



## DISCRIMINANT ANALYSIS: IMPACT OF THE NUMBER OF REPETITIONS ON THE EFFECTIVENESS OF TEACHING BOYS AGED 14 A CARTWHEEL

Andrii Bezzub<sup>1</sup>, Oleg Khudolii<sup>1</sup>, Radoslaw Muszkieta<sup>2</sup>

<sup>1</sup>H. S. Skovoroda Kharkiv National Pedagogical University

<sup>2</sup>Nicolaus Copernicus University

### Abstract

**The purpose of the study** was to determine the impact of exercise modes on the effectiveness of teaching boys aged 14 a cartwheel.

**Materials and methods.** The study participants were 20 boys aged 14. To solve the tasks set, the following research methods were used: study and analysis of scientific and methodological literature; pedagogical observation, timing of training tasks; pedagogical experiment, discriminant analysis.

**Results.** The study found that the mode of 6 sets 2 times each with a rest interval of 60 s is more effective than the mode of 6 sets 1 time each with a rest interval of 60 s when teaching the first, second, and fourth series of tasks ( $p < 0.05$ ). The mode of 6 sets 1 time each with a rest interval of 60 s is more effective when teaching the fifth and sixth series of tasks ( $p < 0.05$ ).

**Conclusions.** Based on the analysis of group centroids, it was found that exercise modes significantly influence the cartwheel skill development in boys aged 14 during physical education classes. The results of group classification show that 100 % of the original grouped observations were classified correctly.

**Keywords:** discriminant analysis, boys, acrobatic exercises, exercise mode, teaching.

### Introduction

Motor skills development plays a leading role in schoolchildren's physical education (Ivashchenko et al., 2020; Petrov et al. 2020; Shevchenko et al., 2020). Based on factor analysis, it was found that the level of proficiency in exercises affects the variation of testing results, and motor skills development is a priority in the educational process at school (Ivashchenko et al., 2017; Shevchenko et al., 2020). According to the researchers, one of the factors that influence the effectiveness of motor skills development is the mode of alternating exercises and the rest interval (Iermakov et al., 2021; Ivashchenko et al., 2021; Marchenko et al., 2020). Therefore, it is relevant to study the impact of different exercise modes on the effectiveness of teaching 14-year-old schoolchildren acrobatic exercises.

*The purpose of the study* was to determine the impact of exercise modes on the effectiveness of teaching boys aged 14 a cartwheel.

### Materials and methods

*Study participants.* The study participants were 20 boys aged 14. The children and their parents were fully informed about all the features of the study and gave their consent to participate in the experiment.

*Organization of the study.* To solve the tasks set, the following research methods were used: study and analysis of scientific and methodological literature; pedagogical obser-

vation, timing of training tasks; pedagogical experiment, methods of mathematical statistics, discriminant analysis.

The pedagogical experiment examined the influence of 6 and 12 repetitions with a 60-second rest interval during a physical education class on the number of repetitions of training tasks to the 100% level of proficiency. In the first group ( $n = 10$ ), the boys repeated the tasks 6 sets 1 time each with a rest interval of 60 s, in the second group ( $n = 10$ ) – 6 sets 2 times each with a rest interval of 60 s.

During teaching, the method of algorithmic instructions was used. The next exercise started on condition of correct performance of the previous exercise on three consecutive attempts. The number of repetitions required for correct performance on three consecutive attempts was recorded.

*Statistical analysis.* The study materials were processed using the IBM SPSS 20 statistical analysis program. Discriminant analysis was conducted.

### Results

The analysis of mean values shows that statistically significant differences in the number of repetitions are observed in all series of training tasks but the third one ( $p < 0.05$ ). The 14-year-old boys who use the second mode (6 sets 2 times each with a rest interval of 60 s) need fewer repetitions to master the movements of the first, second, and fourth series of tasks ( $p < 0.05$ ). The 14-year-old boys who use the first mode (6 sets 1 time each with a rest interval of 60 s) need fewer repetitions to master the movements of the fifth and sixth series of tasks ( $p < 0.05$ ).

To determine the impact of different modes of exercises on the level of proficiency, discriminant analysis was conducted. The first canonical function explains 100% of the results variation, which indicates its high informativity ( $r=0.949$ ), it is statistically significant ( $\lambda_1=0.099$ ;  $p_1=0.001$ ). The first function has a high discriminative ability and value in interpretation of the general population.

The analysis of the standardized canonical discriminant function coefficients showed that the results of the fourth, sixth, and first series of training tasks make the largest contribution. The above indicates that the exercises of the fourth, sixth, and first series of training tasks are the most sensitive to the number of repetitions in boys aged 14.

