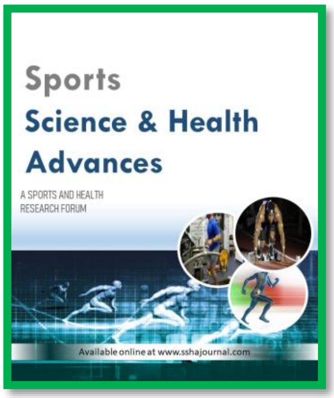
Original Article

Comparative Analysis of Sprint Ability in Athletes and Non-Athletes across 10 to 100 Meters

Ummay Hafsa Rumky[1*], Mst. Mukta Khatun[2*], Humayon Ahmed[3], Mst. Khadiza Akter[4], Suvo Roy[5]

[1,2,3,4,5]Department of Physical Education and Sports Science, Jashore University of Science and Technology, Jashore, Bangladesh

*Correspondence: muktakhatun5392@gmail.com



Peer-Reviewed
Refereed
Indexed

Check for updates

How to cite: Rumky, U. H., Khatun, M. M., Ahmed, H., Akter, M. K., & Roy, S. (2025). Comparative Analysis of Sprint Ability in Athletes and Non-Athletes across 10 to 100 Meters. *Sports Science & Health Advances*. 3(1), 428-434. https://doi.org/10.60081/SSHA.3.1.2025.428-434

Received: 21-05-2025
Accepted: 26-06-2025
Published: 30-06-2025

Abstract

Background: Sprint performance is a key indicator of athletic capability, reflecting explosive speed, power, and neuromuscular coordination. Comparative studies between athletes and non-athletes across multiple sprint distances remain limited, especially when accounting for gender differences. **Study Purpose**: This study aimed to evaluate and compare sprint performance over 10 m, 30 m, 50 m, and 100 m distances between university-level athletes and non-athletes of both sexes. **Material and Methods**: Eighty students from Jashore University of Science and Technology, Bangladesh were equally divided into four groups: male and female athletes and non-athletes (n = 20 each). Sprint times over 10, 30, 50, and 100 meters were manually recorded. Data were analyzed using descriptive statistics and independent t-tests in IBM SPSS (version 25), with significance set at $p < 0.05$. **Results**: Athletes demonstrated significantly faster sprint times than non-athletes across all distances. Among males, athletes outperformed non-athletes at 10 m ($t(38) = -8.31$, $p < .001$), 30 m ($t(38) = -9.38$, $p < .001$), 50 m ($t(38) = -7.30$, $p < .001$), and 100 m ($t(38) = -6.35$, $p < .001$). Female athletes showed even greater differences at 10 m ($t(38) = -17.57$, $p < .001$), 30 m ($t(38) = -11.54$, $p < .001$), 50 m ($t(38) = -23.60$, $p < .001$), and 100 m ($t(38) = -20.55$, $p < .001$), confirming superior sprint performance among athletes of both sexes. **Conclusion**: University athletes exhibited superior sprint performance compared to non-athletes across all tested distances, regardless of sex. These results highlight the significant impact of athletic training on short-distance speed and support targeted conditioning programs for performance enhancement.

Keywords: Athletic training, Gender differences, Speed test, Sprint performance, University Student

Introduction

Physical fitness refers to the body's ability to function efficiently and effectively in daily activities while maintaining good health. Being physically fit means performing daily tasks with minimal effort (Bushman, 2017). Fitness is a fundamental element of athletes' success and serves as the primary foundation, alongside game-specific skills and tactics that influence overall performance (Reza et al., 2024). Physical fitness generally comprises eleven components: six health-related and five skill-related. Each of these components is vital for optimal performance in sports and other physical activities (American College of Sports Medicine, 2008). Key fitness components include muscular endurance, power, strength, flexibility, cardiorespiratory endurance, and body composition. Skill-related components, as the term implies, enhance performance in motor-skill-based activities such as sports. Research has shown a strong association between sprinting and various physical fitness components (Durandt et al., 2006).

