



# Influence of Strength Fitness Classes on the Development of Motor Abilities of High School Students

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## Abstract

**The purpose of study** is to determine the effectiveness of the influence of strength fitness on the development of motor abilities of high school students.

**Materials and methods.** The study was conducted on the basis of secondary school No. 55 Kharkiv in several stages. During the study, two groups were created: experimental and control. The control and experimental groups included 10 boys of 10 grade each. In the control group, lessons were held on the module “Gymnastics” according to the thematic plan. And in the experimental group the lessons content included: strength fitness, stretching exercises and aerobic combinations. Special attention was paid to the preparation of muscles for performing the exercises of the main part of the lesson - strength training. Research methods: study, synthesis and comparative analysis of literature and other sources on the research issue; observation; questionnaires, diagnosis of well-being, activity, mood according to the WAM method, testing of motor readiness, methods of mathematical statistics.

**Results.** According to the study results, in the experimental group was found a probable improvement in the state of activity by 11.3 points ( $p < 0.01$ ) and mood by 12.7 points ( $p < 0.01$ ). This indicates the positive impact of strength fitness exercises, modern music accompaniment and the corresponding load on these indicators. In the control group under the program of the variable module “Gymnastics” we observed an improvement in strength abilities such as flexion and extension of the arms in the abutment position by 3.8 ( $p < 0.05$ ). Indicators of motor abilities of students in the experimental group at the end of the trial had probable shifts towards improvement: shuttle run 4×9 m by 0.9 sec. ( $p < 0.01$ ), flexion and extension of the arms in the abutment position by 3.9 times ( $p < 0.05$ ), flexion and extension of the arms in suspension by 1.5 times ( $p < 0.05$ ), bent suspension by 7.4 sec. ( $p < 0.001$ ), jump in length from the place by 7.4 cm ( $p < 0.05$ ), flexibility (torso inclination) by 3.1 cm ( $p < 0.001$ ).

**Conclusions.** The use of recreational fitness in physical education classes in high school students not only contributes to an increase in the level of motor abilities, but also improves the emotional state of students. Through a combination of physical education, aerobic exercise, stretching, strength fitness, breathing exercises, visualization, high school students noted an improvement in well-being, mood, and activity.

**Keywords:** strength fitness, motor abilities, high school students.

## Introduction

The current problem remains a decrease in motor activity and interest in physical education classes at school. This is determined in the observations and research of the leading scientists (Krutsevych, & Chervotoka, 2019; Khudolii et al., 2019; Bahinska, 2015). The study of the authors Moskalenko and Torbanyuk (2019) found that a significant number of schoolchildren have harmful habits (smoking, alcohol, drugs). All this leads to a decrease in the indicators of physical, mental, and social health of children in Ukraine.

Modern society requires the system of higher pedagogical education to train teachers who are ready to innovatively approach physical education lessons (Babiy, 2017; Tulaidan & Shelekhova, 2021).

There is a constant search for modern approaches to conducting physical education classes in secondary and higher education institutions (Sermeev et al., 2016; Kravchuk et al., 2017; Dubynska et al., 2021). Scientists study the dynamics of changes in the indicators of motor abilities according to the age of students and planned load (Marchenko & Kovalenko, 2020; Petrov et al., 2020; Sanzharova et al., 2019).

According to modern scientists Kravchuk and Kurochka (2013), Sinitsa and Lytovchenko (2022) fitness has become

one of the popular areas of physical culture and health technologies, which are used in physical education classes among different segments of the population. The study of new forms of recreational fitness classes, the structure and content of classes is devoted to the scientific works of the authors Dubinska et al. (2019), Litvin et al. (2020).

In the scientific works of Lithus (2017), Moroz and Mykytyuk (2019), Golenkova et al. (2021), the positive impact of fitness classes on the indicators of physical development of a person, improvement of the functional state of the body of those engaged in the study of the structure, content of activities of various types of fitness were proved.

The issue of the influence of recreational fitness on the indicators of motor abilities of students in secondary education requires more detailed study, which contributed to the choice of the research topic.

*The purpose of study* is to determine the effectiveness of the influence of strength fitness on the development of motor abilities of high school students.

## Materials and methods

### Study participants

The study was conducted on the basis of secondary school No. 55 of Kharkiv in the period from October 2021 to September 2022. During the study, two groups were created: experimental and control. The control and experimental group included 10 boys of the 10th grade, who set themselves the goal of increasing the level of physical fitness, recovery, acquisition of strength and endurance. Study participants and their parents were warned about participation in the experiment and gave their consent.

