

## Comprehensive development of physical qualities of football players in the preparatory period Desarrollo integral de las cualidades físicas de los futbolistas en el período preparatorio

Georgiy Polevoy

Moscow Polytechnic University (Russia)

**Abstract.** The solution to the issue of developing the physical qualities of young football players can be obtained through the introduction of general physical exercises during the preparatory period of training. The objective is to document the increase in the level of physical fitness of young football players due to specific training. The study involved 44 male football players aged 12-13 who were engaged from the Dynamo Moscow football section. The research was conducted from January 12 to March 28 2022. The following tests were administered: running 30 m, shuttle run, long jump, pull-up on the crossbar, 6-minute (running) test and forward tilt. The statistical analysis was performed using SPSS 20.0 statistical software. The study was conducted for 11 weeks. The children from the CG were engaged in the usual 90-minute lesson program for football players of sports schools. The children in the EG performed various physical exercises to develop certain physical qualities. Results showed that regarding pre-to-post comparisons, for experimental and control groups, better results were recorded after compared with pre-training for running 30 m ( $p < 0.001$  and  $p = 0.017$ , respectively), shuttle running (both  $p < 0.001$ ), long jump (both  $p < 0.001$ ), pull-up (both  $p < 0.001$ ), 6min test (both  $p < 0.001$ ) and leaning forward (both  $p < 0.001$ ). Concerning comparisons at post-training between the two groups, the experimental group resulted in better performances than the control in shuttle running ( $p < 0.001$ ), long jump ( $p < 0.001$ ) and leaning forward ( $p = 0.018$ ) as well as for delta change (i.e., the difference between pre and post for each group) in the running 30 m ( $p < 0.001$ ) and 6min test ( $p < 0.001$ ). After athletes from the experimental group performed a special set of physical exercises to develop physical qualities, their performance improved significantly. This indicates the effectiveness of the tools and methods used to develop physical qualities.

**Keywords:** Physical quality; Football; Youth; Preparatory stage; Training.

**Resumen.** La solución al problema de desarrollar las cualidades físicas de los jóvenes futbolistas se puede obtener mediante la introducción de ejercicios físicos generales durante el período preparatorio de entrenamiento. El objetivo es documentar el aumento del nivel de condición física de los jóvenes futbolistas debido a un entrenamiento específico. En el estudio participaron 44 jugadores de fútbol masculinos de entre 12 y 13 años que participaron en la sección de fútbol del Dynamo de Moscú. La investigación se realizó del 12 de enero al 28 de marzo de 2022. Se administraron las siguientes pruebas: correr 30 m, carrera lanzadera, salto de longitud, dominadas en el travesaño, prueba de 6 minutos (corriendo) e inclinación hacia adelante. El análisis estadístico se realizó utilizando el software estadístico SPSS 20.0. El estudio se realizó durante 11 semanas. Los niños del CG participaron en el programa habitual de lecciones de 90 minutos para jugadores de fútbol de escuelas deportivas. Los niños en el EG realizaron varios ejercicios físicos para desarrollar ciertas cualidades físicas. Los resultados mostraron que con respecto a las comparaciones pre a post, para los grupos experimental y control, se registraron mejores resultados después en comparación con el preentrenamiento para correr 30 m ( $p < 0,001$  y  $p = 0,017$ , respectivamente), carrera de lanzadera (ambos  $p < 0,001$ ), salto de longitud (ambos  $p < 0,001$ ), dominadas (ambos  $p < 0,001$ ), prueba de 6min (ambos  $p < 0,001$ ) e inclinarse hacia adelante (ambos  $p < 0,001$ ). En cuanto a las comparaciones en el postentrenamiento entre los dos grupos, el grupo experimental arrojó mejores rendimientos que el control en carrera lanzadera ( $p < 0,001$ ), salto de longitud ( $p < 0,001$ ) e inclinación hacia adelante ( $p = 0,018$ ), así como para el cambio delta (es decir, la diferencia entre pre y post para cada grupo) en la prueba de carrera de 30 m ( $p < 0,001$ ) y 6 min ( $p < 0,001$ ). Después de que los atletas del grupo experimental realizaron un conjunto especial de ejercicios físicos para desarrollar cualidades físicas, su rendimiento mejoró significativamente. Esto indica la efectividad de las herramientas y métodos utilizados para desarrollar cualidades físicas.

