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METHODOLOGICAL JOURNAL**<http://mentaljournal-jspu.uz/index.php/mesmj/index>**SCIENTIFIC AND METHODOLOGICAL BASIS OF THE
PROGRAM FOR IMPROVING THE PHYSICAL FITNESS LEVEL OF FUTSAL
REFEREES USING INNOVATIVE METHODS****Khushnud Atamurotov***Deputy Director for educational work**Institute of Physical Education and Sports Scientific Research**Uzbekistan**E-mail: refereexiva@mail.ru***ABOUT ARTICLE****Key words:** Futsal, physical fitness level, Sprint test, Coda test, Ariet test.**Received:** 08.12.24**Accepted:** 10.12.24**Published:** 12.12.24**Abstract:** In this article, the author provides information about the importance of physical fitness level for futsal referees to effectively carry out their activities during a game. It discusses how the application of "Variative Shuttle," "Shuttle," and "Pyramid" exercises during the training period for futsal referees contributes to improving their physical and functional fitness levels, bringing them closer to the required level for competition. The special exercises used may be beneficial in enhancing the fitness level of futsal referees.**Relevance:**

The speed of mini-football (futsal) worldwide is increasingly linked to the continuous improvement of the physical fitness levels of futsal players. Simultaneously, the intensity of players' movements with and without the ball on the field is growing rapidly. This factor requires futsal referees to consistently maintain a high level of physical fitness. The increasing intensity of the game demands referees to enhance their physical fitness levels and improve the quality of training sessions. In crucial moments of the game, it is essential for referees to select the optimal position and make quick decisions, analyzing situations according to the rules of the game. Many studies are being conducted on the physical fitness requirements of futsal referees, as well as their psychophysiological preparation, tactical thinking, and functional indicators. In developed countries, the ability of referees to manage fast-paced futsal games is

closely related to scientific advancements, enabling them to adapt to these intense matches. It is necessary to improve the physical fitness of futsal referees in selecting optimal positions during the game, and to continually enhance training tools and methods. This requires a methodological approach to the development of physical fitness, offering rational solutions for referees to select the best positions during the game.

In our country, systematic efforts are being made to continuously monitor the physical fitness of referees during different stages of the annual preparation cycle. It has become a priority to create favorable conditions for training referees and improving refereeing quality, ensuring efficiency in the movements of futsal referees on the field. Modern methods of futsal referees' physical training are being implemented. However, the absence of developed methods for monitoring and improving the referees' physical fitness level and for selecting optimal positions during the game highlights the relevance of this research.

This research also contributes to the implementation of tasks outlined in various legal and regulatory documents, including the following decrees of the President of the Republic of Uzbekistan:

The December 4, 2019, PD-5887 on "Measures to take Uzbekistan's football development to a new stage"

The March 16, 2018, PD-3610 on "Measures to develop football"

The November 5, 2021, PD-5282 on "Measures to further develop walking, running, mini-football, badminton, streetball, and 'Workout' sports"

The April 7, 2023, PD-115 on "Additional measures to develop mass and professional football"

The November 3, 2023, resolution PD-355 on "Measures to expand the network of football education Institutions and develop infrastructure in line with international standards"

The May 28, 2024, PD-195 on "Measures to prepare for and organize the 2024 futsal World Cup"

Research Methods and Results:

At the beginning of the pedagogical research, we implemented the "Variative Shuttle" training method, developed by our team, in the training sessions of the research group. This method was used during the rest periods between competitions in the microcycles. The method was applied once, and the following results were obtained at the end of the research. In the annual training program, the "Variative Shuttle" method was performed 32 times, covering a total distance of 96.3 km. This was in line with the required training volume for futsal referees, and they were able to fully complete 10 repetitions of the shuttle.

