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QORAQALPOG‘ISTON RESPUBLIKASIDA JOYLASHGAN IXTISOSLASHTIRILGAN SPORT MAKTABLARI SPORTCHILARIDA TEZLIK SIFATINI TAHLIL QILISH

N.B. Kdirbaeva
Berdaq nomidagi Qoraqalpoq davlat universiteti tayanch doktoranti
E-mail: kadiebaevanargiza@gmail.com
ORCID iD: 0009-0007-9980-9422
A.T. Matchanov
Berdaq nomidagi Qoraqalpoq davlat universiteti Odan va hayvonlar fiziologiyasi kafedrasi mudiri, biologiya fanlari doktori, professor
ORCID iD: 0000-0001-6066-1327
A.T. Esimbetov
Samarqand davlat veterinariya meditsinasi, chorvachilik va biotexnologiyalar universiteti Nukus filiali direktori, biologiya fanlari doktori, professor.
ORCID: ORCID iD: 0000-0002-6958-1873

Annotatsiya. Ushbu tadqiqotda Qoraqalpog‘iston Respublikasida joylashgan ixtisoslashtirilgan sport maktablari sportchilarida (n=294) 40 m masofaga yugurish testi yordamida tezlik sifati tahlil qilingan. Test natijalariga ko‘ra, futbolchilarda 0–40 metr masofani bosib o‘tish vaqti t=6,63±0,02 sek. (tezlik v=6,03 m/sek.), vYo‘qotilishi=1,95%; yengil atletikachilar uchun 40 metr masofaga yugurish o‘rtacha vaqti t=5,9±0,03 sek. (tezlik v=6,78 m/sek.), vYo‘qotilishi=1,2% ga teng. Voleybolchilarda 40 metr masofaga yugurish o‘rtacha vaqti t=5,31±0,02 sek. (tezlik v=7,76 m/sek.), vYo‘qotilishi=2,92%, kurashchilarda mos ravishda — t=7,78±0,04 sek. (v=5,49 m/sek.), vYo‘qotilishi=6,36% hamda bokschilarda — t=5,66±0,04 sek. (v=7,2 m/sek.), vYo‘qotilishi=3,88%, basketbolchilarda — t=7,38±0,02 sek. (v=5,54 m/sek.), vYo‘qotilishi=2,17% ga tengligi aniqlangan. Maksimal o‘rtacha tezlik voleybolchilarda (v=7,76 m/sek.), erishilgan “maksimal tezlikni barqaror ushlab turish” qobiliyati yengil atletikachilarda (vYo‘qotilishi=1,2%) kuzatilgan. Olingan natijalar sport turlarida tezlik sifatini tahlil qilish, rivojlantirish chora-tadbirlarini ishlab chiqishda ilmiy asos sifatida foydalanilishi mumkinligi ta’kidlangan.

Kalit so‘zlar: futbol, yengil atletika, voleybol, kurash, boks, basketbol, 40 m masofaga yugurish testi, yengil atletikachilarda “maksimal tezlikni barqaror ushlab turish” qobiliyati (vYo‘qotilishi).

Аннотация. В данном исследовании проанализированы показатели скоростных качеств, оцененные с помощью теста бега на 40 м, у спортсменов (n=294) специализированных спортивных школ Республики Каракалпакстан. По результатам тестирования, время преодоления дистанции 0–40 м у футболистов составило t=6,63±0,02 с (скорость v=6,03 м/с), vПотери=1,95%; среднее время преодоления дистанции 40 м у легкоатлетов составило t=5,9±0,03 с (v=6,78 м/с), vПотери=1,2%. У волейболистов среднее время на дистанции 40 м составило t=5,31±0,02 с (v=7,76 м/с), vПотери=2,92%; у борцов соответственно — t=7,78±0,04 с (v=5,49 м/с), vПотери=6,36%; у боксёров — t=5,66±0,04 с (v=7,2 м/с), vПотери=3,88%; у баскетболистов — t=7,38±0,02 с (v=5,54 м/с), vПотери=2,17%. Наивысшая максимальная средняя скорость зафиксирована у волейболистов (v=7,76 м/с), тогда как способность «поддерживать максимальную скорость» наблюдалась у легкоатлетов (vПотери=1,2%). Отмечается, что полученные результаты могут быть использованы в качестве научной основы для анализа скоростных качеств в различных видах спорта и разработки мер по их развитию.