**Palabras clave:** Calidad física; Fútbol; Juventud; Etapa preparatoria; Entrenamiento.

Fecha recepción: 31-03-24. Fecha de aceptación: 14-05-24

Georgiy Polevoy

[g.g.polevoy@gmail.com](mailto:g.g.polevoy@gmail.com)

### Introduction

Sports games, in particularly football, which is one of the most popular and exciting sports, are considered to be the most effective means of physical education for schoolchildren. Several studies have shown that football classes educate schoolchildren in such qualities as will, courage, determination, courage, self-control and a sense of camaraderie. Football classes contribute to improving the physical fitness of schoolchildren - the development of strength, speed, endurance, flexibility, dexterity and coordination abilities (Alesi et al., 2016; Kim & Irmatov, 2020; Strykalenko et al., 2021; Craig et al., 2022; Uralov, 2022; Yang & Chen, 2022). For a football player, it is necessary to develop all physical qualities, especially during the preparatory period of training (Alesi et al., 2016; Uralov, 2022).

Based on the monitoring analysis of physical qualities, the authors of the study propose a methodology aimed at developing the necessary motor qualities in young football players. The authors note that. The development of strength at this stage is carried out mainly by the method of repeated efforts. In training, the "structural correspondence" of strength exercises to the specifics of the game should be taken into account to a greater extent. At the same time, work on strengthening the muscles of the whole body should not stop. In order to have a more comprehensive effect on the strength abilities of football players, create conditions close to football, and increase the emotionality of classes. Moreover, it is necessary to accurately dose the load by time and weight (Kim & Irmatov, 2020).

The use of an integrated approach for the overall assessment of the physical conditioning level allows coaches to

obtain an objective picture of the young football players' fitness, as well as to influence the training process quickly and efficiently, with an emphasis on those motor qualities that need further growth (Strykalenko et al., 2021; Yang & Chen, 2022)

The level of development of the physical qualities of football players is one of the most important factors on which the effectiveness of team, group and individual technical and tactical actions depend. No matter how technically and tactically literate a football player is, he or she will never succeed without good and versatile physical fitness. Neither will a team succeed in which the physical development of even one player will not meet modern football standards (Marques et al., 2016; Maughan et al., 2021).

A favorable period for developing most physical qualities is 12-13 years (Bornstein, 1989; Petrova et al., 2019). In youth sports, attention should be paid to the development of strength. At the same time, it is important to influence the maximum number of muscle groups. Since the power capabilities of children are small, the development of strength should be carried out very carefully, using short-term power stresses, mainly of a dynamic nature. With the development of speed, it is necessary to maximize the pace of running and the frequency of movements that do not require much muscle effort. Outdoor games and exercises in the form of competitions are of great importance. The main means of developing general endurance is running in an aerobic mode for up to 30 minutes. The development of dexterity and flexibility at the stages of preliminary training and initial specialization creates the basis for successful mastery of complex motor coordination actions. Joint mobility should be maintained through exercises with large amplitude movements without burdening (Bornstein, 1989; Gabard-Durnam & McLaughlin, 2020; Petrova et al., 2019).

The annual cycle of sports training in football is divided into several stages (Imperlini et al., 2020; Till et al., 2022), namely:

1. the general preparatory stage is the foundation for further specific activities in the chosen sport and the development of basic physical qualities (January-March);
2. the special preparatory period is the performance of football-specific exercises and the development of tactics and other specific techniques (April-May);
3. the competitive stage is the performance in competitions, the use of accumulated experience and the implementation of training sessions of the previous stages (June-October);
4. the transition period is the time of recovery and analysis of the results of the past sports year (November-December).

Summarising the above, it should be concluded that in modern football, the requirements for the level of development of physical qualities of football players are constantly growing, therefore, it is necessary to lay and develop these qualities from childhood and, in football, a preparatory stage of training is defined for this. The sensitive period for

developing most physical qualities is 12-13 years.

**The study aimed** was to increase the physical fitness of football players through physical exercises aimed at developing physical qualities in the preparatory period. It was assumed that the proposed tools and methods would contribute to more effective development of the physical qualities of boys aged 12-13 years at the preparatory stage of training. The study's tasks were to study the scientific and methodological literature on this research topic, determine the level of physical fitness of children aged 12-13 who were engaged in the school football section and develop training tools and methods aimed at developing the basic physical qualities of young football players and experimentally test their effectiveness.