Sprinting is defined as running a specific distance at maximum or near-maximum speed, with the runner referred to as a sprinter (Naser et al., 2017). Sprint performance is largely determined by the ability to accelerate rapidly and sustain high running speeds (Bezodis et al., 2019). In sprint events, athletes aim to reach the finish line as quickly as possible by running at their top speed (Bompa & Buzzichelli, 2019).

Track and field sprint events typically include the 100m, 200m, and 400m races, all of which demand a combination of speed and power. Speed is defined as the rate of movement over a given time, while power refers to the rapid application of force. Sprinting plays a crucial role in the success of both individual and team sports (Alcaraz et al., 2018). Sprint tests are commonly included in assessment batteries for field- and track-based sports; however, testing methods vary depending on sprint distance and starting style (Ellis et al., 2000). Short sprints, such as the 10m sprint, primarily reflect acceleration capabilities, whereas longer sprints like the 50m also measure maximal speed. These distances emphasize different physical traits due to variations in biomechanics, muscle activation, and strength requirements (Young et al., 2001). For instance, Little and Williams (2005) found only a 39% correlation between 10m sprint times and maximal speed measured by a flying 20m sprint (Young et al., 2008). Overall, speed variables significantly contribute to enhanced efficiency, responsiveness, and overall performance (Singh et al., 2024).

Consistent and properly designed training programs are crucial for enhancing both fitness and athletic performance (Mola et al., 2025). Research has shown that power training is particularly effective in improving short-distance sprint performance over 10 to 20 meters, although improvements in maximum sprint speed are generally more modest (Blazevich & Jenkins, 2002). Maximum speed is typically achieved after approximately 40 meters from a standing start but can be reached in just 28.7 meters when beginning from a "fast stride" at 7 m/s (Benton, 2000). Elite sprinters often reach peak velocity between 50 and 80 meters into a race (Volkov & Lapin, 1979), highlighting the progression of speed development over distance. In terms of gender differences, Rahman et al. (2020) reported that female athletes display a slight advantage in quickness compared to their sedentary counterparts.

Success in sprint events requires highly developed physical attributes, with speed being critical for executing rapid, successive actions (Douglas et al., 2018). To maintain peak speed during the deceleration phase of a race, sprinters aim to minimize fatigue-related declines in velocity (Slawinski et al., 2017). Genetic factors also play a significant role in sprint performance; as renowned sprint coach Charlie Francis famously stated, “Sprinters are born, not made” (Francis, 2012). However, sprinting ability can fluctuate throughout a person’s life due to factors such as training, aging, maturity, and development (Malina et al., 1988). Additionally, adequate nutrition knowledge is essential for athletes to develop proper eating habits, which significantly impact sports performance (Taye et al., 2024).

Understanding the relationship between physical fitness components and sprint performance is essential for optimizing athletic development and training. Since sprinting relies on elements such as strength, power, flexibility, and speed, examining their influence on sprint ability can enhance performance, support talent identification, and inform sport-specific conditioning programs. Despite growing interest in sprint performance and fitness assessment, limited research has focused on comparing sprint ability between athletes and non-athletes in a university setting, particularly across different sprint distances. This study aims to fill that gap by examining the impact of athletic training on sprint performance in both male and female university students. By identifying specific fitness attributes associated with enhanced sprint ability, the findings can help coaches, trainers, and educators develop more effective, evidence-based training and conditioning strategies tailored to various athletic and non-athletic populations.

Materials and Methods

Subjects

Eighty university-level athletes (N = 80) from Jashore University of Science and Technology, Jashore, Bangladesh, participated in the study. They were equally divided into four groups: male professionals, male amateurs, female professionals, and female amateurs (n = 20 each). Informed consent was obtained in accordance with institutional ethical guidelines.

Table 1 General characteristic of the subjects (mean±SD)

Groups	Groups	n	Age (yr)	Height (cm)	Weight (kg)	BMI (kg/m2)
Male	Athletes	20	23.10±2.15	167.50±6.48	63.80±7.04	22.81±2.78
	No-athletes	20	24.20±1.01	168.90±5.39	71.55±13.23	25.08±4.34
Female	Athletes	20	22.00±2.38	161.95±6.27	52.65±6.95	20.08±2.42
	No-athletes	20	22.35±1.27	156.75±6.70	54.40±11.83	22.14±4.69

Procedure

Sprint performance tests were conducted over four distances. All procedures were standardized and supervised to ensure consistency and reliability. Sprint performance was tested over 10, 30, 50, and 100 meters. One sprint per distance was hand-timed. For the 100-metersprint, split times at 10m, 30m, and 50m were also recorded. All sprints took place on a flat, dry field.