### Organization of the study

*Research methods:* study, synthesis and comparative analysis of literature and other sources on the topic of research; observation; questionnaires, diagnosis of well-being, activity, mood according to the WAM method, testing of motor readiness, methods of mathematical statistics.

The study was conducted in several stages.

The first stage involved the study and analysis of scientific literature, analysis of regulatory documents on the organization of physical education in school and other materials. We offered to take part in the trial to 10 high school boys, received consent from their parents and through a questionnaire selected types of fitness and wellness programs for physical education lessons. At this stage, the participants of the trial were surveyed to determine the level of interest in recreational fitness classes in physical education classes at school. According to the survey (questionnaire) for the experimental group, a thematic plan was developed, and the content was selected for lessons from the chosen direction of "strength fitness". The lessons also used elements of aerobics in the preparatory part and stretching in the preparatory and final part of the lesson.

In the control and experimental groups, physical education lessons were held 3 times a week for 45 minutes. In the control group, lessons were held in accordance with the thematic plan for the "Gymnastics" module. And in the experi-

mental group the lessons included: strength fitness, stretching exercises and aerobic combinations. And in the experimental group the lessons content included: strength fitness, stretching exercises and aerobic combinations. Strength programs in the experimental group included a set of strength exercises for all muscle groups:

- without weights;
- with stuffed balls;
- with rubber band;
- circular training;
- exercises in pairs;

The second stage was devoted to generalizing, comparing, and processing the obtained data using methods of mathematical statistics, studying and investigation of the effects of recreational fitness classes on the motor abilities of high school students, formulating conclusions.

### Statistical analysis

The statistical analysis application SPSS 20 was used to analyze the results of the study. Elementary statistics, t-test for paired and independent comparisons were calculated.

The study protocol was approved by the University Ethics Committee. In addition, children and their parents or legal guardians were fully informed about all the features of the study, and a signed informed consent document was received from all parents.

## Results

Preliminary testing of students revealed an average level of physical fitness of the studied control and experimental groups. For the experimental group, a thematic plan for strength fitness classes was developed. The structure of each lesson consisted of three parts:

Preparatory part (aerobic exercises, stretching exercises – prestretching).

The main part consisted of five sets of strength training exercises, which were carried out consistently depending on the complexity of the exercises and the level of physical activity.

The final part (stretching exercises – deep stretching, meditation, visualization, breathing exercises).

Exercises for each lesson were selected considering the level of physical fitness of high school students.

At the beginning and at the end of the study, a questionnaire for the WAM test (well-being, activity, mood) was carried out to diagnose the prompt assessment of well-being, activity, and mood among the subjects of the control and experimental groups. At the beginning of the study, in the control and experimental group, we observed average assessments of the psycho-emotional state of students, namely well-being, activity and mood. This indicates that the students were not tired and were ready for a physical education lesson. And the data obtained in both groups did not differ statistically from each other (Table 1).

At the end of the trial, a repeated questionnaire was carried out, which revealed certain changes in the scores according to the WAM tests, both in the control and in the experimental group. Students who were engaged in gymnastics classes stated improvement of their psycho-emotional states.

**Table 1.** WAM test indicators of the control (n=10) and the experimental group (n=10) at the beginning of the trial

Indicators	At the beginning of classes CG	At the beginning of classes EG	t	p
Wellbeing, points	39.9 ± 1.94	37.9 ± 1.94	0.6	>0.05
Activity, points	39.7 ± 1.84	36.6 ± 2.12	1.1	>0.05
Mood, points	43.3 ± 3.60	41.8 ± 2.68	0.3	>0.05

As a result, we obtained an improvement in the assessment of well-being by 1.6 (p>0.05), mood – by 0.3 (p>0.05), activity – by 3.6 (p>0.05), but their increase is statistically unreliable (Table 2).

**Table 2.** The WAM test indicators of the test subjects of the control group at the beginning and end of the trial (n=10)

Indicators	Before	After	t	p
Wellbeing, points	39.9 ± 1.94	41.5 ± 2.07	0.6	>0.05
Activity, points	39.7 ± 1.84	43.3 ± 2.04	1.3	>0.05
Mood, points	43.3 ± 3.60	43.6 ± 2.59	0.1	>0.05

At the same time, the experimental group showed a likely improvement in the state of activity by 11.3 (p<0.01), and mood by 12.7 (p<0.01). This indicates the positive impact of strength fitness exercises, modern musical accompaniment, and the corresponding load on these indicators (Table 3).