Table 1

Comparative analysis of the indicators of the "Variative Shuttle" complex in the experimental group at the start and end of the research

T/r	Control test "Variative shuttle"	Before the research (n=12)			After the research (n=12)			AI	RI	t	P
		\bar{X}	Σ	V, %	\bar{X}	Σ	V, %				
1.	Performing the "Variative shuttle" complex (times)	8,11	0,81	9,96	9,81	0,93	9,48	1,70	20,96	4,78	<0,001
2.	Average HR	181,47	13,69	7,54	166,14	12,27	7,39	15,33	8,45	2,89	<0,01
3.	Maximum HR	196,8	17,94	8,76	186,17	15,79	8,48	18,56	9,07	2,69	<0,05

Notes:

\bar{X} - Mean arithmetic value of indicators; σ - Standard deviation; V, % - Coefficient of variation; AI - Absolute increase; RI - Relative increase; Student's t-value; p -degree of reliability; HR - Heart rate (beats per minute)

The results of the "Variative Shuttle" complex show improvements in the futsal referees' performance, indicating an increase in their functional and physical fitness levels. The average indicator of EG at the beginning of the study, based on the requirements set, was 8.11 ± 0.81 out of 10, with the average heart rate at 181.47 ± 13.69 beats per minute, and the maximum heart rate at 196.8 beats per minute. However, after applying the aforementioned innovative complexes, by the end of the study, the referees had improved their performance to 9.81 ± 0.93 repetitions, with the average heart rate at 166.14 ± 12.27 beats per minute and the maximum heart rate at 186.17 ± 15.79 beats per minute.

Based on these results, it can be concluded that the "Variative Shuttle" complex proved to be effective in enhancing the referees' ability to perform high-intensity tasks without compromising their working capacity. During the competition preparation phase, applying the "Variative Shuttle" complex helped improve the functional fitness level, bringing them closer to the intensity of the competition game. with their HR performance increasing by 4.7 beats per minute, while the average HR improved by 3.4 beats per minute. This highlights the positive impact of the training method on the referees' physical and functional readiness for competitive play.

At the beginning of the pedagogical research, the futsal referees underwent practical sports training with the "Shuttle" complex developed by us. One of the main objectives of this complex was to enable referees to quickly respond to critical situations during the competition

and select optimal positions. The complex was designed based on the movement trajectory of the futsal referees on the field, with specific performance standards set for it. Throughout the annual training cycle, the complex was repeated 56 times, and by the end of the pedagogical research, the final results were measured through a monitoring test.

Table 2

Comparative analysis of the indicators of the "Shuttle" complex in the experimental group at the start and end of the research

Control Tests "Shuttle"	Before the research (n=12)			After the research (n=12)			AI	RI	t	P
	\bar{X}	σ	V, %	\bar{X}	Σ	V, %				
Performing the "Shuttle" complex (times)	3,97	0,40	9,94	4,82	0,46	9,59	0,85	21,32	4,83	<0,001
Average HR Indicator	189,72	14,42	7,60	172,1	12,88	7,48	17,62	9,29	3,16	<0,01
Maximum HR Indicator	197,83	17,18	8,68	181,43	15,47	8,53	16,40	8,29	2,46	<0,05

Note:

\bar{X} - Arithmetic mean of the indicators; σ - Standard deviation; V, % - Coefficient of variation; AI- Absolute increase; RI - Relative increase; Student's t-value p -degree of reliability, HR - Heart rate (beats per minute)

At the beginning of the study, based on the requirements set, the average indicator of EG was 3.97 times from 5 attempts, with the average heart rate being 189.72 beats per minute, and the average maximum heart rate was 197.83 beats per minute. At the end of the study, using the innovative complexes mentioned, the group completed 4.82 repetitions, with an average heart rate of 172.1 beats per minute, and the maximum heart rate reached 181.43 beats per minute. Based on these results, it can be concluded that the "Shuttle" complex improved the speed qualities of futsal referees, enhancing their ability to choose optimal positions during contentious situations in the game. This process was successfully applied during their sports training.

