



Development of Speed Abilities of Players of the Age Category U-15 During the Macrocycle in Futsal

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Abstract

Objectives. To substantiate the construction of the process of development of speed abilities of players of the U-15 age category in futsal throughout the macrocycle.

Materials and Methods. The study involved 15 U-15 players, representatives of the Municipal Institution «Children's and Youth Sports School» of the Bogodukhov City Council (Kharkiv Region), participants of the Ukrainian Futsal Championship (U-15) of the 2024-2025 season. The study was conducted in accordance with the ethical principles of the "Helsinki Declaration". Participation in them was voluntary, about which the athletes signed consent. To solve the tasks of the study, a set of research methods was used: analysis of scientific and methodological literature; pedagogical observation; pedagogical testing; methods of mathematical statistics.

Results. Analysis of the dynamics of the development of speed abilities of U-15 age category futsal players during the macrocycle revealed that statistically significant increase in the result is observed only in the preparatory period ($t=11.42$, $p<0,001$). During the competitive period, statistically significant differences between the test results were not revealed ($t=0.83$, $p>0,05$; $t=1.97$; $p>0,05$), however, negative dynamics are observed at the end ($t= -1.00$; $p>0,05$).

Conclusions. Futsal puts forward specific requirements for the physical training of players, in particular, for the development of speed abilities and their ability to react instantly in conditions of frequent changes in the game situation. The conducted analysis of the dynamics of the development of speed abilities of players showed that a reliable improvement in indicators occurs only in the preparatory period, and in connection with the long competitive period, there is a stabilization of average indicators, however, some players have shown negative dynamics. In this regard, the construction of the training process for the development of speed abilities should be based on scientifically sound methods that take into account the age characteristics of players, the specifics and nature of the competitive load in futsal.

Keywords: training process, training means, physical qualities, preparatory period, competitive period, load.

Introduction

Futsal is one of the fastest growing sports. Futsal's popularity is currently associated not only with the high emotional intensity of the game, but also with the simplicity of the rules and minimal requirements for the courts (Petrenko & Petrenko, 2021). In addition, regular futsal classes have a comprehensive impact on young athletes, contribute to an increase in the level of motor activity, improve the functional capabilities of players and have a positive effect on physical development (Strykalenko et al., 2024).

At the same time, in order to improve the organizational and methodological support for the process of training young futsal players, it is necessary to use scientifically based ap-

proaches (Strykalenko et al., 2021; Strykalenko et al., 2022). This requires searching for modern scientific and innovative methods for constructing training activities in various periods of the annual training cycle (Kostenko, 2023) and the use of modern means and methods of teaching specific technical and tactical actions (Sadiq, 2021).

It is worth noting that for a more effective training process in futsal, the issues of developing priority physical qualities that are most inherent in this particular type of football are acute (Vons et al., 2020), since the physical fitness of young players affects the formation of moral and volitional qualities (Patriychuk & Ivanyshyn, 2024; Sekulic et al., 2021; Spyrou et al., 2020).

However, scientific research and practical recommendations for improving the physical fitness of players are mainly related to classic football. However, as far as scientific devel-

Table 1. Results of 15m sprint testing during a macrocycle of U-15 futsal players, (n=15)

N ^o	1 testing, 1 week preparatory period, s	2 testing, 2 week competition period, s	Difference 1-2, s	3 testing, 7 week competition period, s	Difference 2-3, s	4 testing, 16 week competition period, s	Difference 3-4, s	5 testing, 22 weeks competitive period, s	Difference 4-5, s
1	2.63	2.57	0.06	2.53	0.04	2.56	-0.03	2.55	0.01
2	2.51	2.45	0.06	2.41	0.04	2.40	0.01	2.42	-0.02
3	2.44	2.39	0.05	2.40	-0.01	2.37	0.03	2.38	-0.01
4	2.57	2.45	0.12	2.49	-0.04	2.46	0.03	2.45	0.01
5	2.64	2.54	0.10	2.53	0.01	2.52	0.01	2.52	0.00
6	2.73	2.59	0.14	2.62	-0.03	2.53	0.09	2.55	-0.02
7	2.85	2.74	0.11	2.72	0.02	2.72	0.00	2.70	0.02
8	2.61	2.52	0.09	2.54	-0.02	2.53	0.01	2.55	-0.02
9	2.59	2.51	0.08	2.55	-0.04	2.52	0.03	2.53	-0.01
10	2.47	2.40	0.07	2.43	-0.03	2.41	0.02	2.39	0.02
11	2.58	2.49	0.09	2.44	0.05	2.43	0.01	2.45	-0.02
12	2.66	2.54	0.12	2.49	0.05	2.50	-0.01	2.50	0.00
13	2.54	2.41	0.13	2.39	0.02	2.38	0.01	2.42	-0.04
14	2.81	2.77	0.04	2.72	0.05	2.70	0.02	2.68	0.02
15	2.59	2.47	0.12	2.47	0.00	2.49	-0.02	2.50	-0.01
\bar{x}	2.61	2.52	0.09	2.52	0.00	2.50	0.02	2.51	-0.01

All players showed positive dynamics of the result increase, fluctuating between 0.05 and 0.14 s.