## Methods

### Study participants

This research involved male schoolchildren aged 12-13 in the Dynamo Moscow football section. An a priori power analysis was conducted using the G\*Power software package (Version 3.1.9.4, University of Kiel, Kiel, Germany) to determine the required sample size, with  $\alpha$  set to 0.05 and power ( $1-\beta$ ) set to 0.80. The analysis revealed that a total sample size of 40 subjects would be sufficient to identify significant differences with an actual power of 0.81. In total, 44 football players participated in the study, who were healthy and admitted by a doctor to practice in the sports section. All procedures met the ethical standards of the 1964 Declaration of Helsinki. Written informed consent was obtained from all the parents of the adolescents included in the study.

### The research procedure

The study occurred in the preparatory period from January 12 to March 28, 2022. All participants were randomly divided into 2 groups: the control group (CG) – 22 people and the experimental group (EG) – 22. Both groups played football 3 times a week (Monday, Wednesday and Friday) for 90 minutes each lesson. The study was conducted for 11 weeks.

The children from the CG were engaged in the usual 90-minute lesson program for football players of sports schools, which provides for both the development of physical qualities and the performance of specific football work at this stage of training (Kachani & Gorsky, 2022).

### Training

The children in the EG performed various physical exercises to develop certain physical qualities. The sequence of performing sets of exercises in training was regulated by the recommendations of leading experts in the physical training of athletes (Carvajal-Espinoza et al., 2023; Forest et al., 2018). At the beginning of the 90-minute lesson, there was a 10-minute warm-up (explanation of the training tasks, a short running part, and stretching exercises). After warming up, it was performed sets of exercises for 15

minutes each in a certain sequence for 75 minutes:

1) development of speed of movement (repeated running on short stretches of 10-15 m, shuttle running 2x10m or 3x8m, running on the spot in 10-15 seconds and jerks from different starting positions),

2) coordination abilities (tumbling back and forth, jumping over a gymnastic goat, running between racks, jumping over stuffed balls, juggling a soccer ball and leading the ball between racks),

3) strength qualities (there should be three approaches to each exercise. It is necessary to perform the exercises "to failure" and rest between sets for 60-100 seconds. Flexion and extension of the trunk from a supine position, pulling up from hanging on the crossbar, bending and extending the arms in a prone position, bending with a partner on the shoulders, lying on the chest to raise the arms and legs, plank exercise and squats),

4) general endurance (prolonged but slow running without a ball or with a ball in his legs and alternating running and walking according to the athlete's well-being with a recommended heart rate of 130-155 beats /min self-controlled with wrist heart rate watches),

5) flexibility (slowly performing stretching exercises for all muscle groups and increasing joint mobility potential. Exercises should be performed from top to bottom from the neck muscles to the ankle joint).

After completing all the exercises, the results of the training session were summarized (5 minutes).

### Testing

At the beginning and at the end of the preparatory period, to determine the effectiveness of the technique, all football players underwent control tests (Carron et al., 2023; Salse-Batán et al., 2022):

1. running for 30 m (assessment of speed of movement). Each athlete was given only one attempt, if there was a false start, he was allowed to perform the exercise again. The measurement (by manual stopwatch) accuracy was 0.1s;

2. shuttle run 3x10 m (assessment of coordination abilities). One attempt, in case of a false start, the exercise had to be performed again. The measurement (by manual stopwatch) accuracy was 0.1s;

3. long jump (assessment of leg muscle strength). After two attempts, the best result was recorded. The measurement (by measuring tape) accuracy was 1 cm;

4. pull-up on the crossbar (assessment of the strength of the arm muscles). One try. The measurement score was the number of times;

5. 6-minute (running) test (endurance assessment). One try. The measurement (400-m track around the pitch+measuring tape) accuracy was 1 meter and

6. forward tilt (assessment of flexibility). After two attempts, the best result was registered. The measurement (by measuring tape) accuracy is 1 cm.