Additionally, we developed the "PYRAMID" complex to improve the overall endurance and physical qualities of futsal referees. The primary goal was to maintain an optimal heart rate of 160-170 beats per minute during short-distance movements, without reducing the referees' capacity to work in both aerobic, mixed, and anaerobic zones, while performing rapid movements at maximal intensity. This complex was applied as a priority during their activity and was used throughout the referees' annual training cycle, with 56 repetitions. A final control

test was conducted at the end of the pedagogical study to assess the effectiveness of this method.

Table 3

Comparative analysis of the indicators of the “Pyramid” complex in the experimental group at the start and end of the research

T/r	Control test “Pyramid”	Before the research (n=12)			After the research (n=12)			AO'	NO'	t	P
		\bar{X}	Σ	V, %	\bar{X}	Σ	V, %				
1.	Performing the “Pyramid” complex (times)	474,43	56,81	11,97	601,43	70,84	11,78	127,00	26,77	4,84	<0,001
2.	Average HR	179,36	17,83	9,94	167,14	16,12	9,64	12,22	6,81	1,76	>0,05
3.	Maximum HR	191,46	16,83	8,79	177,54	15,13	8,52	13,92	7,27	2,13	<0,05

Note:

\bar{X} - Average arithmetic value of indicators; σ -Average deviation; V, %-Variation coefficient; AI-Absolute increase; RI- Relative increase; Student's t-value; p- degree of reliability; HR-Heart rate (beats per minute)

At the beginning of the study, the average distance covered by the “Pyramid” complex was 954.5±26.7 meters, the average heart rate was 179.36±17.8 beats per minute, and the maximum heart rate was 191.46±16.8 beats per minute (Table 3). By the end of the study, the average distance covered by the complex increased to 1283±36.46 meters, with an average heart rate of 167.14±16.12 beats per minute and a maximum heart rate of 177.54±15.13 beats per minute.

Based on the results obtained at the end of the pedagogical research, we can conclude that the tests and exercises developed by FIFA for improving various physical abilities are gradually losing their relevance. Therefore, the development of a rationally distributed program and alternative exercises aimed at improving special endurance levels has become an increasingly urgent issue. We can infer that, based on the video analysis of futsal referees' movements during matches, the FIFA exercises mentioned earlier were found to be ineffective for referees to efficiently manage high-intensity matches.

The effectiveness of the 'PYRAMID' development, created and applied in practice by us, lies in its ability to progressively adapt referees' bodies to increasing distances and volumes in a stepwise manner. This allows referees to select optimal positions during matches. As can be seen from the table, the results of the research conducted by us.

Conclusion:

In conclusion, it can be stated that at the beginning of the pedagogical research, the “Variative Shuttle” exercise developed by us was introduced into the training sessions of the experimental group and proved its effectiveness by the end of the study, as confirmed during the competition.

In order to improve the special endurance of futsal referees, we developed the “Variative Shuttle” complex, which was incorporated into their practical sports training and used in the annual preparation cycle. The “Variative Shuttle” complex consists of 10 cycles, each lasting 1 minute, and includes various intense, combinational, and variative movements (sideways running, backward running, acceleration, and shuttle sprints). The total duration is 10 minutes, with 25 seconds of intense load followed by 35 seconds of rest per cycle. This complex was performed on a 40-meter futsal field. In it, the start/finish are located in the same place, and the referees start from the high starting position upon receiving a signal. Upon request, the 'Variative Shuttle' complex was performed 10 times for 10 minutes, achieving an average score of 9.8, with an average heart rate of 169.3 beats per minute. The maximum heart rate reached 187.1 beats per minute

To improve the speed of futsal referees during the game, we also used the “Shuttle” complex, which is characterized by high-intensity, short-duration loads with minimal rest periods. This exercise was aimed at developing speed and adapting to the rhythm of the game, and was incorporated into the annual training program for practical sports sessions. At the beginning of the research, the referees were not able to complete the test fully, but by applying it in micro-cycles in a combinatory manner, their functional capacity was improved. By the end of the study, the average heart rate was 172.1 beats per minute, and the maximum heart rate reached 182.7 beats per minute. The results obtained demonstrated their effectiveness in maintaining refereeing performance without reducing the number of accelerations during a two-halftime intense game.

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