Ключевые слова: футбол, лёгкая атлетика, волейбол, борьба, бокс, баскетбол, тест бега на 40 м, способность «поддерживать максимальную скорость» у легкоатлетов (vПотери).

Annotation. This study analyzed speed-quality indicators, using the 40 m sprint test, in athletes (n=294) from specialized sports schools located in the Republic of Karakalpakstan. According to the test results, the time to cover the 0–40 m distance among footballers was t=6.63±0.02 s (velocity v=6.03 m/s), vLoss=1.95%; the average time for track-and-field athletes to cover the 40 m distance was t=5.9±0.03 s (v=6.78 m/s), vLoss=1.2%. Among volleyball players, the average 40 m time was t=5.31±0.02 s (v=7.76 m/s), vLoss=2.92%; among wrestlers, correspondingly, t=7.78±0.04 s (v=5.49 m/s), vLoss=6.36%; among boxers, t=5.66±0.04 s (v=7.2 m/s), vLoss=3.88%; and among basketball players, t=7.38±0.02 s (v=5.54 m/s), vLoss=2.17%. The highest maximum average speed was recorded among volleyball players (v=7.76 m/s), while the achieved ability to “maintain maximum speed” was observed among track-and-field athletes (vLoss=1.2%). It is emphasized that the obtained results can be used as a scientific basis for analyzing speed quality across different sports and for developing measures aimed at its improvement.

Keywords: football, athletics, volleyball, wrestling, boxing, basketball, 40 m sprint test, ability to “maintain maximum speed” in track-and-field athletes (vLoss).

Kirish. It is known that the objective assessment of athletes' motor (physical) qualities, including speed, plays a decisive role in talent selection, in the planning of training loads, and in improving competitive performance. At the same time, the comparative dynamics of speed-quality indicators among athletes representing different sports, assessed under standardized testing conditions, remain insufficiently substantiated for the conditions of the Republic of Karakalpakstan.

The aim of this study was to analyze speed-quality indicators, using the 40 m sprint test, in athletes (n=294) from specialized sports schools located in the Republic of Karakalpakstan.

Adabiyotlar tahlili

It is known that physical quality is a complex of morpho-functional capacities of the human body, both innate and developing during ontogenesis in the process of physical training, that ensures the effectiveness of motor activity, the performance of physical loads, adaptation to the effects of external environmental factors, and the maintenance of a high level of working capacity [1–9].

As a rule, the main physical qualities are classified as strength, speed (or quickness), endurance, coordination (or agility), and flexibility [5, 7, 8].

Speed is associated with the intensity of the reactions involved in performing a movement per unit of time; it has been shown to depend on the regulation of excitation–inhibition processes in the central nervous system, the rate of nerve-impulse transmission in the afferent/efferent direction, and the efficiency of the neuromuscular complex [5, 7, 8, 10].

As a rule, after reaching starting acceleration and maximum velocity (vmax), the depletion of the body's energy reserves, the increase in the concentration of metabolic products in the muscles, and the effect of fatigue lead to a gradual decrease in speed [14, 15].

The dynamics of speed indicators over the sprint distance are related to the sport-specific characteristics of athletes and differ accordingly, changing favourably under the influence of systematic training [20–24]. The aspects of speed quality related to the specific characteristics of different sports (football, athletics, wrestling, boxing, volleyball, basketball), and the development of this quality, have been analyzed in detail by a number of researchers [25–29].