Statistical Analysis

All data were analyzed using IBM SPSS Statistics (version 25; IBM). Descriptive statistics (mean ± standard deviation) were calculated for all variables. Independent t-tests were conducted to examine differences between groups based on sex and athletic level (athletes vs. non-athletes). Statistical significance was set at $p< 0.05$.

Results

Table 2 presents descriptive statistics of the speed variable, showing that athletes recorded faster sprint times than non-athletes across all distances. Males performed slightly better than females.

Table 2 Descriptive statistics of speed variable

Variables	Groups	Groups	n	Mean	Std. Deviation	Std. Error Mean
10 meters	Male	Athletes	20	2.03	0.14	0.03
		No-athletes	20	2.74	0.35	0.08
	Female	Athletes	20	2.12	0.08	0.02
		No-athletes	20	3.15	0.25	0.06
30 meters	Male	Athletes	20	4.31	0.21	0.05
		No-athletes	20	5.28	0.41	0.09
	Female	Athletes	20	4.29	0.18	0.04
		No-athletes	20	6.28	0.75	0.17
50 meters	Male	Athletes	20	6.80	0.33	0.07
		No-athletes	20	8.07	0.71	0.16
	Female	Athletes	20	6.56	0.23	0.05
		No-athletes	20	10.05	0.62	0.14
100 meters	Male	Athletes	20	13.37	0.48	0.11
		No-athletes	20	16.29	2.00	0.45
	Female	Athletes	20	13.40	0.55	0.12
		No-athletes	20	20.66	1.48	0.33

Table 3 Independent Sample t-test of Fitness Variables

Variables	Groups	Groups	Mean difference	Std. error difference	t	df	Sig. (2-tailed)
10-meter Speed (sec.)	Male	Athletes	-0.71	0.09	-8.31	38.00	0.00
		No-athletes	-0.71	0.09	-8.31	24.97	0.00
	Female	Athletes	-1.03	0.06	-17.57	38.00	0.00
		No-athletes	-1.03	0.06	-17.57	23.24	0.00
30-meter Speed (sec.)	Male	Athletes	-0.97	0.10	-9.38	38.00	0.00
		No-athletes	-0.97	0.10	-9.38	28.76	0.00
	Female	Athletes	-1.98	0.17	-11.54	38.00	0.00
		No-athletes	-1.98	0.17	-11.54	21.11	0.00
50-meter Speed (sec.)	Male	Athletes	-1.27	0.17	-7.30	38.00	0.00
		No-athletes	-1.27	0.17	-7.30	26.92	0.00
	Female	Athletes	-3.48	0.15	-23.60	38.00	0.00
		No-athletes	-3.48	0.15	-23.60	24.05	0.00
100-meter Speed (sec.)	Male	Athletes	-2.92	0.46	-6.35	38.00	0.00
		No-athletes	-2.92	0.46	-6.35	21.21	0.00
	Female	Athletes	-7.26	0.35	-20.55	38.00	0.00
		No-athletes	-7.26	0.35	-20.55	24.24	0.00

*. Significant at 0.05 level

Table 3 presents the results of independent samples t-tests comparing sprint performance between athletes and non-athletes across four distances (10 m, 30 m, 50 m, and 100 m) for both males and females. The results show that athletes performed significantly better than non-athletes in all sprint events. Among males, athletes had faster times at 10 m (t (38) = -8.31, p< .001), 30 m (t (38) = -9.38, p< .001), 50 m (t (38) = -7.30, p< .001), and 100 m (t (38) = -6.35, p< .001). Similarly, female athletes outperformed non-athletes at 10 m (t(38) = -17.57, p< .001), 30 m (t (38) = -11.54, p< .001), 50 m (t (38) = -23.60, p< .001), and 100 m (t (38) = -20.55, p< .001). All differences were statistically significant at the p< .05 level, indicating superior sprint performance among athletes regardless of sex.

