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**STUDY ON THE DEVELOPMENT OF THE MOTOR QUALITY FORCE
BY USING THE ISOMETRIC CONTRACTION PROCESS**

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Abstract: The work started from a desire to develop the motor quality of strength through isometric contraction in high school students. There are data in the literature confirming the benefits of these exercises, but it must be kept in mind that an intense isometric effort maintains a state of maximal cortical cell excitation throughout the contraction period, between 10-12 sec. In a lesson we recommend 6-8 isometric contractions twice a week. In this sense, we assume that strength, as a basic motor quality, can be developed by using the isometric contraction process in high school students leading to increased indices of its manifestation. The aim of the paper is to select the most effective individual and pair isometric exercises for the development of the motor quality of strength in 10th grade students. The experiment was conducted at the Ion Nistor Technological High School in Vicovu de Sus, and from the chosen sample we formed two groups: an experimental group and a control group consisting of 6 boys and 10 girls. The experiment showed that, using specific means of the isometric contraction process, significant results were obtained in both experimental groups compared to the control groups.

Introduction: In the literature, the development of motor skills through various means, procedures and methods requires a permanent concern of specialists in the field, both researchers and teachers of physical education and sport. At the secondary school level, the approach to the development of motor skills has "advantages also for increasing the efficiency of the training process specific to sports/skill tests" [4]. In physical education and sport, "strength is the result of muscle contraction and is generally defined as the body's ability to overcome resistance during movement based on muscle contraction" [6]. Human strength is considered as the ability to overcome certain internal or external resistance through muscle contractions, and strength is developed less in girls 75% than in boys [7]. In this sense, the progression in strength development in girls is "increasing effort intensity at the expense of increasing loads" and therefore strength is not particularly valued by girls. [8] In this paper I focused on the development of motor quality of strength in high school students through the process of isometric effort,

and studies have observed that "isometric effort performed for a few seconds leads to increased synchronization of motor units during exercise" [3], recognized as a "method that does not produce muscular hypertrophy" but allows the student to "develop volitional tensions greater than the maximum value in isometric mode" [9]. Regarding the method of strength development at the high school level, both the growth and development peculiarities and the level of preparation of the students will be taken into account. Thus, the authors believe that, regardless of the age of the students, "the teacher will aim to develop robust musculature in a training process that does not stress the skeletal system" [1]. The effectiveness of exercise selection in terms of the muscle contraction process must take into account the level of preparation of the students, the objectives proposed in the lesson plan and the material base required. Since in high school strength is based on the diversity of development methods and procedures, regarding as well the quality of the lessons, it is also necessary to "repeat exercises with maximum functionality, with maximum efficiency" [5], and "the force developed through isometric exercises is a force close to maximum and contributes little to the achievement of explosive dynamic force" [6]. In high school students it should be taken into account that "isometric efforts of large muscles can lead to a marked increase in blood pressure", students who are prone to certain heart conditions should avoid such exercises. [10] Methodical guidance on strength development in terms of the means and methods used should be carefully selected for both boys and girls [2].

Material-method: We start from the premise that strength, as a basic motor quality, can be developed with the use of the isometric contraction process in high school students leading to an increase in its manifestation indices. The aim of the paper is to select the most effective isometric exercises individually and with a partner in order to develop strength motor quality in 10th graders. The experiment took place at the Ion Nistor Technological High School in Vicovu de Sus. From the chosen sample we formed two groups, an experimental group of 6 boys and 10 girls, and a control group of 6 boys and 10 girls. The period of the study was the school year 2021-2022 (sem I and sem II). In the experimental group we applied the proposed isometric exercises for strength development, and the control group worked according to the school curriculum given by the Ministry. The semester plans were respected in both the experimental and control groups. In this paper we used the following methods: Bibliographical study method according to the title of the thesis, Observation method, Method of experiment, Test method, Mathematical-statistical method and Graphical method.

