

Monitoring the physical fitness of students aged 10-15 and 15-18 during online education

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Abstract

Background and Study Aim The necessity to switch to online learning is closely related to the need to ensure the safety of students, which is jeopardized by the military conflict in Ukraine. In the context of online learning, diagnosing the physical fitness of students becomes more challenging, creating problems for physical education teachers. The purpose of the study is to suggest alternatives to physical fitness tests for students that can be adequately conducted at home.

Material and Methods The study involved students aged 10-15 (middle school) and 15-18 (high school). The study involved students aged 10-15 (middle school) and 15-18 (high school). The high school group comprised 11 students (7 girls and 4 boys), while the middle school group included 28 students (16 boys and 12 girls). The research was conducted at the Velikosknitsky Lyceum (Khmelnitskyi region, Ukraine) during offline physical education classes at the beginning of the 2023-2024 academic year. The physical fitness testing was carried out using suggested tests that could be performed independently at home.

Results The presence of significant correlational relationships between the outcomes of certain tests has been established. For example, there is a high correlation (0.95) between the results of the standing long jump and physical fitness in higher grades. A moderate correlation was also found between the results of the 30-meter dash and physical fitness in higher grades. Additionally, a weak correlation was established for the 4×9 meter shuttle run in middle grades.

Conclusions It is possible to replace standard tests for assessing students' physical fitness with those that can be performed at home during online learning.

Keywords: lesson, physical culture, diagnosis, preparation

Introduction

The conditions of wartime force schools to switch to online learning. Moreover, the prolonged need (over two years of military actions) to ensure the safety of students leads to a decrease in their level of physical activity. In this aspect, the search for and adaptation of existing approaches to organizing the educational process for students in physical education classes is relevant. Few studies on the impact of military conflict on the physical activity of children and youth show various possibilities for increasing or maintaining an appropriate level of physical activity [1, 2, 3, 4, 5]. The authors emphasize ensuring minimal safety conditions for learning.

One of the key components of the modern physical education process in schools is the level of physical fitness of students, which is directly related to the functional capabilities of the body, the state of health, and is an integrative indicator of physical activity [6, 7, 8, 9]. The effectiveness of developing

motor skills depends on the correct choice of means implemented in educational and training sessions [10], as well as the objectivity of timely pedagogical control, which allows assessing the physical fitness of students. It is important to constantly monitor the state and dynamics of readiness in order to be able to timely adjust the organization and planning of physical load parameters.

Some authors note that the control standards for students' physical fitness are an important stimulus in solving educational, health-improving, and educational tasks of physical education, and their implementation should stimulate and increase students' motivation for active participation in physical exercises and various sports [6, 11, 12]. A particular complication for physical education teachers in diagnosing physical fitness indicators of students remains the distance form of learning [13]. The physical education curriculum recommends a battery of tests to assess the dynamics of students' physical fitness [7, 8, 9]. However, the difficulties of wartime require other forms of organizing the educational process, namely the use of a distance form of conducting classes [13]. It is difficult, and

some are impossible, to conduct standard tests to determine physical qualities under the conditions of remote learning [13]. Therefore, there is a need to search for tests that can provide an adequate replacement for the standard ones.

The aim of the study is to suggest alternatives to the physical fitness tests for students that can be adequately conducted at home.

Materials and Methods

Participants

The study involved students aged 10-15 (middle school) and 15-18 (high school). The high school group comprised 11 students (7 girls and 4 boys), while the middle school group included 28 students (16 boys and 12 girls). Parents consented to their children's participation in the experiment.

Research Design

The study was conducted at the Velikosknitsky Lyceum (Khmelnitskyi region, Ukraine) during offline physical education classes at the beginning of the 2023-2024 academic year. The physical fitness testing was carried out using suggested tests that could be performed independently at home. For middle school students, we were unable to propose an equivalent alternative only for the "Throwing a small ball for distance" test, and for high school students, the replacement option for the "Shuttle run 4-9 meters" test remains in question.

The following alternatives to standard tests for use during remote learning by students are suggested (Fig. 1).

Speed Test (Fig. 1a). Starting position - stand with feet apart, arms bent. On signal - running in place. The exercise is performed for 5 seconds, counting the number of steps on one of the legs (right).

