

ANALYSIS OF SPEED QUALITY IN ATHLETES

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ABSTRACT

Speed is one of the most important physical qualities for athletes. It depends on how well the nervous system and muscles work together. This study looked at the speed of 294 athletes from sports schools in Karakalpakstan, using a 40 m running test. The athletes were from six sports: football, athletics, volleyball, wrestling, boxing, and basketball. The fastest average speed was found in volleyball players ($v = 7.76$ m/s). The best ability to keep top speed until the end of the run was found in athletics (track and field) athletes ($v_{Loss} = 1.2\%$). These results can help coaches understand and improve speed training in different sports.

Speed means how fast a person can react and move in a given time. It depends on the work of the central nervous system (how well it starts and stops signals), how fast nerve signals travel to and from the muscles, and how well the nerves and muscles work together [Kochman et al., 2023; pp. 18–26].

The aim of this study was to look at the speed of athletes ($n = 294$) from special sports schools in the Republic of Karakalpakstan, using a 40 m running test.

Materials and methods. A total of 294 athletes took part in the study. They all trained regularly at special sports schools in the Republic of Karakalpakstan. The athletes were from six sports: football ($n = 94$), athletics ($n = 58$), volleyball ($n = 49$), wrestling ($n = 48$), boxing ($n = 29$), and basketball ($n = 16$). All athletes agreed to take part in the study. The study followed the rules of the Declaration of Helsinki (“Ethical Principles for Medical Research Involving Human Subjects”), made by the World Medical Association (WMA). The results were used only for science, and the names of the athletes were kept private.

Speed was measured with a 40 m running test. Each athlete ran 40 m, and the time (in seconds) was recorded. Athletes rested for 3–5 minutes between runs, ran three times, and the best (shortest) time was used. The first 0–10 m showed how fast the athlete could start. The 10–30 m part showed how well the athlete could build up speed. The 30–40 m part showed how well the athlete could keep the top speed [Haugen et al., 2013; pp. 148–156].

In the 40 m test, along with starting speed and top speed (v_{max}), it is also important to see how well an athlete can keep the top speed. To measure this, we used v_{Loss} – the percent of speed lost between 20 and 40 m [Healy et al., 2022; pp. 75–84].

The v_Loss value was found using this formula (2.1) [Healy et al., 2022; pp. 75–84]:

$$v_Loss = ((v_max - v_final) / v_max) \times 100 \quad (2.1)$$

Here, v_max is the top speed (m/s) in the 40 m run for all athletes, and v_final is the average speed (m/s) between 20 and 40 m. It is found as $v_final = 20 / t_{20-40}$, where t_{20-40} is the time (in seconds) needed to run from 20 m to 40 m.

All numbers from the study were checked and processed using Microsoft Excel 2007 (Microsoft, USA) and OriginPro v. 8.5 SR1 (EULA, USA), with standard methods [Glantz, 1999; p. 459].

Results. The test showed the following results. Footballers ran the 40 m in $t = 6.63 \pm 0.02$ s ($v = 6.03$ m/s), with $v_Loss = 1.95\%$. Athletics (track and field) athletes ran it in $t = 5.9 \pm 0.03$ s ($v = 6.78$ m/s), with $v_Loss = 1.2\%$. Volleyball players ran it in $t = 5.31 \pm 0.02$ s ($v = 7.76$ m/s), with $v_Loss = 2.92\%$. Wrestlers ran it in $t = 7.78 \pm 0.04$ s ($v = 5.49$ m/s), with $v_Loss = 6.36\%$. Boxers ran it in $t = 5.66 \pm 0.04$ s ($v = 7.2$ m/s), with $v_Loss = 3.88\%$. Basketball players ran it in $t = 7.38 \pm 0.02$ s ($v = 5.54$ m/s), with $v_Loss = 2.17\%$. The fastest average speed was in volleyball players ($v = 7.76$ m/s). The best ability to keep top speed was in athletics athletes ($v_Loss = 1.2\%$).

Conclusion. The study found that volleyball players had the fastest average speed ($v = 7.76$ m/s), and athletics athletes were best at keeping their top speed ($v_Loss = 1.2\%$). These results can be used as a scientific base to study speed in sports and to plan ways to improve it.

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