Discussion

Statistical analysis confirmed that athletic training significantly enhances sprint performance across all distances for both males and females (p < 0.001). Athletes consistently outperformed non-athletes, with the most substantial differences observed among female non-athletes in longer sprints, likely due to lower neuromuscular and anaerobic capacity. These results support existing research showing that structured sprint training improves acceleration, technique, and endurance underscoring the importance of including sprint-specific training in physical education programs. According to Morin et al. (2011), the ability to effectively apply horizontal force is a key determinant of sprint performance, particularly during the acceleration phase. The marked differences observed in the 10 m and 30 m sprints in our study likely reflect athletes' superior capacity to generate and direct force horizontally during initial strides. This is further supported by Rabita et al. (2015), who found that elite sprinters exhibit greater propulsive impulse in early acceleration, contributing to enhanced performance. The 10-meter sprint times varied significantly across different age groups (Islam & Rakib, 2024).

The most pronounced disparity in our data emerged in the female non-athlete group over the 100 m distance (20.66 s vs. 13.40 s), indicating not only a lack of sprint-specific training but also underdeveloped anaerobic endurance. As highlighted by Miller et al. (2011), anatomical and biomechanical characteristics such as reduced relative muscle mass and altered stride mechanics can hinder sprint performance in untrained females. Our findings are consistent with those of Shalfawi et al. (2011) and Highton et al. (2012), who reported that trained individuals, even at the university level, demonstrate superior sprint mechanics, faster reaction times, and more resilient muscle-tendon function. These performance traits, developed through regular training, are often absent in non-athletic individuals.

Additionally, Cronin and Hansen (2009) emphasized the critical role of lower-body muscular strength in sprinting, particularly in explosive acceleration. This supports the superior performance of the athlete groups in our study, as they likely possess greater neuromuscular power. Kukolj et al. (1999) also highlighted the importance of concentric force production during the initial sprint steps, offering a biomechanical explanation for the significant advantages observed in the 10 m sprint among athletes. Complementing this, Mendez-Villanueva et al. (2011) demonstrated that sprint-specific interventions, such as resisted sprint drills, effectively improve acceleration and stride frequency—key contributors to mid-distance sprint performance. This insight aligns with the advantage observed among athletes at the 50 m distance in our data. Weyand et al. (2000) concluded that sprint performance depends more on the rapid application of ground forces than on stride frequency, which aligns with our findings of superior athlete performance at 10 m and 30 m. Spencer et al. (2005) further noted that untrained individual's fatigue more quickly due to lower anaerobic capacity, explaining the weaker 100 m results in female non-athletes.

In summary, the findings of this study reinforce a growing body of evidence that structured athletic training significantly improves sprint performance by enhancing biomechanics, neuromuscular efficiency, and anaerobic capacity. These outcomes highlight the need for targeted physical education strategies that incorporate sprint-specific training to enhance the physical competencies of non-athletic populations, particularly in school and university environments.

Conclusion

Sprint performance was consistently higher among university athletes than non-athletes at all distances, regardless of sex. This suggests that regular athletic training plays a key role in enhancing short-distance speed and supports the implementation of focused training programs to boost sprint ability.

Acknowledgment

The authors express their gratitude to all participants who contributed to the study.

Conflicts of interest

The authors declare no conflicts of interest.

ORCID

Ummay Hafsa Rumky https://orcid.org/0009-0007-3444-5998
Mst. Mukta Khatun https://orcid.org/0009-0005-7892-139X
Humayon Ahmed https://orcid.org/0009-0005-1289-5192
Mst. Khadiza Akter https://orcid.org/0009-0004-2994-1389
Suvo Roy https://orcid.org/0009-0008-9767-3629

References

Alcaraz, P. E., Carlos-Vivas, J., Oponjuru, B. O., &Martínez-Rodríguez, A. (2018). The effectiveness of resisted sled training (RST) for sprint performance: A systematic review and meta-analysis. Sports Medicine, 48(9), 2143–2165. https://doi.org/10.1007/s40279-018-0947-8

American College of Sports Medicine. (2008). ACSM's health-related physical fitness assessment manual (2nd ed.). Lippincott Williams & Wilkins

Benton, D. (2000). An analysis of sprint running patterns in Australian Rules football: The effect of different starting velocities on the velocity profile (Unpublished Honours thesis). University of Ballarat.