**Table 3.** The WAM test indicators of subjects from the experimental group at the beginning and end of the trial (n=10)

Indicators	Before	After	t	p
Wellbeing, points	37.9 ± 2.63	41.7 ± 2.83	1.0	>0.05
Activity, points	36.6 ± 2.12	47.9 ± 2.14	3.8	<0.01
Mood, points	41.8 ± 2.68	54.1 ± 2.31	3.5	<0.01

When comparing the results according to the WAM test, we obtained a probable difference in mood indicators between the control and experimental groups (p<0.01) (Table 4).

During the study, a comparative analysis of the dynamics of changes in the indicators of motor abilities was also carried out in the experimental and control groups, as a result of the influence of strength fitness and gymnastics, respectively. This comparison made it possible to reveal the effectiveness of physical education lessons using different means.

As a result of the study of the control group under the program of the variable module “Gymnastics”, we observed an improvement in strength abilities such as flexion and extension of the arms in the abutment at 3.8 (p<0.05), which is probable (Table 5).

In addition, other indicators of motor abilities improved: shuttle run 4×9 m by 0.5 sec. (p>0.05), flexion and extension of the arms in suspension by 0.9 times (p>0.05), bent suspension by 3.7 sec. (p>0.05), a jump in length from the place by 2.2 cm (p>0.05), flexibility (torso inclination) by 1.7 cm (p>0.05), but these indicators are not reliable (Table 5).

Indicators of motor abilities of students in the experimental group at the end of the trial had probable shifts towards improvement: shuttle run 4×9 m by 0.9 sec. (p<0.01), flexion and extension of the arms in the abutment position by 3.9 times (p<0.05), flexion and extension of the arms in suspension by 1.5 (p<0.05), bent suspension by 7.4 sec. (p<0.001), jump in length from the place by 7.4 cm (p<0.05), flexibility (torso inclination) by 3.1 cm (p<0.001) (Table 6.).

**Table 4.** The WAM test indicators of the control (n=10) and experimental groups (n=10) at the end of the trial

Indicators	At the end of the classes CG	At the end of the classes EG	t	p
Wellbeing, points	41.5 ± 2.07	41.7 ± 2.83	0.1	>0.05
Activity, points	43.3 ± 2.04	47.9 ± 2.14	1.6	>0.05
Mood, points	43.6 ± 2.59	54.1 ± 2.31	3.0	<0.01

**Table 5.** Indicators of the level of development of motor abilities of the subjects from control group at baseline and end of study (n=10)

Indicators	Before	After	t	p
1. Shuttle run 4×9 m. (sec.)	11.1 ± 0.17	10.6 ± 0.16	2.1	>0.05
2. Flexion and extension of the arms in the abutment position (number of times)	12.2 ± 1.17	16.0 ± 1.09	2.4	<0.05
3. Flexion and extension of the arms in suspension (number of times)	7.4 ± 0.63	8.3 ± 0.52	1.1	>0.05
4. Bent suspension (sec.)	15.7 ± 1.60	19.4 ± 1.87	1.5	>0.05
5. Jump in length from place (cm)	196.2 ± 1.83	198.4 ± 1.29	1.0	>0.05
6. Torso inclination (cm)	2.3 ± 0.57	4.0 ± 0.52	2.2	>0.05

**Table 6.** Motor ability indicators of the subjects from experimental group at the beginning and end of the trial under the programm of “Strenght Fitness” (n=10)

Indicators	Before	After	t	p
1. Shuttle run 4×9 m. (sec.)	11.4 ± 0.14	10.5 ± 0.16	4.3	<0.01
2. Flexion and extension of the arms in the abutment position (number of times)	10.3± 0.93	14.2 ± 0.95	2.9	<0.05
3. Flexion and extension of the arms in suspension (number of times)	8.5 ± 0.36	10.0 ± 0.31	3.1	<0.05
4. Bent suspension (sec.)	16.7 ± 1.01	24.1 ± 0.94	5.4	<0.001
5. Jump in length from place (cm)	194.6 ± 2.35	202.0 ± 2.01	2.4	<0.05
6. Torso inclination (cm)	2.1 ± 0.40	5.2 ± 0.38	5.6	<0.001

Thus, the complexes of exercises of strength fitness, stretching, aerobic combinations were aimed at the development of all motor abilities, and especially at the development of strength and flexibility.