The third test was conducted on the 7th week of the competition period, two weeks before the second round of the competition. The average result was 2.52 ± 0.10 s. The best result remained at 2.39 s, and the worst improved to 2.72 s. At the same time, positive dynamics of test results were observed only in 8 players and ranged from 0,01 to 0,05. Neutral dynamics were detected in 1 player and negative dynamics were detected in 6 players, which ranged from - 0.01 to - 0.04.

The fourth test was conducted on the 16th week of the competition period, two weeks before participation in the third round of the Ukrainian Futsal Championship. The average result of the players improved to 2.50 ± 0.10 s, but 3 athletes demonstrated negative dynamics of the observed (- 0.01 - - 0.03 s), and 1 - neutral.

The fifth test was conducted on the 22nd week of the competitive period, two weeks before participation in the fourth (final) round of the competition. Despite the improvement of max=2.38 s and min=2.70 s results, there is a deterioration in the average result - 2.51 ± 0.09 s. Compared to the previous test, negative dynamics are observed in 8 players.

The analysis of the dynamics of the test results made it possible to determine the statistical difference in the indicators (Table 2).

The study of the dynamics of the average result of the players was conducted using an even two-sample Student's criterion for average values. It was found that during the

Table 2. Analysis of the dynamics of 15 m sprint performance during the macrocycle of U-15 futsal players, (n=15).

Testing	$\bar{x} \pm \sigma$	t	p
1	2.61 ± 0.11	11.42	<0.001
2	2.52 ± 0.11		
2	2.52 ± 0.11	0.83	>0.05
3	2.52 ± 0.10		
3	2.52 ± 0.10	1.97	>0.05
4	2.50 ± 0.10		
4	2.50 ± 0.10	-1.00	>0.05
5	2.51 ± 0.09		

preparatory period there was a statistically significant increase in speed abilities ($t=11.42$, $p<0.001$), which on average amounted to 0.09 s. This can be explained by the effectiveness of the adaptation processes that took place in the first period of the macrocycle. Analysis of the dynamics of the development of speed abilities during the competitive period did not reveal statistically significant differences between the average indicators ($t=0.83$, $p>0.05$; $t=1.97$; $p>0.05$; $t= -1.00$; $p>0.05$). This can be explained by the stabilization of results in the second period of the macrocycle. At the same time, the negative dynamics of results in some players may be associated with the accumulation of fatigue, insufficient individual load and other factors, which requires further research.

Discussion

This study assumed that futsal is a speed-strength sport and puts forward specific requirements for the development of players' motor skills, in particular, speed abilities. This requires the formation of a proprietary futsal concept for the development of motor skills, which should currently become a priority area of research for both theorists and practitioners.

The conducted research confirms that the high dynamism of futsal is due to the nature of competitive activity, which involves multiple accelerations, instant start from a place, quick inclusion in the rivalry and the performance of explosive actions with the ball. The obtained results are consistent with the findings of foreign researchers Santa Cruz et al. (2015), who define the main physical qualities that are of priority importance for futsal. These include starting speed, distance speed, speed endurance and explosive power. It is these components of physical training that determine the player's ability to quickly adapt to a variable game situation, ensure effective movement around the court and the implementation of technical and tactical actions at a high pace.

At the same time, for the development of effective training programs, it is key to determine the nature of the competitive load in futsal. Thus, according to Horbenko & Kohanetz (2012), during the performance of such game actions as sprints, accelerations, returns to the defense zone and sprint-brake movements, players are predominantly in conditions of submaximal and maximum intensity ($HR \geq 180$ bpm), and the total volume of such actions is 600-800 m per match with 260-300 s of active playing time. Such intensity of the load indicates the need for targeted development of speed qualities, the ability to react quickly and effectively recover between episodes of high activity.

Summarizing the results of testing futsal players aged 20 to 30 years, playing in the Extra League of Ukraine, domestic experts Strikalenko, Shalar & Guzar (2020) determined the dynamics of the level of physical fitness. Thus, the increase in the result in the test "15 m sprint" during the preliminary period is 19.60%. At the same time, our research has revealed that for players of the U-15 age category, the dynamics of indicators in a similar test during the preparatory period, which lasted 11 weeks, is significantly lower. The average increase in the indicator was 3.52% and ranged from 1.42% to 5.13%.