Bezodis, N. E., Willwacher, S., &Salo, A. I. T. (2019). The biomechanics of the track and field sprint start: A narrative review. Sports Medicine, 49(9), 1345–1364. https://doi.org/10.1007/s40279-019-01138-1

Blazevich, A. J., & Jenkins, D. G. (2002).Effect of the movement speed of resistance training exercises on sprint and strength performance in concurrently training elite junior sprinters.Journal of Sports Sciences, 20(12), 981–990. https://doi.org/10.1080/026404102321011742

Bompa, T. O., &Buzzichelli, C. A. (2019).Periodization: Theory and methodology of training (6th ed.). Human Kinetics.

Bushman, B. A. (2017). Complete guide to fitness and health (2nd ed.). Human Kinetics.

Cronin, J. B., & Hansen, K. T. (2009). Strength and power predictors of sports speed. Journal of Strength and Conditioning Research, 23(7), 1863–1869. https://doi.org/10.1519/JSC.0b013e3181b6c8d5

Douglas, J., Pearson, S., Ross, A., &McGuigan, M. (2018). Kinetic determinants of reactive strength in highly trained sprint athletes. Journal of Strength and Conditioning Research, 32(6), 1562–1570. https://doi.org/10.1519/JSC.0000000000002245

Durandt, J., Tee, J. C., Prim, S. K., & Lambert, M. I. (2006). Physical fitness components associated with performance in a multiple-sprint test. International Journal of Sports Physiology and Performance, 1(2), 150–160

Ellis, L., Gastin, P., & Lawrence, S. (2000). Protocols for the physiological assessment of team sport players. In C. J. Gore (Ed.), Physiological tests for elite athletes (pp. 128–144). Human Kinetics.

Francis, C. (2012). The Charlie Francis training system [Kindle version].Amazon.https://www.amazon.com/dp/B008ZK0WR8

Highton, J., Twist, C., & Lamb, K. L. (2012). The reliability and validity of non-motorised treadmill sprint performance measures. Journal of Strength and Conditioning Research, 26(2), 458–465. https://doi.org/10.1519/JSC.0b013e31822e59bd

Islam, M. A., & Rakib, M. R. (2024). Comparing speed progression in pre-adolescent girls: A developmental analysis. Sports Science & Health Advances, 2(2), 291–298. https://doi.org/10.60081/SSHA.2.2.2024.291-298

Kukolj, M., Jaric, S., &Mirkov, D. (1999).Relationship between force-time characteristics and vertical jump performance.European Journal of Applied Physiology, 80(3), 254–257. https://doi.org/10.1007/s004210050566

Little, T., & Williams, A. G. (2005). Specificity of acceleration, maximum speed, and agility in professional soccer players. Journal of strength and conditioning research, 19(1), 76–78. https://doi.org/10.1519/14253.1

Malina, R. M., Bouchard, C., &Beunen, G. (1988). Human growth: Selected aspects of current research on well-nourished children. Annual Review of Anthropology, 17, 187–219. https://doi.org/10.1146/annurev.an.17.100188.001155

Mendez-Villanueva, A., Hamer, P., & Bishop, D. (2011). Fatigue in repeated-sprint exercise is related to muscle power factors and reduced neuromuscular activity. European Journal of Applied Physiology, 111(5), 1007–1015. https://doi.org/10.1007/s00421-010-1716-0

Miller, R. H., Umberger, B. R., Hamill, J., & Caldwell, G. E. (2011).Evaluation of the minimum energy hypothesis and other potential optimality criteria for human running.Proceedings of the Royal Society B: Biological Sciences, 279(1733), 1498–1505. https://doi.org/10.1098/rspb.2011.2015