We will present some of the means of action applied to the experimental group, both girls and boys. The selection of exercises was made from the existing literature: 1-Student sitting on forearms on tiptoes with trunk aligned forming a straight line. Effective: abdominal muscles, especially the transverse muscle (3-6

sec.). 2-The pupil adopts the position of bringing the back to the ground while the legs are bent, then straightens the arms while lifting the shoulders off the ground. Legs are held at a 90° angle and the position is maintained. (3-6 sec.). 3-The pupil adopts a sideways torso position, resting on one forearm and the two legs which are crossed. This position of the lower limbs makes it possible to obtain a three-point support on the ground. The main purpose of this exercise is to work the abdominal muscles, especially the obliques. (3-6 sec.). 4-The student adopts the supine position with a ball on the abdomen - moving slowly into dorsal support without dropping the ball from the abdomen and maintaining the position. (4-8 sec.). 5-In pairs, lying face down, face forward, arms in extension of torso, palms grasp the ball with a simultaneous reverse-pull grip, keeping the ball as close to the center position as possible (4-8 sec.). 6-Students in face down position, arms in torso extension, palms grasp the bottom of the fixed ladder, ankles support the ball, slowly lift legs back and maintain position (4-8 sec.)

Results and Discussions: The results obtained from the tests proposed for the study, both initial and final, are centralized in tables and presented in graphical form. We calculated the statistical indicators: arithmetic mean, standard deviation and coefficient of variability.

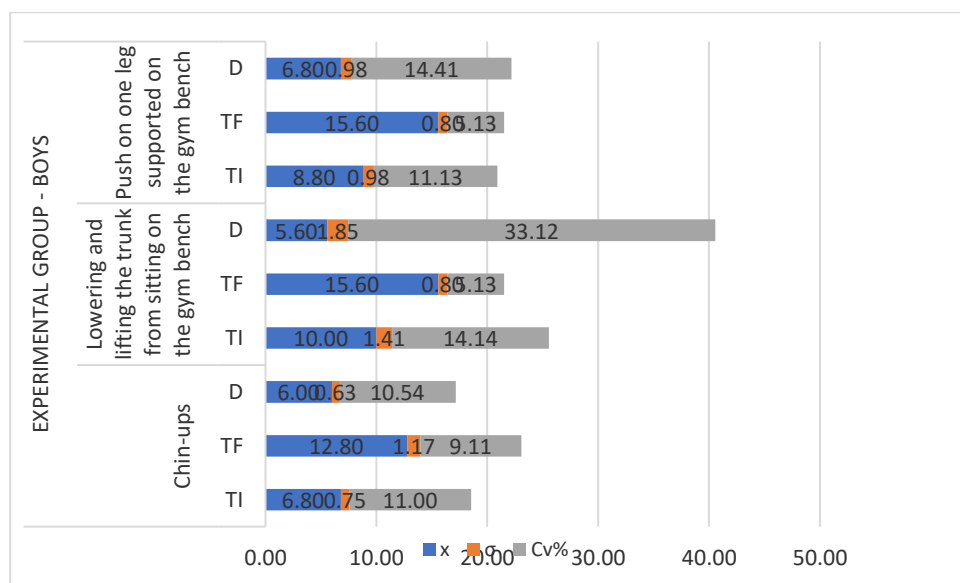


Fig.1

It can be observed a difference in the mean between the initial and final test in the test Chin-ups of 6,00 rep. in the test Lowering and lifting the torso from the bench a difference in the mean of 5,60 rep. and a difference of 6,80 in the mean of the test Push on one leg supported on the gym bench (Fig.1).