### Statistical analysis

The statistical analysis was performed using SPSS 20.0

statistical software (IBM corps., Armonk, NY, USA). Data were presented as mean and standard deviation and median and interquartile range values were reported for non-normal distribution data. The Shapiro-Wilk test was used to check and confirm the normality of data sets and the Levene test was used to verify the homogeneity of variances. Sphericity was tested using the Mauchly test. The Wilcoxon signed-rank test was used for all variables for pre-to-post comparisons for each group. Concerning the comparisons between the two groups, for the variables where significant difference at pre-intervention was detected (i.e., running 30 m and 6min tests), performance delta change was calculated and used for comparisons between the two groups using the U Mann-Whitney test for the running 30 m test and the independent samples t-test for 6min test. For the remaining variables, comparisons at post-intervention were performed using the U Mann-Whitney test. For the variables that were normally distributed, standardized effect size analysis (Cohen's d) was used to interpret the magnitude of differences between variables and considered as trivial ( $\leq 0.20$ ), small ( $0.20 < d \leq 0.60$ ), moderate ( $0.60 < d \leq 1.20$ ), large ( $1.20 < d \leq 2.0$ ), very large ( $2.0 < d \leq 4.0$ ) and extremely large ( $> 4.0$ ; Hopkins, 2002). The correlation coefficient (r) was calculated for the non-normal distributed variables using the Wilcoxon Z-scores and the total number of observations (N, i.e.,  $r = Z / \sqrt{N}$ ) and considered as  $0.1 < r \leq 0.3$  (small),  $0.3 < r \leq 0.5$  (moderate) and  $> 0.5$  (large; M. Tomczak & E. Tomczak, 2014). The level of statistical significance was set at  $p \leq 0.05$ .

### Results

Table 1 presents physical qualities measured before and after the intervention for experimental and control groups.

Table 1.

Physical performances recorded before and after the intervention for the experimental (EG) and control (CG) groups (n=44)

Tests	Groups	Before	After	Delta
Running 30 m (s)	Experimental	5.7(0.2)	4.9(0.2)*	-0.8(0.175) <sup>‡</sup>
	Control	5.8(0.275)	5.8(0.1) <sup>£</sup>	-0.05(0.1)
Shuttle running (s)	Experimental	9.05(0.3)	7.85(0.375)* <sup>‡</sup>	-
	Control	9.2(0.275)	9.05(0.1)*	-
Long jump (cm)	Experimental	185.5(4.75)	198.5(5)* <sup>‡</sup>	-
	Control	184.5(5.5)	188(3.75)*	-
Pull-up on crossbar (n)	Experimental	5(2)	6(1.75)*	-
	Control	5.5(1.75)	6(1.75)*	-
6-minute test (m)	Experimental	1083±8	1206±12*	124±10* <sup>‡</sup>
	Control	1088±8	1121±8*	33±10*
Leaning forward (n)	Experimental	7(2)	9(1.75)* <sup>§</sup>	-
	Control	7(2)	8(2.75)*	-

\*different from pre at  $p < 0.001$ , £ different from pre at  $p = 0.018$ , ‡ different from the control group at post-measurement and delta change at  $p < 0.001$ , ¶ different from the control group at post-measurement at  $p = 0.018$ .

Values are expressed as mean±standard deviation for normally distributed data. Values are expressed as mediane(interquartile range) for not normally distributed data.

In the table 1 we see regarding pre-to-post comparisons, for experimental group, significant improvements were recorded with better results after compared with pre-training for running 30 m ( $z = -4.135$ ,  $r = -0.18$ ,  $p < 0.001$ ), shuttle running ( $z = -4.118$ ,  $r = -0.19$ ,  $p < 0.001$ ), long jump ( $z = -$

4.115,  $r=-0.19$ ,  $p<0.001$ ), pull-up ( $z=-4.208$ ,  $r=-0.191$ ,  $p<0.001$ ), 6min test ( $z=-4.109$ ,  $r=-0.18$ ,  $p<0.001$ ) and leaning forward ( $z=-4.349$ ,  $r=-0.20$ ,  $p<0.001$ ). Similarly, for the control group, significant improvements were recorded at post-measurements for running 30 m ( $z=-2.379$ ,  $r=-0.11$ ,  $p=0.017$ ), shuttle running ( $z=-3.755$ ,  $r=-0.17$ ,  $p<0.001$ ), long jump ( $z=-3.404$ ,  $r=-0.15$ ,  $p<0.001$ ), pull-up ( $z=-4.243$ ,  $r=-0.19$ ,  $p<0.001$ ), 6min test ( $z=-4.109$ ,  $r=-0.18$ ,  $p<0.001$ ) and leaning forward ( $z=-4.873$ ,  $r=-0.22$ ;  $p<0.001$ ).

