STUDIA UBB EDUCATIO ARTIS GYMN., LXX, Special Issue 1, 2025, pp. 359-370
(RECOMMENDED CITATION)
DOI: 10.24193/subbeag.70.sp.iss.1.25

EXPLOSIVE POWER OF THE LOWER LIMBS IN FENCING AND TRACK AND FIELD ATHLETES

Ioana-Alexandra RADU[1]*, Luisa Cristiana GAMEN[2]

ABSTRACT. *Introduction*: Explosive power in the lower limbs is fundamental in fencing, influencing not only the performance, but also the overall dynamics of movements. Similarly, track and field events heavily rely on the strength and explosive capabilities of the lower limbs. *Objective:* The aim of the study was to compare the explosive power of the lower limbs between fencing and track and field athletes. *Material and Methods*: The study was conducted on 70 athletes (35 fencers and 35 track and field athletes) from Iasi, Romania, both males (37.1%) and females (62.9%), aged 13-14 years and 19-20 years. The instruments used to measure the explosive power in athletes were the Standing Long Jump (SLJ) Test and the Vertical Jump Test (Sargent Jump). *Results*: The analysis of the Standing Long Jump (SLJ) Test and the Vertical Jump Test (Sargent Jump) showed no statistically significant differences in the lower limb explosive power between the fencing and the track and field athletes for the first age group, but showed statistically significant differences in the second age group. *Discussion:* The Standing Long Jump (SLJ) Test and the Vertical Jump Test (Sargent Jump) act as benchmarks for younger athletes, allowing coaches to tailor training programs that cater to their specific need, thus enhancing their chances of success in both fencing and track and field. *Conclusions:* The Standing Long Jump Test and the Vertical Jump Test serve as a vital tool in the sports disciplines of athletics and track and field, providing essential metrics regarding explosive lower limb power.

Keywords: fencing; track and field; power; strength; lower limbs.

[1] Doctoral School in Sports Science and Physical Education, Faculty of Physical Education and Sport, "Alexandru Ioan Cuza" University of Iași, Romania
[2] Doctoral School in Sports Science and Physical Education, Faculty of Physical Education and Sport, "Alexandru Ioan Cuza" University of Iași, Romania
* Corresponding author: radu.ioana123@gmail.com

INTRODUCTION

Explosive power is the combination of maximum strength and maximum velocity. High value of muscle strength and velocity can lead to good measurement of explosive power (Pandoyo et al., 2020). The evolution of the explosive power is strongly influenced by the transition from preadolescence to adolescence, which represents a critical period of physical and neuromuscular development. During this stage, children undergo significant hormonal, muscular and structural changes that enhance their ability to produce force rapidly. These adaptations include increase in muscle mass, improvements in intermuscular coordination and greater efficiency in motor unit recruitment, all of which contribute to the development of explosive power. During adolescence, individual undergo substantial physiological changes due to hormonal shifts, particularly increases in testosterone and growth hormone levels, which contribute to muscle hypertrophy and enhanced neuromuscular efficiency (Pinto et al., 2017). Research indicates that from approximately ages 13 to 18, adolescents experience peak increases in lower limb muscle strength and explosive power (Ling, 2013). This coincides with critical periods for training interventions that can maximize these physiological developments. Moreover, explosive power in sports involves the ability to generate high force in a short period, which is crucial for actions such as sprinting, jumping, and rapid directional changes.

Explosive power, defined as the ability the explosive power of the lower limbs is fundamental in fencing, influencing not only performance but also the overall dynamics of movements such as lunging and advancing. Explosive power, defined as the ability to exert maximum force in the shortest time, is crucial for athletes who require rapid and forceful movements to execute techniques effectively (Pandoyo et al., 2020). Explosive power is a critical factor in athletic performances of both fencers and track and field athletes.

In fencing, explosive power is essential due to the nature of the sport, which is characterized by quick movements and rapid directional changes. Fencers must generate a substantial force in a brief time, particularly during lunges and rapid retreats. Research indicates that enhanced lower limb strength and explosive power correlate with increased lunge velocity and quicker movements, making this attribute crucial for competitive fencing (Chen et al., 2017; Turner et al., 2014). This power is not merely a byproduct of strength; rather, it is a requisite for executing complex movements required in the sport, where repeated explosive actions are performed in quick succession interspersed with lower-intensity activities (Hagiwara et al., 2023).