Vertical Jump Test (Fig. 1b). A paper tape with centimeter markings is hung on a vertical surface

(wall). The student stands with their arm extended upwards. A mark on the tape is noted. Then, the student performs a vertical jump and touches the paper tape. The difference between the first and second chalk marks on the paper will indicate the result of the vertical jump.

Line Jumping Test in the Push-up Position (Fig. 1c). Starting position - push-up position. Jumping hands over a line forwards and backwards. Perform the exercise for 5 seconds. Count the number of jumps.

Yarotsky Test (Fig. 1d). The exercise is performed from the starting standing position with closed eyes, hands on the hips. The participant starts continuously rotating their head in one direction at a pace of 2 movements per second upon the command "Start!" until losing balance or the stopwatch stops. The test result is the time from start to loss of balance.

It should be noted that the "Line Jumping Test in the Push-up Position" can only be used with high school students.

Statistical Analysis

For the statistical analysis of data, the Python software environment was used, utilizing the pandas library for data processing and calculation of correlation coefficients. The level of significance in the study was set at $p < 0.05$.

Results

The present study examines the relationship between the results of tests to determine the physical fitness of middle school students. A heatmap (Fig. 2) displays the correlation coefficients between various tests.

The heatmap (Fig. 2) displays the correlation coefficients between various tests. Correlations are represented by colors, where red indicates a positive correlation and blue indicates a negative correlation.

The heatmap (Fig. 3) displays the correlation coefficients between all pairs of tests. Correlations are

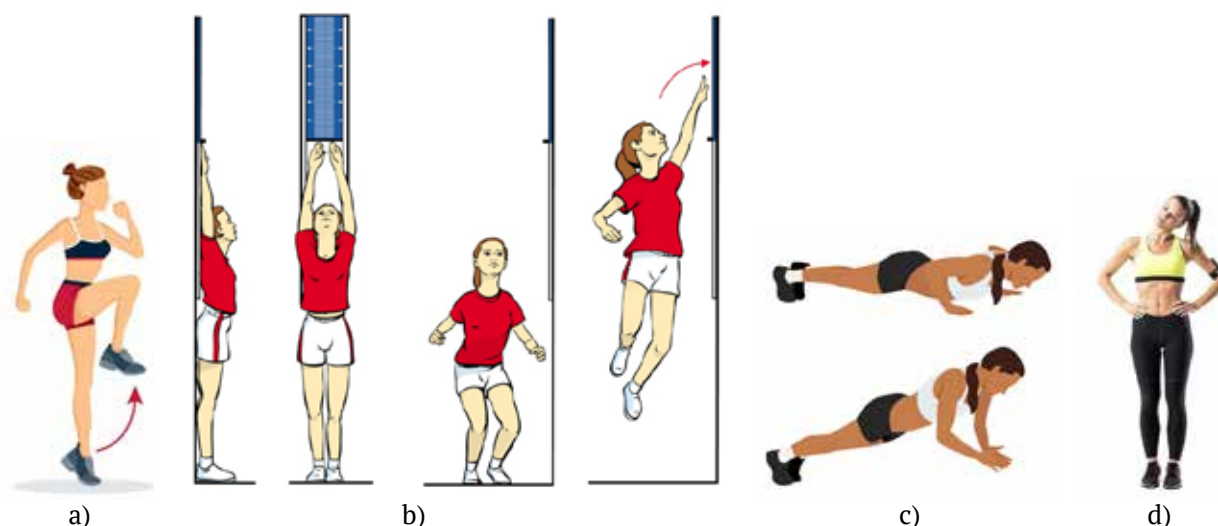


Figure 1. Test battery (image: Sportshall; VectorStock; Shutterstock; Alamy)