Concerning comparisons at post-training between experimental and control groups, statistical analysis showed that the experimental group resulted in better performances than the control in shuttle running ( $z=-5.706$ ,  $r=-0.13$ ,  $p<0.001$ ), long jump ( $z=-5.093$ ,  $r=-0.11$ ,  $p<0.001$ ) and leaning forward ( $z=-2.375$ ,  $r=-0.05$ ,  $p=0.018$ ). In contrast, there was no difference between groups for pull-up test ( $z=-0.220$ ,  $p=0.826$ ). For delta change comparisons, there was a significant difference with better values for experimental compared to the control group for running 30 m ( $z=-5.746$ ,  $r=-0.13$ ,  $p<0.001$ ) and 6min test ( $t=28.961$ ,  $df=42$ ,  $d=p<0.001$ ).

All raw data are shown in the supplementary file raw data.xlsx.

To illustrate the results of the study, a percentage increase was determined in both groups in each test from the beginning to the end of the study.

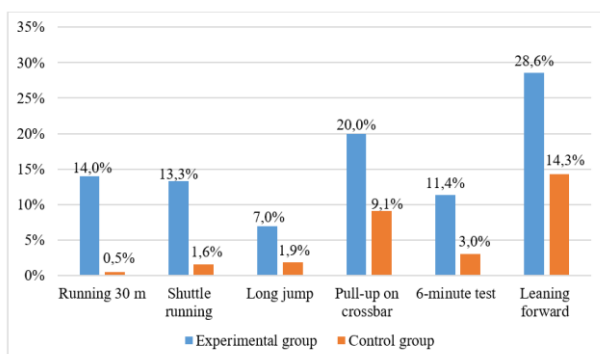


Figure 1. The increase in indicators over the period of the study

Figure 1 shows that from the beginning to the end of the pedagogical experiment, the indicators in the experimental group in all tests improved from 7% to 28.6%, and the indicators in the control group became higher by 0.5% - 14.3%. This confirms the effectiveness of the proposed program in comparison with the usual program for children involved in football at a sports school.

## Discussion

After analysing the state of the issue according to literary sources, we concluded that the content of the training process of football players in the preparatory period of the annual training cycle should be directed less to the technique of performing competitive exercises and tactics and more to the development of physical qualities such as strength, speed, endurance, dexterity and flexibility (Imperlini et al.,

2020; Till et al., 2022). Previous studies have noted that in adolescence it is important to develop not only technical skills, but also the physical qualities of young football players. This is especially true for the preparatory period of training (Alesi et al., 2016; Uralov, 2022).

Some studies suggest an author's technique that improves some physical qualities in young football players. The authors note that muscle strengthening should be systematic and comprehensive, and the load should be dosed by time and weight (Kim & Irmatov, 2020). Of course, our proposed methodology for the development of physical qualities in the preparatory period is fully confirmed by previous studies. At the same time, it is important to use an integrated approach for an overall assessment of the level of physical fitness, which allows coaches to get an objective picture of the physical fitness of young football players (Strykalenko et al., 2021; Yang & Chen, 2022)

It is known that at the age of 12-13 years, the anatomical and physiological formation of a teenager ends and his great motor activity gives a great increase in the development of most physical qualities (Bornstein, 1989; Gabard-Durnam & McLaughlin, 2020; Petrova et al., 2019).

In the scientific literature, many studies were about developing the physical qualities of qualified football players (Champ et al., 2020; Young et al., 2014). However, some studies reflected the issues of the development of physical qualities of schoolchildren involved in football in sports sections (Platvoet et al., 2020; Smothers et al., 2021). Based on the analysis of the relevant literature, sets of exercises aimed at developing physical qualities, which have been experimentally tested, have been chosen and administered (Alesi et al., 2016; Marques et al., 2016; Rico-González et al., 2021; Woods et al., 2016; Zago et al., 2022).

The final testing showed that in the control group, young football players did not achieve changes the same as the experimental in running 30 m and 6-minute tests ( $p<0.001$ ). Both groups improved running 30 m, shuttle running, long jump, pull-up, 6-minute test and leaning forward (Table 1). Yet, the magnitude of improvement in the two groups was different for all physical performances.