A large-scale cross-sectional analysis of elite athletes from 23 different sports, tested under identical 40 m sprint conditions, demonstrated that sprint mechanical variables (maximal velocity, horizontal force and power) differ substantially between sports: athletes from disciplines in which sprinting ability is a decisive performance factor (athletics, jumping events) produced markedly higher values than athletes from sports in which linear sprinting is only one of several performance components [30]. This finding provides a mechanistic basis for expecting between-sport variation in 40 m sprint outcomes such as those observed in the present study.

Similarly, a comparative study of junior soccer, basketball, volleyball and handball players found that acceleration and maximum-speed characteristics differed meaningfully between sports, with the strength of the relationship between acceleration and maximum-speed components itself varying by sport [31]. These observations are consistent with the sport-specific pattern of 0–40 m times and vLoss values described below.

With regard to the deceleration phase of sprinting, a systematic review and meta-analysis of match-play demands in elite team sports reported that high-intensity decelerations occur more frequently than accelerations of comparable intensity in the majority of team sports, with the largest asymmetry observed in football [32]. This is a relevant physiological

background for interpreting the relatively larger vLoss values recorded in football and wrestling in the present study, since a pronounced capacity — and, correspondingly, a pronounced demand — for repeated deceleration may be reflected in a less complete maintenance of maximum speed over the final segment of a linear sprint.

Tadqiqot metodologiyasi

2.1. Study population.

The study involved a total of n=294 subjects who regularly engaged in physical training at specialized sports schools in the Republic of Karakalpakstan (football — n=94, athletics — n=58, volleyball — n=49, wrestling — n=48, boxing — n=29, basketball — n=16).

2.2. Adherence to bioethical principles.

In working with the athletes, their consent was obtained, and the principles of the Declaration of Helsinki[1] — “Ethical Principles for Medical Research Involving Human Participants” — approved by the World Medical Association (WMA) were observed. It was guaranteed that the results obtained would be used solely for scientific research purposes and that the identity of the subjects would not be disclosed.

2.3. Method for assessing speed quality.

Speed quality in the athletes was assessed on the basis of the 40 m sprint test. The time (in seconds) required by each subject to cover the 40 m distance was recorded (with a rest interval of 3–5 minutes between attempts; the minimum time value from three repetitions was used for analysis). The initial 0–10 m segment was used to assess starting acceleration, the 10–30 m segment to assess the capacity to increase speed, and the 30–40 m segment to assess the degree of maintaining maximum speed.

The evaluation scale depends on physiological age, sex, sport and other factors; according to several researchers, the following scale is used to evaluate the speed level of male subjects aged 17–25 (0–40 m): ≤ 5 s — “excellent” (5 points), 5.01–5.2 s — “good” (4 points), 5.21–5.4 s — “satisfactory” (3 points), 5.41–5.6 s — “unsatisfactory” (2 points), > 5.6 s — “poor” (1 point). Likewise, for the 0–10 m starting-acceleration segment: ≤1.75 s — “very good”, 1.76–1.9 s — “good”, 1.91–2.05 s — “satisfactory”; for the 10–30 m speed-increase segment: ≤2.2 s — “very good”, 2.21–2.4 s — “good”, 2.41–2.6 s — “satisfactory”; and for the 30–40 m maximum-speed-maintenance segment: ≤1 s — “very good”, 1.01–1.1 s — “good”, 1.11–1.2 s — “satisfactory” [11–13][2].

In the 40 m sprint test, together with the subject's starting acceleration and maximum velocity (vmax), the achieved capacity for “maintaining maximum speed” is an important indicator. To evaluate this indicator, the percentage decrease in velocity over the 20–40 m distance — the proportion of average velocity lost, vLoss — was used [15, 16].

[1]World Medical Association, France. World Medical Association Declaration of Helsinki. Ethical Principles for Medical Research Involving Human Participants // JAMA. – 2025. – V.333(1). Available at: https://hrec.medicine.psu.ac.th/upload/original/WMA%20Declaration... (accessed: 12.08.2026).