Explosive power is a key component for success in track and field disciplines as well (Hermwan et al., 2023; Litao et al., 2023). This power is primarily derived from fast- twitch muscle fibers that are engaged during sprinting, jumping and throwing motions. Athletes in power events, such as sprinters and jumpers, require a unique combination of strength and speed to maximize their performance in high-stake competitions (Loturco et al., 2015). The ability to execute explosive movements is closely related to an athlete's muscle mechanical properties, which can differ significantly depending on the event the athlete is specializing in (Loturco et al., 2015).

Athletic disciplines like sprinting and jumping events rely heavily on the strength and explosive capabilities of the lower limbs. Studies have indicated that greater lower limb strength is positively associated with enhanced sprinting speed and vertical jump height (Exell et al., 2016; O`Driscoll et al., 2024).

Understanding how explosive lower-limb power develops differently between these sports can inform more targeted training programs, adapted to both the athlete's sport demands and biological stage. By comparing fencers and track and field athletes, this research seeks to fill a gap in knowledge about how training specificity and maturation interact to shape explosive performance. Such insights are valuable for coaches and sports scientists aiming to optimize long-term athletic development and prevent training inefficiencies during adolescence.

Our general objective is to compare the explosive power of the lower limbs in fencing and track and field athletes across different ages and stages of pubertal development.

MATERIAL AND METHODS

The present study employed a quantitative, comparative and correlational research design aimed at analyzing the differences in lower-limb explosive power between fencers and track and field athletes across two age groups representing different stages of maturation. The research sought to identify how age and gender influence the development of explosive power, using standardized physical performance tests.

Participants

The approval of the Ethics Committee must be mentioned along with the statement that approved consent was obtained from all subjects.

A total of 70 athletes voluntarily participated in the study. The sample consisted of 40 athletes aged 13-14 years (20 fencers and 20 track and field athletes) and 30 athletes aged 19-20 years (15 fencers and 15 track and field athletes). All participants were male and female competitive athletes from sports clubs in Iasi, Romania.

Anthropometric characteristics such as height (cm) and weight (kg) were recorded prior to the performance tests (Table 1 and Table 2).

The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. All participants provided informed consent prior to participation.

Table 1. Anthropometric data of the subjects 13-14 year old

Sport	Number	Gender	Height (cm)	Weight (kg)
Track and field	20	F=14; M=6	160.0±8.9	42.2±4.9
Fencing	20	F=11; M=9	170.2±10.2	56.4±10.9
Total	40	F=25; M=15	165.6±10.6	49.3±11.0

Table 2. Anthropometric data of the subjects 19-20 year old

Sport	Number	Gender	Height (cm)	Weight (kg)
Track and field	15	F=9; M=6	179.9±6.3	64.3±7.9
Fencing	15	F=10; M=5	174.7±9.7	63.9±11.2
Total	30	F=19; M=11	177.3±8.4	64.1±9.5

Procedure

Data collection was conducted in the athletes' regular training environments to ensure ecological validity. Prior to testing, participants performed a 20-minute dynamic warm-up, including light jogging, mobility exercises, running drills and short sprints.

Explosive power was evaluated using two standardized field tests (Mackenzie, 2005):

1. Standing Long Jump (SLJ) Test, which measured horizontal explosive power of the lower limbs. Participants stood behind a marked line with feet shoulder-width apart and jumped forward as far as possible using both legs. The best of two trials was recorded in centimeters (cm).
2. Vertical Jump (VJ) Test, which assessed vertical explosive power. Participants performed a counter movement jump starting from an upright position, using arm swing for maximal effort. The highest jump height, recorded in centimeters (cm), was taken as the final score.

All tests followed the same protocol for both sports and age groups to ensure reliability.

Anthropometric measurements were taken using a stadiometer and a digital scale.

Materials

The materials used in this study included:

- Stadiometer, for measuring height;
- Digital weighting scale (Tanita) for measuring body mass;
- Measure tape and adhesive floor markers for the standing long jump;
- Measure tape and markers;
- Data recording sheets and Jamovi statistical software (version 2.7.6) for data entry and analysis.

All measurements adhered to the International System of Unites (SI) and abbreviations were defined upon first use.

Data analysis

Data was processed and analyzed using the Jamovi statistical software (version 2.7.6). Descriptive statistics (mean ± standard deviation) were calculated for all variables. The Shapiro–Wilk test was applied to assess data normality. Depending on data distribution, Independent Samples T-Tests or Mann–Whitney U tests were used to compare explosive power between groups.