### Discussion

The conducted trial suggested an improvement in a few indicators of motor abilities, an improvement in the psycho-emotional state of high school students. As a result of conducting physical education classes in high school by means of health-improving fitness, we observed likely shifts towards improving the indicators of strength testing, flexibility, and agility. At the same time, students noted an increase in mood.

We received confirmation of studies of Khudolii et al. (2012, 2019) on the peculiarities of the development of strength abilities in high school boys, namely the ability of students to develop strength abilities.

The obtained data complement the results of the study of Kravchuk et al. (2017) on the positive impact of the use of health fitness on the development of physical abilities of high school students.

In contrast to the studies of Dubynska et al. (2019), which studied the influence of mental fitness on the psycho-emotional state of high school girls, the influence of the use of mental fitness elements on the psycho-emotional state of high school boys was studied.

Conclusions confirmed the study of Lithus (2017) on the effectiveness of various forms of strength fitness classes with high school students, the need for the development of strength abilities for the general physical fitness of young men has been proven.

### Conclusions

The use of recreational fitness in physical education classes in high school students not only contributes to an increase in the level of motor abilities, but also improves the emotional state of students. Through a combination of physical education, aerobic exercise, stretching, strength fitness, breathing exercises, visualization, high school students noted an improvement in well-being, mood, and activity.

### Conflict of interest

The authors declare that there is no conflict of interest.

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## Вплив занять силовим фітнесом на розвиток рухових здібностей учнів старших класів

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Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; E – збір коштів

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**Мета дослідження** полягає у визначенні ефективності впливу занять силовим фітнесом на розвиток рухових здібностей старшокласників.

**Матеріали і методи.** Дослідження проводилося на базі ЗОШ № 55 м. Харків у декілька етапів. У ході дослідження було створено дві групи: експериментальна та контрольна. До контрольної та експериментальної групи увійшли по 10 хлопців 10 класу. В контрольній групі проводились уроки за модулем «Гімнастика» згідно тематичного плану. А в експериментальній групі проводились уроки, до змісту яких були включені: силовий фітнес, вправи стретчингу та аеробні комбінації. Особлива увага приділялася підготовці м'язів до виконання вправ основної частини уроку – силового тренінгу. Методи дослідження: вивчення, синтез та порівняльний аналіз літератури та інших джерел за темою дослідження; спостереження; анкетування, діагностика самопочуття, активності, настрою за методикою САН, тестування рухової підготовленості, методи математичної статистики.

**Результати.** За результатами дослідження було виявлено в експериментальній групі, вірогідне покращення стану активності на 11,3 бали ( $p < 0,01$ ) та настрою на 12,7 балів ( $p < 0,01$ ). Що свідчить про позитивний вплив вправ силового фітнесу, сучасного музичного супроводу та відповідного навантаження на ці показники. В контрольній групі за програмою варіативного модулю «Гімнастика» ми спостерігали покращення силових здібностей таких як, згинання та розгинання рук в упорі лежачи на 3,8 ( $p < 0,05$ ). Показники рухових здібностей учнів експериментальної групи наприкінці експерименту мали вірогідні зрушення в бік покращення: човниковий біг 4x9 м на 0,9 сек. ( $p < 0,01$ ), згинання та розгинання рук в упорі лежачи на 3,9 раз ( $p < 0,05$ ), згинання та розгинання рук у висі на 1,5 рази ( $p < 0,05$ ), вис на зігнутих руках на 7,4сек. ( $p < 0,001$ ), стрибок у довжину з місця на 7,4см ( $p < 0,05$ ), гнучкість (нахил тулуба) на 3,1см ( $p < 0,001$ ).

**Висновки.** Використання оздоровчих видів фітнесу на уроках фізичної культури в учнів старших класів сприяє не тільки підвищенню рівня показників рухових здібностей, а й покращує емоційний стан учнів. Завдяки поєднанню на уроці фізичної культури аеробних вправ, стретчингу, силового фітнесу, дихальних вправ, візуалізації учні старших класів відмітили покращення самопочуття, настрою та підйом активності.

**Ключові слова:** силова підготовленість, рухові здібності, старшокласники.

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