[2]Sports Authority of India (SAI). Annexure III – Khelo India Approved Tests – Guidelines and the Template: Sports Science and Sports Specific Tests with Benchmarks. Ministry of Youth Affairs & Sports, Government of India. Available at: https://kheloindia.gov.in/uploads/Hockey... (accessed: 12.08.2026).

The value of the vLoss indicator was calculated using the following modified formula (2.1) [15]:

$$vLoss = ((vmax - vfinal) / vmax) \times 100 \qquad (2.1)$$

where vmax is the maximum speed (m/s) recorded over the 40 m sprint in the overall sub-cohort of subjects, and vfinal is the average speed (m/s) over the 20–40 m interval, calculated as vfinal = 20 / t20–40, where t20–40 is the time (in seconds) required to cover the 20–40 m distance.

2.4. Statistical processing of results.

Mathematical and statistical processing of the experimental results obtained was carried out using standard methods with the specialized software packages Microsoft Excel 2007 (Microsoft, USA) and OriginPro v.8.5 SR1 (EULA, USA). The results of experiments performed with n=3 repetitions are presented as M±m, where M is the arithmetic mean and m is the standard error [17].

Natijalar va ularning tahlili

1-jadval

Qoraqalpog‘iston Respublikasi ixtisoslashtirilgan sport maktablari sportchilarida (n=294) 40 m masofaga yugurish testi natijalari (segmentlar bo‘yicha vaqt, maksimal tezlik va tezlik yo‘qotilishi) (M±m)

Sport turi (n)	0–10 m (s)	10–20 m (s)	20–30 m (s)	30–40 m (s)	20–40 m (s)	0–40 m (s)	vmax (m/s)	vYo‘qotilishi (%)
Futbol (n=94)	1,87±0,02	1,63±0,04	1,6±0,02	1,53±0,02	3,13±0,04	6,63±0,02*	6,15	1,95
Yengil atletika (n=58)	1,65±0,02	1,34±0,03	1,48±0,03	1,43±0,02	2,91±0,04	5,9±0,03	6,86	1,2
Voleybol (n=49)	1,38±0,03	1,21±0,03	1,35±0,02	1,37±0,01	2,72±0,03	5,31±0,02	7,76	2,92
Kurash (n=48)	2,18±0,03	2,03±0,03	1,87±0,04	1,7±0,04	3,57±0,02	7,78±0,04**	5,49	6,36
Boks (n=29)	1,62±0,01	1,15±0,02	1,44±0,02	1,45±0,02	2,89±0,03	5,66±0,04	7,2	3,88
Basketbol (n=16)	2,05±0,04	1,94±0,02	1,73±0,03	1,66±0,03	3,39±0,03	7,38±0,02**	5,54	2,17

*Izoh: * — voleybol guruhiga nisbatan (eng past 0–40 m ko‘rsatkichi, t=5,31±0,02 sek.) boshqa guruhlarda p<0,05; ** — p<0,01 (n=3).*

The average values obtained for footballers in the 40 m sprint test correspond, in general, to data available in the literature [18, 19].

Based on the results obtained, in footballers, the average time to cover the initial 0–10 m segment (starting acceleration) in the 40 m sprint test was 1.87±0.02 s (velocity v=5.35 m/s), the average time for the 10–20 m segment was 1.63±0.04 s (v=6.13 m/s), for the 20–30

m segment was 1.6±0.02 s (v=6.25 m/s), and for the 30–40 m segment was 1.53±0.02 s (v=6.54 m/s); the time to cover the full 0–40 m distance was t=6.63±0.02 s (v=6.03 m/s).