Mola, D. W., Rahman, M. H., Uvinha, R. R., Adane, A. K., Tyagi, S., Adili, D., & Islam, M. S. (2025). Effect of 12 week training program on the fitness and performance of long jumpers. International Journal of Kinesiology & Sports Science. 13(1), 45–53. http://dx.doi.org/10.7575/aiac.ijkss.v.13n.1p.45

Morin, J. B., Edouard, P., &Samozino, P. (2011).Technical ability of force application as a determinant factor of sprint performance.Medicine & Science in Sports & Exercise, 43(9), 1680–1688. https://doi.org/10.1249/MSS.0b013e318216ea37

Naser, N., Ali, A., & Macadam, P. (2017).Physical and physiological demands of futsal.Journal of Exercise Science & Fitness, 15(2), 76–80. https://doi.org/10.1016/j.jesf.2017.09.001

Rabita, G., Dorel, S., Slawinski, J., Sàez-de-Villarreal, E., Couturier, A., Samozino, P., & Morin, J. B. (2015). Sprint mechanics in world-class athletes: A new insight into the limits of human locomotion. Scandinavian Journal of Medicine & Science in Sports, 25(5), 583–594. https://doi.org/10.1111/sms.12389

Rahman, M. H., Chanda, S., & Reza, M. N. (2020). Comparison of simple choice visual reaction time between athlete and sedentary university women students. European Journal of Physical Education and Sport Science, 6(4), 1–8. http://dx.doi.org/10.46827/ejpe.v0i0.3045

Reza, M. N., Rahman, M. H., Islam, M. S., Mola, D. W., & Andrabi, S. M. H. (2024). Assessment of motor fitness metrics among athletes in different sports: An original research. Physical Education Theory and Methodology, 24(1), 47–55. https://doi.org/10.17309/tmfv.2024.1.06

Shalfawi, S. A. I., Tønnessen, E., & Haugen, T. A. (2011).The relationship between sprinting and jumping performance in professional soccer players.Journal of Strength and Conditioning Research, 25(4), 944–950. https://doi.org/10.1519/JSC.0b013e3181c86508

Singh, P., Kumar, D., Morya, M., Singh, R., & Rahman, M. H. (2024). Evaluating key biomotor abilities: A comparison between national and international elite tennis players. Physical Education Theory and Methodology, 24(6), 897–904. https://doi.org/10.17309/tmfv.2024.6.06

Slawinski, J., Termoz, N., Rabita, G., Le Pellec-Muller, A., Morin, J.-B., &Seyfarth, A. (2017). How 100-m event analyses improve our understanding of world-class men's and women's sprint performance. Scandinavian

Journal of Medicine & Science in Sports, 27(1), 45–54. https://doi.org/10.1111/sms.12632

Spencer, M., Bishop, D., Dawson, B., & Goodman, C. (2005). Physiological and metabolic responses of repeated-sprint activities: Specific to field-based team sports. Sports Medicine, 35(12), 1025–1044. https://doi.org/10.2165/00007256-200535120-00003

Taye, A. G., Mola, D. W., & Rahman, M. H. (2024). Analyzing the nutritional awareness, dietary practices, attitudes, and performance of U-17 football players in Ethiopia. Physical Education Theory and Methodology, 24(1), 110–117. https://doi.org/10.17309/tmfv.2024.1.14

Volkov, N., & Lapin, V. (1979).Analysis of the velocity curve in sprint running.Medicine and Science in Sports, 11(4), 332–337.

Weyand, P. G., Sternlight, D. B., Bellizzi, M. J., & Wright, S. (2000). Faster top running speeds are achieved with greater ground forces not more rapid leg movements. Journal of Applied Physiology, 89(5), 1991–1999. https://doi.org/10.1152/jappl.2000.89.5.1991

Young, W., Benton, D., Duthie, G., & Pryor, J. (2001).Resistance training for short sprints and maximum-speed sprints.Strength and Conditioning Journal, 23(2), 7–13. https://doi.org/10.1519/00126548-200104000-00002

Young, W., Russell, A., Burge, P., Clarke, A., Cormack, S., & Stewart, G. (2008). The use of sprint tests for assessment of speed qualities of elite Australian Rules footballers. International Journal of Sports Physiology and Performance, 3(2), 199–206.