According to the results of the new pedagogical experiment, a significant improvement in the indicators of all physical qualities in the experimental group should be noted. For example, in the "Running 30 m" test, the performance of young football players from EG improved by 14%, while children from CG improved the indicator by only 0.5%. In the "Shuttle running" test, children from EG performed jerks 13.3% better, and children from CG performed 1.6% better. In the "Long jump" test, young football players from EG showed a higher result by 7%, and children from CG by 1.9%. The indicators of the "Pull-up on crossbar" test improved in children in EG by 20%, and in children from CG by 9.1%. Also, from the beginning to the end of the study, children from EG improved their performance in the "6-minute test" by 11.4%, while children from CG improved by only 3%. In the "Leaning forward" test, the EG football players improved the data by 28.6%,

and the children from CG by 14.3%. Such research results allow us to conclude that the proposed methodology for the development of physical qualities in the preparatory period of football players aged 12-13 years is more effective than the standard program. Based on the above analysis of the results obtained, the working hypothesis we put forward at the beginning of the study received its full confirmation in the research. The tools and methods have shown their effectiveness in developing the physical fitness of 12-13-year-old football players at the preparatory stage.

The results that were obtained after the end of the pedagogical experiment make it possible to effectively adjust the usual training program for young football players. This is important, as many studies emphasize the insufficient effectiveness of the standard training system for young football players. The issue of the development of physical qualities is quite relevant (Polevoy, 2024). It should be noted that a high level of development of physical qualities contributes not only to achieving athletic results, but also, above all, has a positive impact on the growth and development of children (Sarroeira et al., 2022; Septianto et al., 2024). This is especially important in modern living conditions, as the problems of insufficient activity of children in early school age (Marambio Miranda et al., 2020; Galán-Arroyo et al., 2023) are significantly increasing. The results of the pedagogical experiment expand the theoretical base in the field of football player training and complement the standard football player training program. The data obtained are of great practical importance for modern coaches, since the goal of each coach is to find ways to improve standard training techniques for athletes in different sports. This study is relevant and promising for further study of the issue. For example, in the future, it is possible to compare the training of football players of different ages and adjust the set of exercises proposed in this study.

## Conclusion

The effectiveness of using a regular program in the preparatory period of a one-year training cycle for football players aged 12-13 years has been proven by the results of studies in the control group. However, the increase in indicators for all tests was not significant. On the other hand, when athletes from the experimental group performed a special set of physical exercises aimed at developing physical qualities, their performance improved significantly. This indicates the effectiveness of the tools and methods used to develop physical qualities.

## Acknowledgment

The authors thank the local secondary school for assisting with program recruitment.

## Conflict of interest

None. The author declares no conflict of interest

## Author contributions

Author Contribution: Study design; Data collection; Statistical analysis; Manuscript Preparation; Funds Collection – Georgiy Polevoy.

## Funding

This research did not receive any funding.

## References

- Alesi, M., Bianco, A., Luppina, G., Palma, A., & Pepi, A. (2016). Improving Children's Coordinative Skills and Executive Functions: The Effects of a Football Exercise Program. *Perceptual and motor skills*, 122(2), 27–46. <https://doi.org/10.1177/0031512515627527>
- Bornstein, M. H. (1989). Sensitive periods in development: structural characteristics and causal interpretations. *Psychological bulletin*, 105(2), 179–197. <https://doi.org/10.1037/0033-2909.105.2.179>
- Carron, M. A., Scanlan, A. T., Power, C. J., & Doering, T. M. (2023). What Tests are Used to Assess the Physical Qualities of Male, Adolescent Rugby League Players? A Systematic Review of Testing Protocols and Reported Data Across Adolescent Age Groups. *Sports medicine - open*, 9(1), 106. <https://doi.org/10.1186/s40798-023-00650-z>
- Carvajal-Espinoza, R., Talpey, S., & Salazar-Rojas, W. (2023). Effects of physical training on change of direction performance: A systematic review with meta-analysis. *International Journal of Sports Science & Coaching*, 18(5), 1850–1866. <https://doi.org/10.1177/17479541231160894>
- Champ, F. M., Nesti, M. S., Ronkainen, N. J., Tod, D. A., & Littlewood, M. A. (2020). An exploration of the experiences of elite youth footballers: The impact of organizational culture. *Journal of Applied Sport Psychology*, 32(2), 146–67. <https://doi.org/10.1080/10413200.2018.1514429>
- Craig, T. P., Swinton, P., Barrett, S., & Maughan, P. (2022). Locomotor activities and subjective load differences between professional youth soccer players and professional development loans: A comparative analysis. *International Journal of Sports Science & Coaching* 19(1), 1–7. <https://doi.org/10.1177/17479541221141145>
- Forest, E., Lenzen, B., & Öhman, M. (2018). Teaching traditions in physical education in France, Switzerland and Sweden: A special focus on official curricula for gymnastics and fitness training. *European Educational Research Journal*, 17(1), 71–90. <https://doi.org/10.1177/1474904117708889>
- Gabard-Durnam, L., & McLaughlin, K. A. (2020). Sensitive periods in human development: charting a course for the future. *Current Opinion in Behavioral Sciences*, 36, 120–128.

