Formulation of the study's conclusions.

Thus, the test session involved measuring speed-strength performance in the following exercises: long jump (from a run-up / standing), high jump, shuttle run, and 100-metre sprint.

A specific programme was then developed, which was performed only by the experimental group (Table 2). The control group followed a standard physical education programme.

The exercises had their own specific techniques, but generally lasted for one minute. There was a 30-second break between sets. Each physical training session consisted of five sets, lasting approximately 30 minutes.

The programme was carried out in the experimental group over a period of three months. A total of 10 sessions were held, in each of which around 30 minutes was devoted to developing the students' speed-strength abilities.

The next stage of the methodology was the evaluation of results. To this end, a comparison was made of the results of the experimental and control groups before and after.

Results of the study and discussion. Following three months of experimental sessions, the following comparative results were obtained (Table 3):

Table 3 shows the difference in performance be-

Table 1. Exercise groups for speed and strength

Category	Description
1. Overcoming resistance greater than the target value	The speed of the exercise decreases
	The display of strength increases
2. Overcoming resistance less than the target value	The speed of the exercise increases
	Strength decreases
3. Overcoming resistance equal to the target value	Virtually maximum exercise speed
4. Instantly overcoming an impact load	Maximum power output during the exercise over a short period
	These are also referred to as explosive exercises, i n line with the characteristics of this category

Table 2. A programme of exercises designed to develop speed and strength skills

Exercise	Features of performing the exercise
Hopping from foot to foot along a gymnastics bench	Variations in execution
Jumping over an obstacle on both feet	The obstacle course is approximately 10 cones lined up in a row
Jumping rope	Execution varies depending on the students' abilities
Jumping on the spot whilst throwing a weight from the chest	At least 10 repetitions in a row
Shuttle run	The length of the 'course' for the shuttle run is 10 metres

Table 3. Comparison of mean values for the experimental and control groups before and after the experimental sessions

Exercise	Control group		Experimental group	
	Before	After	Before	After
100-metre sprint, s	16,4	16,7	16,5	15,9
Running long jump, cm	321	324	320	331
Standing long jump, cm	169	170	167	172
Running high jump, cm	98	98	98	104
Shuttle run, s	9,1	8,9	9,3	8,6

Table 4. Comparison of results

Exercise	Control group	Experimental group
	Difference, %	Difference, %
100-metre sprint, s	+ 1,8% (negative trend)	- 3,6% (positive trend)
Running long jump, cm	+ 0,9% (positive trend)	+ 3,4% (positive trend)
Standing long jump, cm	+ 0,59% (positive trend)	+ 2,9% (positive trend)
Running high jump, cm	0% (lack of trend)	+ 6,12% (positive trend)
Shuttle run, s	- 2,19% (positive trend)	- 7,5% (positive trend)

tween the two groups before and after the three-month study. For the various types of jumps, a positive result is an increase in performance measured in centimetres, meaning that the students jumped further or higher. For the 100-metre sprint and the shuttle run, a positive result is a reduction in the time taken to complete the run.

Thus, in the experimental group, all five indicators from the speed-strength exercise tests showed positive trends. The results for the control group are not quite as clearly positive. In one instance, a negative trend was observed – the students' 100-metre sprint times were 0.3 seconds slower (a 1.8% decrease). Furthermore, there was no change in the standing long jump – the result remained at 98 cm. In the case of the experimental group, the overall effect was significantly greater than that of the control group. This indicates the success of the selected exercises and the implementation of the programme for the development of speed-strength skills.

Conclusions. Based on the theoretical and methodological research of other authors, a programme has been developed to improve students' speed-strength abilities, which includes hopping from foot to foot along a gymnastics bench, jumping over an obstacle on both feet, skipping, jumping on the spot whilst throwing a weight from the chest, and shuttle runs.

The results of applying this programme showed positive progress in the experimental group across all test exercises: from 2.9% to 7.5% over three months.

Thus, the high effectiveness of the developed exercise programme for developing speed-strength abilities in students was confirmed.

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