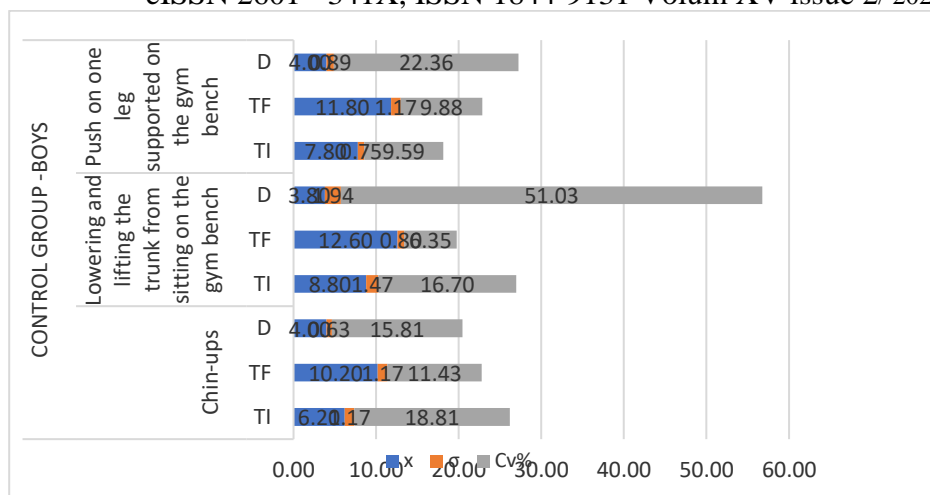


Fig.2

It can be observed a difference in the mean between the initial and final test in the test Chin-ups of 4,00 rep. in the test Lowering and lifting of the trunk from the gym bench a difference in the mean of 3,80 repetitions and a difference of 4,00 rep. in the test Push on one leg supported on the gym bench (Fig 2).

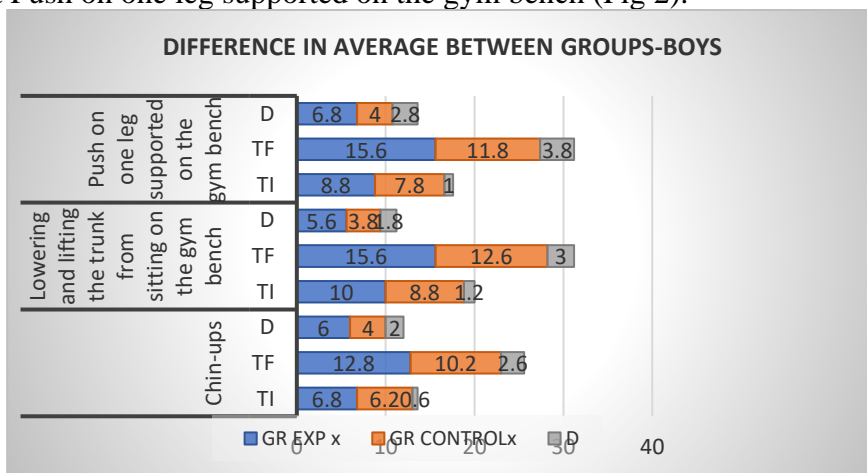


Fig.3

In the graph below (Fig. 4), in the experimental group of girls a difference of 6,10 rep. can be observed in the test of Lifting the bench with two hands from the chest, in the test of Lifting the trunk from the dorsal with difficulty bearing a difference of 6,60 rep. can be observed, and in the test of Pushing on one leg supported on the fixed ladder a difference of 10,80 rep. can be observed.