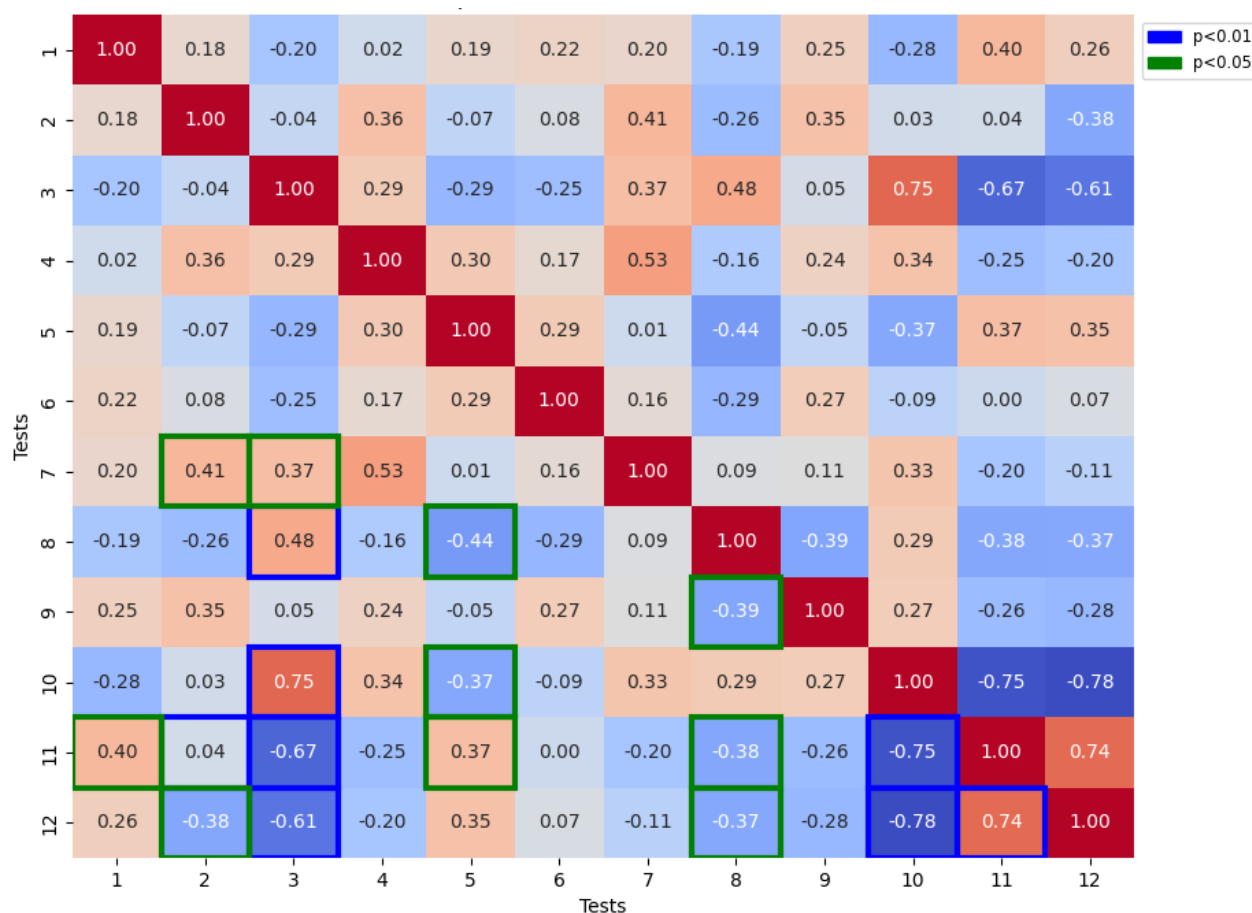


Figure 2. Relationship between the results of physical fitness tests for middle school students (r); $n=28$ students (16 boys and 12 girls). Tests: 1 - 5 Burpees, sec; 2 - Running in place for 5 sec, times; 3 - Vertical jump, cm; 4 - 5 Tuck jumps, sec; 5 - 3 Knee tuck jumps, sec; 6 - Hand switchovers 2 times over a line in push-up position, sec; 7 - Hand switchovers over a line in push-up position 5 sec, times; 8 - Yarotsky's test, sec; 9 - Throwing a Small Ball for Distance; 10 - Standing Long Jump; 11 - Shuttle Run 4×9m; 12 - 30m Sprint, sec.

represented by colors, where red indicates a positive correlation and blue indicates a negative correlation.

This study examines alternatives for replacing tests to assess students' physical fitness. Figure 4 demonstrates the correlation between results in senior and middle grades and suggests alternative test options.

The Figure 4 displays the correlation between the results of tests for assessing students' physical fitness in senior and middle grades, and also suggests alternative tests for use.