The structure coefficients indicate that the function is most closely connected with the number of repetitions of exercises of the fourth, first, and sixth series of training tasks ( $r_4 = -0.543$ ;  $r_1 = -0.432$ ;  $r_6 = 0.305$ ).

The coordinates of centroids for two groups make it possible to interpret the canonical function in relation to the role in classification. At the positive pole is a centroid for the exercise mode of 12 repetitions, at the negative — a centroid for the exercise mode of 6 repetitions. This indicates a significant difference in the impact of exercise repetition modes on the number of repetitions required for motor skills development in boys aged 14 during physical education classes. The results of group classification show that 100.0 % of the original

grouped observations were classified correctly. Based on the discriminant function coefficients and centroids, it is possible to calculate the number of repetitions for mastering the motor skill.

Thus, the assumption was made about a significant influence of the modes of alternating exercise repetitions and the rest interval on the effectiveness of motor skills development in boys aged 14. The study found that the mode of 6 sets 2 times each with a rest interval of 60 s is more effective than the mode of 6 sets 1 time each with a rest interval of 60 s when teaching the first, second, and fourth series of tasks ( $p < 0.05$ ). The mode of 6 sets 1 time each with a rest interval of 60 s is more effective when teaching the fifth and sixth series of tasks ( $p < 0.05$ ). The results presented confirm the data of Ivashchenko et al. (2015), Khudolii et al. (2020), Marchenko et al. (2020b) about the influence of the modes of alternating physical exercises and the rest interval on the effectiveness of motor skills development in schoolchildren.

## Conclusions

Based on the analysis of group centroids, it was found that exercise modes significantly influence the cartwheel skill development in boys aged 14 during physical education classes. The results of group classification show that 100 % of the original grouped observations were classified correctly.

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## ДИСКРИМІНАНТНИЙ АНАЛІЗ: ВПЛИВ КІЛЬКОСТІ ПОВТОРЕНЬ НА ЕФЕКТИВНІСТЬ ПРОЦЕСУ НАВЧАННЯ ПЕРЕВОРОТУ УБІК ХЛОПЦІВ 14 РОКІВ

Андрій Беззуб, Олег Худолій, Радослав Мушкета

Харківський національний педагогічний університет імені Г.С. Сковороди  
Університет Миколи Коперника

**Мета дослідження** – визначити вплив режимів виконання вправ на ефективність процесу навчання перевороту убік хлопців 14 років.

**Матеріали і методи.** У дослідженні прийняли участь 20 хлопців 14 років. Для вирішення поставлених завдань були використані методи дослідження: вивчення та аналіз науково-методичної літератури; педагогічне спостереження, хронометраж навчальних завдань; педагогічний експеримент, дискримінантний аналіз.

**Результати.** Встановлено що режим 6 підходів по 2 рази з інтервалом відпочинку 60 с має більшу ефективність ніж режим 6 підходів по 1 разу з інтервалом відпочинку 60 с у

процесі навчання першої, другої та четвертої серії завдань ( $p < 0,05$ ). Режим 6 підходів по 1 разу з інтервалом відпочинку 60 с має більшу ефективність у процесі навчання п'ятої та шостої серій завдань ( $p < 0,05$ ).

**Висновки.** На основі аналізу центроїдів груп визначено, що режими виконання вправ мають суттєвий вплив на процес формування навички виконання перевороту убік хлопців 14 років на уроках фізичної культури. Результати класифікації груп показують, що 100 % вихідних згрупованих спостережень класифіковано вірно.

**Ключові слова:** дискримінантний аналіз, хлопці, акробатичні вправи, режим виконання вправ, навчання.

### Information about the authors:

**Bezzub Andrii:** andbezzub55@gmail.com; <https://orcid.org/0000-0001-5343-2104>; H. S. Skovoroda Kharkiv National Pedagogical University, Alchevskikh St, 29, Kharkiv, 61002, Ukraine

**Khudolii Oleg:** khudolii@hnpu.edu.ua; <https://orcid.org/0000-0002-5605-9939>; H. S. Skovoroda Kharkiv National Pedagogical University, Department of Theory and Methodology of Physical Education, Alchevskikh St, 29, Kharkiv, 61002, Ukraine

**Muszkiet Radosław:** muszkiet@umk.pl; <https://orcid.org/0000-0001-6057-1583>; Nicolaus Copernicus University; Faculty of Earth Sciences, Jurija Gagarina St, 11, 87-100 Toruń, Poland

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