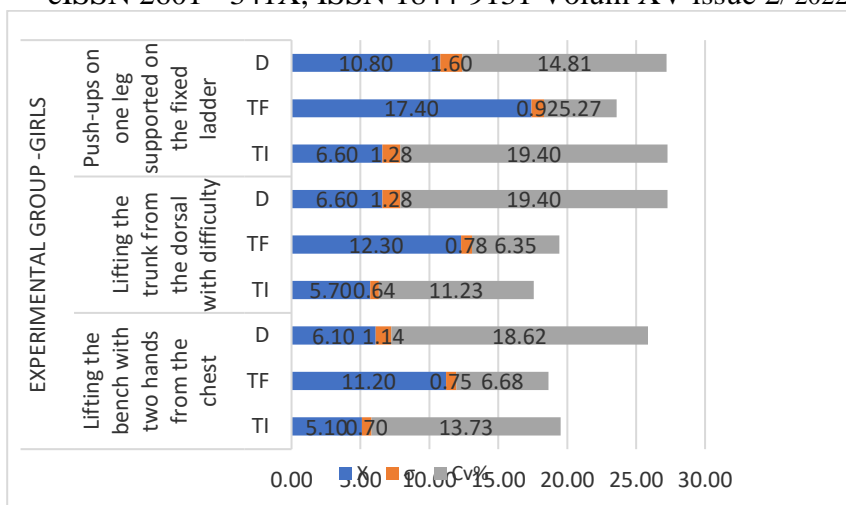


Fig.4

In Figure 5, in the girls control group a mean difference of 3 rep. can be observed in the test Lifting the bench with two hands from the chest, in the test Lifting the trunk from supine with weight bearing a difference of 3,9 rep. can be observed, and in the test Pushing on one leg supported on the fixed ladder a mean difference of 7 rep. can be observed.

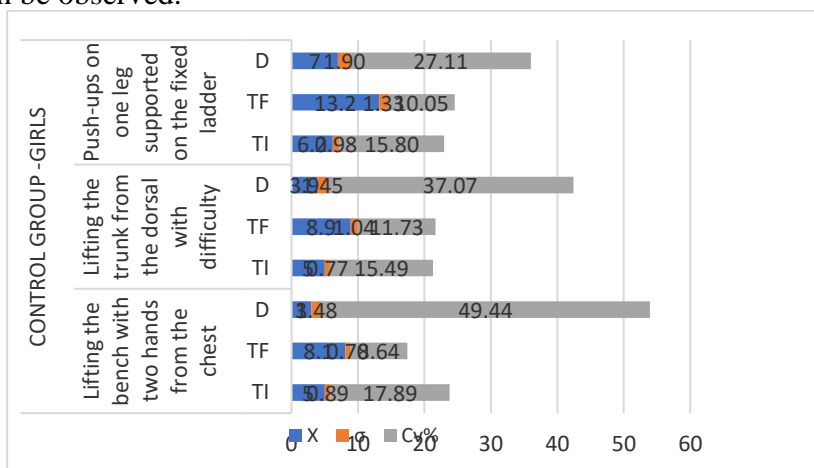


Fig.5

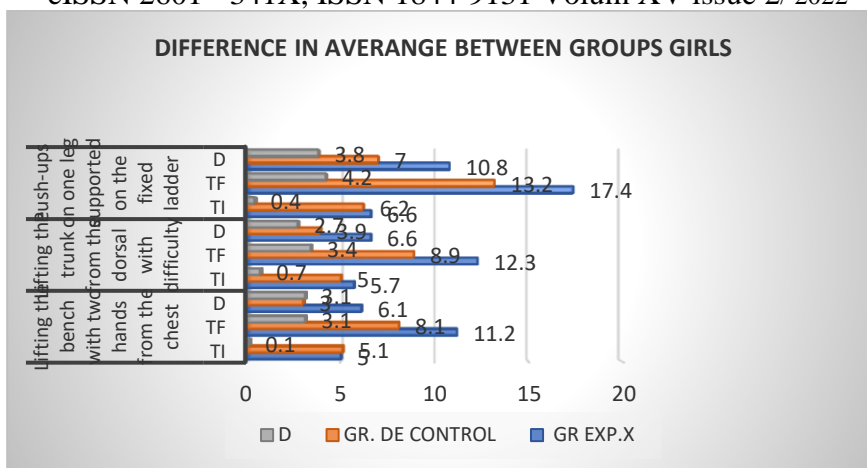


Fig.6

Conclusions: Selecting the best exercises to influence the development of strength motor quality is an obvious necessity in teaching physical education lessons. The value of results increased in all assessment tests. The experiment showed that, using specific means of the isometric contraction process, significant results were obtained in both experimental groups (girls + boys) compared to the control groups (girls + boys). Performing strength exercises requires prior training of the locomotor system. Our hypothesis was confirmed. Exercises are used for the rapid manifestation of strength in motor skills specific to different branches or sporting events and should be performed with high amplitude and without limiting the final movement.

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