In addition, as noted by Stasiuk (2013), a long competitive period in futsal requires the use of various training process tools to maintain optimal athletic form. In the structure of each competitive mesocycle, in addition to competitive and recovery microcycles, those aimed at maintaining the physical and functional fitness of players should also be used and play an important role in maintaining the stability of physical form, allowing athletes to maintain a high level of readiness and include tools that promote effective functioning. This is confirmed by our study. Thus, during the 24-week competitive period, it was possible to maintain a sufficient level of development of the players' speed abilities (the average result of the «15 m sprint» test was: Week 2 – 2.52 s; Week 7 – 2.52 s; Week 16 – 2.50 s; Week 22 – 2.51 s). This was facilitated by the use of exercises that contributed to: maintaining explosive speed; improving reaction and adaptability to changes in the game situation; developing movement speed and team interaction; increasing coordination

and leg strength; improving the frequency of movements and ball control; maintaining explosive power and start speed; developing coordination and maneuverability.

The use of these tools is consistent with the research of foreign experts (Kassiano et al., 2019), who consider the development of speed, explosive and anaerobic strength of the lower limbs to be an important aspect of the training process for young futsal players. But as the authors note, the selection of training exercises should take into account: the development of fast attacks; improvement of positional attacks; control and possession of the ball at high speeds; improvement of speed technical and tactical actions in martial arts.

The introduction of specialized methods will improve the efficiency of the training process and adapt the physical training of players to the specific requirements of futsal.

Conclusions

Futsal puts forward specific requirements for the physical training of players, in particular, for the development of speed abilities and their ability to react instantly in conditions of frequent changes in the game situation.

The conducted analysis of the dynamics of the development of speed abilities of players showed that a reliable improvement in indicators occurs only in the preparatory period, and in connection with the long competitive period, there is a stabilization of average indicators, however, some players have shown negative dynamics.

The construction of the training process for the development of speed abilities should be based on scientifically sound methods that take into account the age characteristics of players, the specifics and nature of the competitive load in futsal.

Informed Consent

Informed consent was obtained from all participants.

Data Availability

The data are not publicly available due to ethical or privacy restrictions; anonymized data may be provided upon reasonable request.

Conflict of Interest

The authors declare no conflicts of interest.

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Розвиток швидкісних здібностей гравців вікової категорії U-15 протягом макроциклу в футзалі

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

Реферат. Стаття: 6 с., 2 табл., 1 рис., 15 джерел.

Мета дослідження – обґрунтувати побудову процесу розвитку швидкісних здібностей гравців вікової категорії U-15 у футзалі протягом макроциклу.

Матеріали і методи. У дослідженні брали участь 15 гравців категорії U-15, представники Комунальної установи «Дитячо-юнацька спортивна школа» Богодухівської міської ради (Харківська область), учасники Чемпіонату України з футзалу (U-15) сезону 2024-2025 рр. Середній вік гравців склав 14,8 років. Дослідження проводилось відповідно до етичних принципів «Гельсінської Декларації». Участь в них відбувалось на добровільних засадах, про що спортсмени підписали згоду. Для вирішення поставлених завдань дослідження роботи застосовувався комплекс методів досліджень: аналіз науково-методичної літератури; педагогічне спостереження; педагогічне тестування; методи математичної статистики.

Результати. Аналіз динаміки розвитку швидкісних здібностей гравців вікової категорії U-15 у футзалі протягом макроциклу виявив, що статистично достовірний приріст результату спостерігається лише у підготовчому періоді ($t=11,42$, $p<0,001$). Протягом змагального періоду статистично достовірних відмінностей між результатами тестування на виявлено ($t=0,83$, $p>0,05$; $t=1,97$; $p>0,05$), разом з тим наприкінці спостерігається негативна динаміка ($t= -1,00$; $p>0,05$).

Висновки. Футзал висуває специфічні вимоги до фізичної підготовки гравців, зокрема до розвитку швидкісних здібностей та їх здатності до миттєвих реакцій в умовах частої зміни ігрової ситуації. Проведений аналіз динаміки розвитку

швидкісних здібностей гравців виявив, що достовірне покращення показників відбувається лише в підготовчому періоді, а у зв'язку з тривалим змагальним періодом відбувається стабілізація середніх показників, проте у деяких гравців виявлено негативну динаміку. У зв'язку з цим, побудова тренувального процесу щодо розвитку швидкісних здібностей повинна базуватися на науково обґрунтованих методиках, що враховують вікові особливості гравців, специфіку та характер змагального навантаження в футзалі.

Ключові слова: тренувальний процес, засоби підготовки, фізичні якості, підготовчий період, змагальний період, навантаження.

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