To evaluate the relationship between gender and performance indicators (SLJ, VJ), Pearson's or Spearman's correlation coefficients were computed. Statistical significance was set at $p < 0.05$.

RESULTS

Track and field athletes achieved a mean Standing Long Jump (SLJ) distance of 196.4 ± 13.3 cm, while fencers jumped slightly shorter distances, with a mean SLJ of 194.5 ± 21.3 cm. Vertical jump (VJ) performance was similar between groups, with track and field athletes averaging 35.9 ± 5.0 cm and fencers 35.8 ± 5.9 cm. Only the best performance jump for each individual was recorded and reported (Table 3).

Table 3. Explosive power performance in the 13-14 years old athletes

Variables	Track and field	Fencing
SLJ (cm)	196.4±13.3	194.5±21.3
VJ (cm)	35.9±5.0	35.8±5.9

Track and field athletes achieved a mean SLJ distance of 240.4 ± 15.5 cm, whereas fencers recorded a mean SLJ distance of 221.5 ± 13.8 cm. VJ performance was 52.1 ± 10.1 cm for track and field athletes and 39.4 ± 5.6 cm for fencers. Only the best performance jump for each individual was recorded and reported (Table 4).

Table 4. Explosive power performance in the 19-20 year old athletes

Variables	Track and field	Fencing
SLJ (cm)	240.4±15.5	221.5±13.8
VJ (cm)	52.1±10.1	39.4±5.6

Prior to conducting the comparative analysis, the normality of data distribution was verified using Shapiro-Wilk test for each variable and sport group.

For the 13-14 year old athletes, the SLJ data were normally distributed ($p > 0.05$), while the VJ data showed a non-normal distribution in the track and field group ($p = 0.032$). Therefore, an independent samples t-test was applied for the SLJ, and a non-parametric Mann-Whitney U test was used for VJ. Homogeneity of variances was verified with Lavene's test ($p = 0.051$), indicating equal variances between sports and supporting the use of the standard t-test. The results of the 13-14 years group indicated no statistically significant differences between fencing and track and field athletes in either SLJ ($t(38) = 0.338$, $p = 0.737$, $d = 0.107$) or VJ ($U = 192$, $p = 0.839$) (Table 5).

Table 5. Statistical analysis for the 13–14-year-old athletes

		Shapiro-Wilk	Levene's	Test statistic	Df	p-value	Effect size Cohen's d
SLJ (cm)	T&F	0.138	0.051	t=0.338	38	0.737	0.107
	Fencing	0.203					
VJ (cm)	T&F	0.032	-	U=192	-	0.839	-
	Fencing	0.139					

For the 19-20 years group, all variables met the normality assumption (*p*>0.05), allowing the use of independent samples t-tests for both SLJ and VJ. Homogeneity of variances was verified using Levene's test. The results indicated equal variances for SLJ ($F(1,28) = 0.292$, $p = 0.593$) and unequal variances for VJ ($F(1,28) = 7.663$, $p = 0.010$). Consequently, the Student's t-test was used for SLJ and the Welch's t-test for VJ. Significant differences were observed in both tests, with track and field athletes achieving higher values compared to fencers. The SLJ showed a significant difference ($t = 3.54$, $p = 0.001$, $d = 1.29$), while the VJ, analyzed with Welch's correction due to unequal variances, also revealed a highly significant difference ($t = 4.26$, $p < 0.001$, $d = 1.55$) (Table 6).

Table 6. Statistical analysis for the 19–20-year-old athletes

Variables	Test statistic	Df	p-value	Effect size Cohen's d
SLJ (cm)	t=3.54	28	0.001	1.29
VJ (cm)	t=4.26	28	0.001	1.55

To further explore potential factors influencing explosive power, the relationship between gender (female = 1, male = 0) and performance in the SLJ and VJ was analyzed withing each sport and age group. Pearson correlations were used when the performance variables were normally distributed and Spearman correlations were applied when normality assumptions were not met.

In the 13-14-years- old track and field group, Pearson correlation indicated no significant relationship between gender and SLJ performance ($r = –0.047$, $p = 0.844$), while Spearman correlation showed no significant association between gender and VJ performance ($\rho = –0.076$, $p = 0.749$), suggesting that male and female athletes in this group performed similarly in both tests. In the 13–14-year-old fencing group, strong negative correlations were observed for both SLJ ($r = –0.777$, $p < 0.001$) and VJ ($r = –0.799$, $p < 0.001$), indicating that male fencers exhibited substantially higher explosive strength than female fencers (Table 7).