In footballers (n=94), the maximum speed value recorded in the 40 m sprint test was vmax=6.15 m/s, and the time to cover the 20–40 m distance was t=3.13±0.04 s; accordingly, the average speed over the 20–40 m interval was:

$$v_{20–40} = 40 / 6.63 = 6.15 \text{ m/s}$$

The decrease in speed over the 20–40 m distance — the proportion of average velocity lost, vLoss — was accordingly calculated as:

$$vLoss = (6.15 - 6.03) / 6.15 \times 100 = 1.95\%$$

Thus, for track-and-field athletes, the average time for the 40 m sprint was t=5.9±0.03 s (v=6.78 m/s), with vLoss=1.2%. Among volleyball players, the average 40 m time was t=5.31±0.02 s (v=7.76 m/s), with vLoss=2.92%; among wrestlers, correspondingly, t=7.78±0.04 s (v=5.49 m/s), with vLoss=6.36%; among boxers, t=5.66±0.04 s (v=7.2 m/s), with vLoss=3.88%; and among basketball players, t=7.38±0.02 s (v=5.54 m/s), with vLoss=2.17%, as confirmed by the results.

It was noted that the highest maximum average speed was recorded among volleyball players (v=7.76 m/s), while the greatest ability to maintain maximum speed was achieved by track-and-field athletes (vLoss=1.2%).

It has also been noted in research that, in football, the final 10 m segment of the sprint distance — which requires maintaining maximum speed — is directly related to agility quality [19].

The dynamics of speed indicators over the sprint distance are related to the sport-specific characteristics of athletes and differ accordingly, changing favourably under the influence of systematic training [20–24].

These sport-specific patterns are broadly consistent with the earlier-described cross-sport comparisons [30, 31]: volleyball, characterized by short, repeated jumping and sprinting actions over relatively short distances, was associated with the highest recorded maximum velocity in the present cohort, whereas wrestling — a sport in which linear sprinting ability is not a primary performance determinant — showed both the lowest maximum velocity and the highest vLoss. The comparatively high vLoss recorded in football and wrestling may additionally reflect the elevated frequency of high-intensity deceleration actions characteristic of these sports, as previously reported for team-sport match play [32].

From a practical standpoint, these findings suggest that speed-quality assessment protocols for athletes of specialized sports schools should take into account not only maximum sprint velocity but also the athlete's capacity to maintain that velocity (vLoss), since the two parameters appear to be influenced by partly independent sport-specific demands and may therefore require separate consideration when designing sport-specific speed-development programmes.

Xulosalar

Thus, it was established that the time to cover the 0–40 m distance among footballers was t=6.63±0.02 s (v=6.03 m/s), with vLoss=1.95%; for track-and-field athletes, the average

40 m sprint time was t=5.9±0.03 s (v=6.78 m/s), with vLoss=1.2%. Among volleyball players, the average 40 m time was t=5.31±0.02 s (v=7.76 m/s), with vLoss=2.92%; among wrestlers, correspondingly, t=7.78±0.04 s (v=5.49 m/s), with vLoss=6.36%; among boxers, t=5.66±0.04 s (v=7.2 m/s), with vLoss=3.88%; and among basketball players, t=7.38±0.02 s (v=5.54 m/s), with vLoss=2.17%. It was confirmed that the highest maximum average speed was observed among volleyball players (v=7.76 m/s), while the greatest ability to maintain maximum speed (vLoss=1.2%) was achieved by track-and-field athletes.

The findings obtained can be used as a scientific basis for analyzing speed quality across different sports and for developing measures aimed at its improvement.

Mualliflar bayonotlari

Mualliflar hissasi: barcha mualliflar tadqiqot konsepsiyasini ishlab chiqish, ma'lumotlarni yig'ish va tahlil qilish hamda maqola matnini tayyorlashda teng hissa qo'shgan.

Manfaatlar to‘qnashuvi: mualliflar manfaatlar to'qnashuvi mavjud emasligini bildiradi.

Moliyalashtirish manbai: tadqiqot tashqi moliyaviy yordamsiz, mualliflarning shaxsiy tashabbusi asosida amalga oshirilgan.

Foydalanilgan adabiyotlar

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