- <https://doi.org/10.1016/j.cobeha.2020.09.003>
- Galán-Arroyo, C., Mayordomo-Pinilla, N., Castillo-Paredes, A., & Rojo-Ramos, J. (2023). Aptitud Física y Bullying en el Aula de Educación Física (Physical Fitness and Bullying in Physical Education Classroom). *Retos*, 50, 849–857. <https://doi.org/10.47197/retos.v50.100170>
- Hopkins, W. G. (2002). A New View of Statistics: Effect Magnitudes. <https://www.sportsci.org/resource/stats/effectmag.html>
- Imperlini, E., Mancini, A., Orrù, S., Vitucci, D., Di Onofrio, V., Gallè, F., Valerio, G., Salvatore, G., Liguori, G., Buono, P., & Alfieri, A. (2020). Long-Term Recreational Football Training and Health in Aging. *International journal of environmental research and public health*, 17(6), 2087. <https://doi.org/10.3390/ijerph17062087>
- Kachani, L., & Gorsky, L. (2022). Training of football players. *FiS*.
- Kim, V. G. & Irmatov, D. (2020). Features of the Development of Physical Qualities of Young Football Players at the Stage of Initial Training. *Texas Journal of Multidisciplinary Studies*, 8,125-129
- Knauer, H., Baker, D. L., Hebbeler, K., & Davis-Alldrift, L. (2015). The Mismatch Between Children's Health Needs and School Resources. *The Journal of school nursing: the official publication of the National Association of School Nurses*, 31(5), 326–333. <https://doi.org/10.1177/1059840515579083>
- Marambio Miranda, M., Núñez Fernández, T., Ramírez Guajardo, J., Ramírez Eyraud, P., Palma Leal, X. A., & Rodríguez-Rodríguez, F. (2020). Relación entre la actividad física escolar y extraescolar en estudiantes de escuelas públicas chilenas (Relationship between school and out-of-school physical activity in Chilean public school children). *Retos*, 37, 393–399. <https://doi.org/10.47197/retos.v37i37.72851>
- Marques, M. C., Izquierdo, M., Gabbett, T. J., Travassos, B., Branquinho, L., & van den Tillaar, R. (2016). Physical fitness profile of competitive young soccer players: Determination of positional differences. *International Journal of Sports Science & Coaching*, 11(5), 693–701. <https://doi.org/10.1177/1747954116667107>
- Maughan, P. C., MacFarlane, N. G., & Swinton, P. A. (2021). Quantification of training and match-play load across a season in professional youth football players. *International Journal of Sports Science & Coaching*, 16(5), 1169–1177. <https://doi.org/10.1177/17479541211000328>
- Petrova, M. A., Kaldarikov, E. N., & Bakulina, E. D. (2019). Sensitive periods in schoolchildren's physical development in Kalmykia republic. *Theory and Practice of Physical Culture*, 6, 1–27.
- Platvoet, S. W., Opstoel, K., Pion, J., Elferink-Gemser, M. T., & Visscher, C. (2020). Performance characteristics of selected/deselected under 11 players from a professional youth football academy. *International Journal of Sports Science & Coaching*, 15(5-6), 762–771. <https://doi.org/10.1177/1747954120923980>
- Polevoy, G. (2024). El efecto de la carrera aeróbica en el pensamiento y la resistencia de los niños (The effect of aerobic running on children's thinking and endurance). *Retos*, 54, 303–311. <https://doi.org/10.47197/retos.v54.103477>
- Rico-González, M., Pino-Ortega, J., & Ardigò, L. P. (2021). Playing Non-Professional Football in COVID-19 Time: A Narrative Review of Recommendations, Considerations, and Best Practices. *International journal of environmental research and public health*, 18(2), 568. <https://doi.org/10.3390/ijerph18020568>
- Ringdal, K., Ringdal, G. I., Olsen, H. K., Mamen, A., & Fredriksen, P. M. (2018). Quality of life in primary school children: The Health Oriented Pedagogical Project (HOPP). *Scandinavian journal of public health*, 46(21\_suppl), 68–73. <https://doi.org/10.1177/1403494818767821>
- Salse-Batán, J., Varela, S., Garcia-Fresneda, A., & Ayan, C. (2022). Reliability and validity of field-based tests for assessing physical fitness in gymnasts. *Apunts Sports Medicine*, 57(216), 100397. <https://doi.org/10.1016/j.apunsm.2022.100397>
- Sarroeira, S., Pereira, B. O., Carvalho, G. S., & Fernández, E. R. (2022). Intervenciones basadas en métodos de relajación en el contexto escolar desde la perspectiva de la promoción de la salud y el bienestar: una revisión sistemática (Relaxation methods based interventions in a school context from a perspective of health and w. *Retos*, 45, 583–590. <https://doi.org/10.47197/retos.v45i0.90898>
- Septianto, I., Sumaryanti, S., Nasrulloh, A., Sulistiyono, S., Nugraha, H., Ali, M., Ramadhani, A. M., Dewantara, J., Haniyyah, N., Fauzi, F., Suryadi, D., Ardian, R., & Subarjo, S. (2024). Juegos tradicionales para mejorar la forma física: estudio experimental con alumnos de primaria (Traditional games for physical fitness: an experimental study on elementary school students). *Retos*, 54, 122–128. <https://doi.org/10.47197/retos.v54.104177>
- Smothers, N., Copley, B., Lloyd, R., & Oliver, J. (2021). An exploration of the landscape of fundamental movement skills and strength development in UK professional football academies. *International Journal of Sports Science & Coaching*, 16(3), 608–621. <https://doi.org/10.1177/1747954121992522>
- Strykalenko, Y., Huzar, V., Shalar, O., Oloshynov, S., Homenko, V., Svirida V. (2021). Physical fitness assessment of young football players using an integrated approach. *Journal of Physical Education and Sport*, 21(1), 360-366. DOI:10.7752/jpes.2021.01034
- Till, K., Lloyd, R. S., McCormack, S., Williams, G., Baker, J., & Eisenmann, J. C. (2022). Optimising long-term athletic development: An investigation of practi-