Table 7. Correlations between gender and SLJ and VJ in the 13-14 year old athletes

		r/p	***p***
Track and field	SLJ	-0.047	0.844
	VJ	-0.076	0.749
Fencing	SLJ	-0.777	<0.001
	VJ	-0.799	<0.001

For the 19–20-year-old track and field group, very strong negative correlations were found for SLJ ($r = –0.771$, $p < 0.001$) and VJ ($r = –0.903$, $p < 0.001$), reflecting the greater performance of male athletes in this older age group. Similarly, in the 19–20-year-old fencing group, the correlation between gender and VJ remained very strong and negative ($r = –0.890$, $p < 0.001$), while SLJ also showed a strong negative correlation ($r = –0.909$, $p < 0.001$) (Table 8).

Table 8. Correlations between gender and SLJ and VJ in the 19-20 year old athletes

		r	***p***
Track and field	SLJ	-0.771	<0.001
	VJ	-0.903	<0.001
Fencing	SLJ	-0.909	<0.001
	VJ	-0.890	<0.001

DISCUSSION

For the 13–14 year old group, no statistically significant differences were found in either the SLJ (t = 0.338, p = 0.737, d = 0.107) or the VJ (u = 192, p = 0.839) between fencing and athletics athletes. Both groups demonstrated comparable levels of explosive strength, suggesting that at this developmental stage, sport-specific training has not yet produced differentiated effects on lower-limb power. This finding is consistent with research showing that between ages 13 and 18, adolescents undergo substantial physiological transformations — including increases in testosterone and growth hormone — that lead to muscle hypertrophy, improved neuromuscular efficiency, and enhanced motor control (Pinto et al., 2017; Ling, 2013; Hermawan et al., 2023). These changes mark the onset of the critical growth window for strength and power development, during which biological maturation exerts a stronger influence on performance than training specificity. As Ravi (2024) and Ling (2013) suggest, the explosive capabilities of adolescents begin to accelerate around age 13 but reach their peak only in late adolescence. Therefore, the absence of significant differences between fencing and athletics athletes at 13–14 years likely reflects a stage where maturation and general training dominate performance, while sport-specific adaptations are still emerging.

In contrast, the results from the 19–20 years group revealed highly significant differences between the two sports. Athletics athletes achieved greater performance in both the SLJ (t = 3.54, p = 0.001, d = 1.29) and VJ (t = 4.26, p < 0.001, d = 1.55), with large to very large effect sizes. These outcomes clearly indicate a superior level of explosive strength in track and field athletes compared to fencers. Such differences can be attributed to long-term, sport-specific training adaptations that accumulate during late adolescence and early adulthood (Litao et al., 2023). Track and field athletes typically engage in more frequent and specialized plyometric and power-based training, which enhances the stretch-shortening cycle and neuromuscular coordination required for explosive performance (Jastrzębski et al., 2014; Shuai et al., 2025). These exercises directly improve maximal force production and jump performance, explaining the higher results in athletics athletes. Conversely, fencing prioritizes agility, reaction time, and unilateral explosive actions rather than maximal jump power (Turner et al., 2014), with only one general physical training session per week—limiting the development of maximal lower-limb power.

The comparison across age groups also illustrates a developmental trajectory: while early adolescents display little variation between sports, differences become more pronounced after 18 years of age. This supports the idea that sport-specific differentiation in explosive strength emerges only after the major phase of physical maturation, when neuromuscular and hormonal systems stabilize and the effects of long-term training accumulate (Ling, 2013; Litao et al., 2023; Pinto et al., 2017). Studies have shown that lower-limb power output continues to increase significantly through late adolescence, particularly in athletes exposed to structured plyometric and resistance training (Shuai et al., 2025; LI et al., 2025; Chen, 2023). The superior performances observed among 19–20-year-old athletics athletes thus reflect both physiological maturity and the cumulative benefit of years of targeted training for explosive strength.

From a practical perspective, these findings suggest that multilateral physical development should be emphasized during early adolescence, as athletes in this age group are still undergoing foundational neuromuscular and hormonal changes. Coaches of younger athletes should prioritize general strength and coordination work, postponing narrow specialization until after peak height velocity and the onset of stable power development. For fencing coaches, progressively integrating bilateral and plyometric exercises could enhance leg power and complement the sport's agility-oriented demands. Meanwhile, athletics coaches can interpret these results as evidence of the effectiveness of plyometric and power-oriented programs, particularly during late adolescence, when such training aligns with peak physiological readiness for strength development (Jastrzębski et al., 2014; Shuai et al., 2025).