Discussion

The aim of this study was to propose test exercises for assessing the level of physical fitness of students that can be performed at home. The results of our research confirm the importance of regular diagnostics of students' physical fitness during remote learning.

It is known that students' physical fitness is a key component of the educational process and is closely related to their health and physical activity [8, 9, 14, 15, 16]. This is supported by several studies indicating the significance of physical activity for the health and

overall well-being of students [6, 11, 12, 17, 18].

However, in the context of online learning, physical education teachers will face difficulties in assessing changes in students' physical fitness [13]. Tests recommended by the curriculum for diagnosing changes in physical fitness are partially or wholly inapplicable in a online learning format [13]. For example, tests for speed, endurance, and speed-strength muscle performance require special equipment or space, making their execution at home challenging or impossible.

Other studies [19, 20, 21, 22] note that the physical fitness and activity of adolescents have a wide range of impacts on their health, cognitive functions, and emotional state. This underscores the importance of finding adaptive approaches to diagnosing and developing physical fitness in a online learning context.

Thus, in our study, we proposed alternative test exercises that can be performed at home. This will enable teachers to effectively assess the level of students' physical fitness and adapt the physical education program to the conditions of online learning.

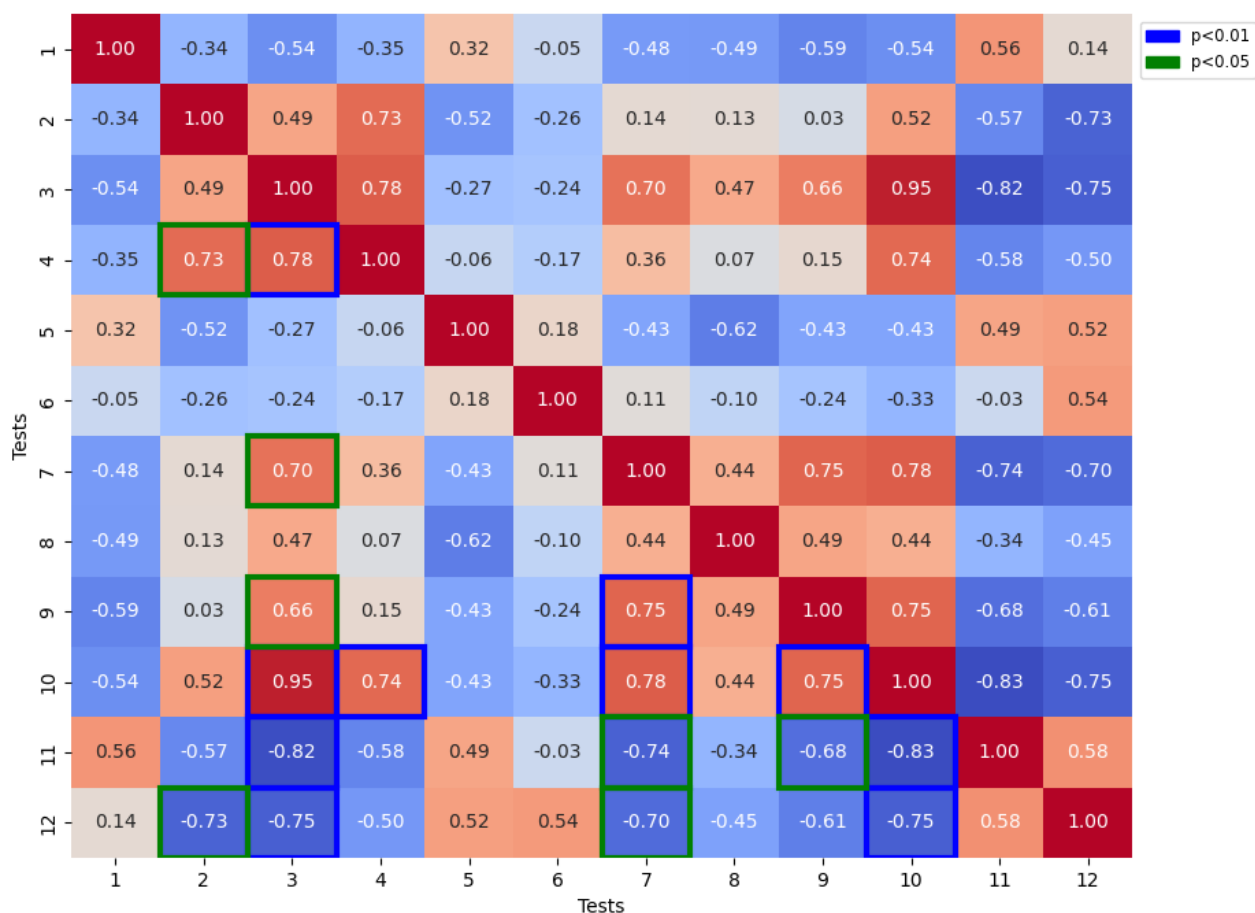


Figure 3. Relationship between the results of physical fitness tests for high school students (r); $n=11$ students (7 girls and 4 boys). Tests: 1 - 5 Burpees, sec; 2 - Running in place for 5 sec, times; 3 - Vertical jump, cm; 4 - 5 Tuck jumps, sec; 5 - 3 Knee tuck jumps, sec; 6 - Hand switchovers 2 times over a line in push-up position, sec; 7 - Hand switchovers over a line in push-up position 5 sec, times; 8 - Yarotsky's test, sec; 9 - Throwing a Small Ball for Distance; 10 - Standing Long Jump; 11 - Shuttle Run 4×9m; 12 - 30m Sprint, sec.

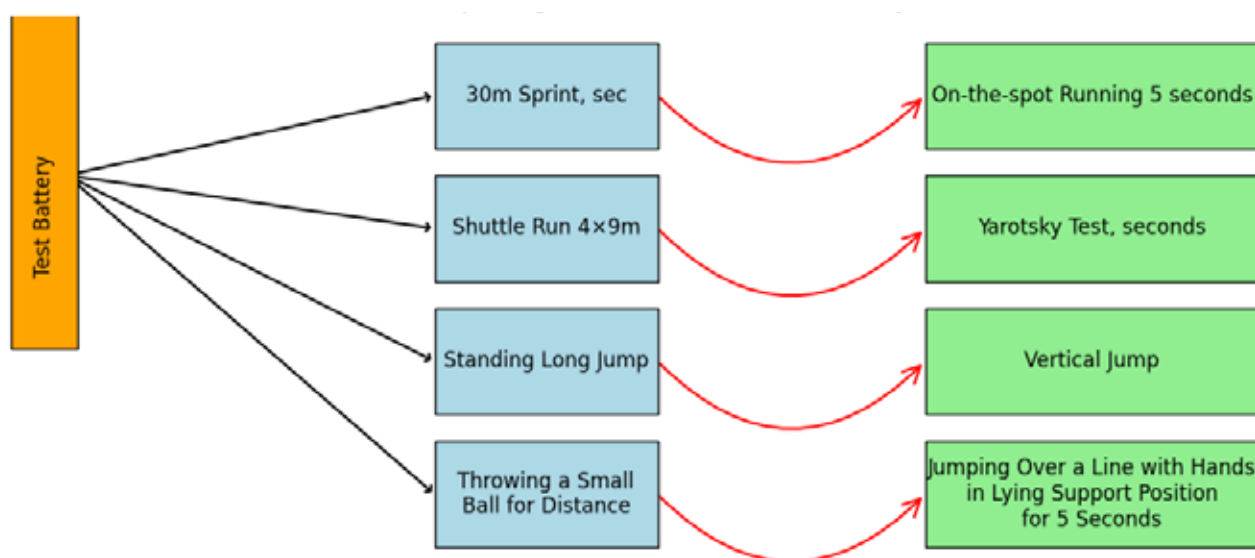


Figure 4. Alternatives for Replacing Tests to Assess Students' Physical Fitness

Conclusions

The study's findings demonstrate that conducting test exercises at home is a practical and efficient alternative to traditional diagnostics in school sports halls. However, assessing some aspects of physical fitness, such as speed, endurance, and strength, may be more challenging in an online setting.

Nonetheless, our proposed alternatives for test exercises can assist physical education teachers in effectively evaluating students' fitness levels under online learning conditions and adapting educational plans and programs. This constitutes a crucial step towards ensuring a high-quality and comprehensive physical education, regardless of the learning format.

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