- tioners' knowledge, adherence, practices and challenges. *PloS one*, 17(1), e0262995. <https://doi.org/10.1371/journal.pone.0262995>
- Tomczak, M., & Tomczak, E. (2014). The need to report effect size estimates revisited. An overview of some recommended measures of effect size. *TRENDS in Sport Sciences*, 1(21), 19–25.
- Turner, G. L., Owen, S., & Watson, P. M. (2016). Addressing childhood obesity at school entry: Qualitative experiences of school health professionals. *Journal of child health care : for professionals working with children in the hospital and community*, 20(3), 304–313. <https://doi.org/10.1177/1367493515587061>
- Uralov Sardor Abdulla o'g'li. (2022). Developing the physical qualities of young football players outside the class and preparing them for competitions. *Academia Globe: Inderscience Research*, 3(12), 20–23. <https://doi.org/10.17605/OSF.IO/RXHF8>
- Woods, C. T., McKeown, I., Haff, G. G., & Robertson, S. (2016). Comparison of athletic movement between elite junior and senior Australian football players. *Journal of sports sciences*, 34(13), 1260–1265. <https://doi.org/10.1080/02640414.2015.1107185>
- Young, W., Grace, S., & Talpey, S. (2014). Association between leg power and sprinting technique with 20-m sprint performance in elite junior Australian football players. *International Journal of Sports Science & Coaching*, 9(5), 1153–1160. <https://doi.org/10.1260/1747-9541.9.5.1153>
- Yang, S., & Chen, H. (2022). Physical characteristics of elite youth male football players aged 13-15 are based upon biological maturity. *PeerJ*, 10, e13282. <https://doi.org/10.7717/peerj.13282>
- Zago, M., Lovecchio, N., & Galli, M. (2022). Players at home: Physical activity and quality of life in 12–17 years-old football (soccer) players during the Covid-19 lockdown. *International Journal of Sports Science & Coaching*, 17(3), 626–636. <https://doi.org/10.1177/174795412111041703>

#### Datos de los/as autores/as y traductor/a:

Georgiy Polevoy

[g.g.polevoy@gmail.com](mailto:g.g.polevoy@gmail.com)

Autor/a – Traductor/a