The correlations between gender and explosive performance further reinforce these patterns. In the younger athletics group (13–14 years), both standing long jump and vertical jump showed very weak, non-significant correlations with gender ($r = -0.047$ to -0.076, $p > 0.05$), indicating that males and females perform similarly before major hormonal divergence. This aligns with previous findings showing minimal gender-based performance differences in prepubescent and early pubescent athletes (Thomas et al., 2020). However, in fencing, where maturation may occur earlier, strong negative correlations were observed even in this younger group ($r = -0.777$ to -0.799, $p < 0.001$), possibly reflecting earlier pubertal onset among female fencers.

By late adolescence (19–20 years), strong and significant gender correlations emerged in both sports (r = –0.890 to –0.909, p < 0.001), indicating that male athletes exhibited superior explosive strength. This is consistent with established evidence that testosterone levels in males drive greater muscle hypertrophy and strength gains, particularly in power-oriented activities (Handelsman et al., 2018; Mateo-Orcajada et al., 2022). Thomas et al. (2020) further showed that while males continue improving in jumping performance up to ages 16–17, females tend to plateau earlier, around 12–13 years old. These physiological and hormonal differences become decisive in late adolescence, explaining the stronger gender-performance associations observed in the older groups.

Overall, the present findings align closely with existing literature, supporting the conclusion that explosive strength development during adolescence is governed first by biological maturation and later by sport-specific training. Between 13–14 years, general growth processes overshadow training effects, whereas after 18, differentiated training loads and physiological specialization yield marked inter-sport and inter-gender differences. These insights emphasize the need for age-appropriate and gender-sensitive training approaches in both fencing and track and field, ensuring optimal development of explosive power across the athlete's growth trajectory.

CONCLUSIONS

This study compared the explosive power of the lower limbs in fencing and track and field athletes across different ages and stages of pubertal development. The results showed that at 13–14 years, there were no significant inter-sport differences in jumping performance, suggesting that explosive strength was primarily influenced by biological maturation rather than sport-specific training. However, at 19–20 years, track and field athletes displayed significantly greater performance, reflecting the effects of long-term, power-oriented training adaptations.

Gender differences were minimal in early adolescence but became pronounced in late adolescence, with male athletes outperforming females in both jump tests. These findings confirm that both maturation and training specialization play key roles in developing explosive power.

Overall, the study highlights that sport-specific differentiation in lower-limb power emerges after pubertal development and that early training should emphasize general physical preparation. Future research should explore longitudinal changes and include broader samples to further understand the interaction between growth, gender, and training specialization.

AUTHOR CONTRIBUTIONS

Ioana-Alexandra Radu and Luisa Cristiana Gamen contributed to the design and implementation of the research, to the analysis of the results and to the writing of the manuscript. All authors have read and agreed to the published version of the manuscript.

REFERENCES

Chen, J. (2023). Effects of stretching on lower limb strength in basketball athletes. *Revista Brasileira De Medicina Do Esporte, 29.* https://doi.org/10.1590/1517-8692202329012022_0669

Chen, T., Wong, D., Wang, Y., Ren, S., Yan, F., & Zhang, M. (2017). Biomechanics of fencing sport: A scoping review. *PLOS ONE, 12*(2), e0171578. https://doi.org/10.1371/journal.pone.0171578

Exell, T., Irwin, G., Gittoes, M., & Kerwin, D. (2016). Strength and performance asymmetry during maximal velocity sprint running. *Scandinavian Journal of Medicine and Science in Sports, 27*(11), 1273–1282. https://doi.org/10.1111/sms.12759

Hagiwara, M., Yamagishi, T., Okamoto, S., Azuma, Y., & Yamashita, D. (2023). Short-term repeated sprint training in hypoxia improves explosive power production capacity and repeated sprint ability in Japanese international-level male fencers: A case study. *Physiological Reports, 11*(6). https://doi.org/10.14814/phy2.15637

Handelsman, D. J., Hirschberg, A. L., & Bermon, S. (2018). Circulating testosterone as the hormonal basis of sex differences in athletic performance. *Endocrine Reviews, 39*(5), 803–829. https://doi.org/10.1210/er.2018-00020

Hermawan, I., Fachrezzy, F., Ginanjar, S., Widyawan, D., Husaini, F., & Maslikah, U. (2023). Comparison of vertical jump test measuring instruments with Choronojump on the explosive power of leg muscles of Indonesian badminton elite athletes. *Kinestetik: Jurnal Ilmiah Pendidikan Jasmani, 7*(3), 748–755. https://doi.org/10.33369/jk.v7i3.30240

Jastrzębski, Z., Wnorowski, K., Mikolajewski, R., Jaskulska, E., & Radzimiński, Ł. (2014). The effect of a 6-week plyometric training on explosive power in volleyball players. *Baltic Journal of Health and Physical Activity, 6*(2). https://doi.org/10.2478/bjha-2014-0008

LI, Y., Guo, Q., Shao, J., Gan, Y., Zhao, Y., & Zhou, Y. (2025). Neuromuscular factors predicting lower limb explosive strength in male college sprinters. *Frontiers in Physiology, 15.* https://doi.org/10.3389/fphys.2024.1498811

Ling, X. (2013). *Research on the influence of complex training on the explosive force of adolescent athletes.* Proceedings of the 2nd International Conference on Science and Social Research. https://doi.org/10.2991/icssr-13.2013.59

Litao, G., Yang, J., & Xutao, L. (2023). Influence of lower limb resistance training on the explosive quality of athletes. *Revista Brasileira De Medicina Do Esporte, 29.* https://doi.org/10.1590/1517-8692202329012023_0015

Loturco, I., Gil, S., Laurino, C., Roschel, H., Kobal, R., Abad, C., & Nakamura, F. (2015). Differences in muscle mechanical properties between elite power and endurance athletes. *The Journal of Strength and Conditioning Research, 29*(6), 1723–1728. https://doi.org/10.1519/jsc.0000000000000803

Mackenzie, B. (2005). *101 performance evaluation tests*. Electric Word plc.

Mateo-Orcajada, A., Abenza-Cano, L., Cano-Martínez, A., & Vaquero-Cristóbal, R. (2022). The importance of healthy habits to compensate for differences between adolescent males and females in anthropometric, psychological and physical fitness variables. *Children, 9*(12), 1926. https://doi.org/10.3390/children9121926

O'Driscoll, M., Mooney, T., & Sweeney, L. (2024). The relationship between maximum lower limb strength & power, and GPS acceleration speed in elite U20 Gaelic football athletes. *International Journal of Strength and Conditioning, 4*(1). https://doi.org/10.47206/ijsc.v4i1.282

Pandoyo, P., Indraswari, D., Marijo, M., & Bakhtiar, Y. (2020). The effect of plyometrics training on explosive power of medical students in Diponegoro University. *Jurnal Kedokteran Diponegoro (Diponegoro Medical Journal), 9*(3), 213–219. https://doi.org/10.14710/dmj.v9i3.27495

Pinto, V., Gantois, P., Dantas, M., Araújo, J., Cabral, S., & Cabral, B. (2017). Relationship between bone age, hormonal markers and physical capacity in adolescents. *Journal of Human Growth and Development, 27*(1), 77. https://doi.org/10.7322/jhgd.127658

Ravi, P. (2024). Improving athletic abilites: The role of circuit training in student populations. *Untitled. International Journal of Yogic, Human Movement and Sports Sciences, 9*(1). https://doi.org/10.22271/yogic.2024.v9.i1.b

Shuai, C., Wang, X., Li, Z., Xinqi, J., & Li, G. (2025). Effects of plyometric training on lower-limb explosive power and its retention after detraining in sprinters. *American Journal of Men's Health, 19*(4). https://doi.org/10.1177/15579883251363089

Thomas, E., Petrigna, L., Tabacchi, G., Teixeira, E., Pajaujienė, S., Sturm, D. J., Sahim, F. N., Gómez-López, M., Pausic, J., Paoli, A., Alesi, M., & Bianco, A. (2020). Percentile values of the standing broad jump in children and adolescents aged 6–18 years old. *European Journal of Translational Myology.* https://doi.org/10.4081/ejtm.0.9050

Turner, A., James, N., Dimitriou, L., Greenhalgh, A., Moody, J., Fulcher, D., Milas, E., & Kilduff, L. (2014). Determinants of Olympic fencing performance and implications for strength and conditioning training. *The Journal of Strength and Conditioning Research, 28*(10), 3001–3011. https://doi.org/10.1519/jsc.0000000000000478