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OPTIMISING THE POWER CAPACITY FOR ATHLETS IN THROWING EVENTS

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Abstract. Background. Throwing events in athletics–such as shot put, discus, and javelin–require a unique combination of strength, speed, coordination, and technical precision. Over the years, coaches and researchers have developed various training strategies to improve performance in these disciplines. Among the most common approaches are training methods that involve throwing with heavier or lighter implements than the standard competition weight. These methods are believed to help athletes develop both explosive power and better movement patterns.
Despite the growing use of such techniques, there is still some debate about their actual effectiveness in improving performance over time. While some studies suggest positive results, others highlight the need for more controlled experiments to confirm these findings. Additionally, less attention has been given to the physiological demands placed on athletes during these specific training sessions–especially from an aerobic and neuromuscular point of view. In this scientific paper, I aim to present the optimization of power through specific athletic methods, such as plyometric training and exercises using medicine balls.
Objectives. The purpose of this paper was to validate whether athletic training programs for throwers, incorporating specific exercises such as throws with heavy implements and lighter-weighted implements, can lead to significant improvements in performance.
Methods. Observation method, bibliographic study method, statistical-mathematical method, experimental method.
Results. Physical exercise plays a crucial role in improving performance among throwers.Training programs for throwers are inherently complex, as high-level performance requires a well-rounded, multilateral approach to physical preparation.
Conclusion. Ultimately, it can be concluded that optimizing strength capacity in throwing events is achievable through the implementation of specific athletic exercises. The comparison between initial and final test results clearly indicates measurable improvements in performance.

Keywords: Throwing events, strength, force.

Introduction

Maximizing muscular strength output is essential in throwing sports, as athletes must generate high force within extremely short time frames to excel (Bartlett, 2000). Events like shot put, discus, and javelin require a complex coordination of biomechanical and neuromuscular elements, demanding a comprehensive approach to physical conditioning, technique, and functional training (Bartlett, 1992). Research highlights that developing explosive strength, refining the force-velocity profile, and maintaining precise biomechanical control are fundamental factors that differentiate elite throwers (Izquierdo, Hakkinen, Gonzalez-Badillo, Ibanez, & Gorostiaga, 2002). Training regimens over the long term need to induce specific adaptations across both upper and lower body kinetic chains. Athletes display unique strength characteristics tailored to the specific neuromuscular requirements of their discipline, emphasizing the importance of individualized training strategies (Izquierdo et al., 2002).

In these throwing events, cultivating both maximal strength and the ability to rapidly express force–known as explosive strength–is vital for executing fast, powerful movements (Bouhlel, Chelly, Tabka, & Shephard, 2007). The force-velocity relationship is a critical indicator of an athlete's capacity to produce force quickly, a necessity in throwing actions (Rahmani, Viale, Dalleau, & Lacour, 2001). Training with moderate loads at high speeds, such as through medicine ball throws or dynamic bench presses, can enhance this relationship and improve muscular power (Marques, van den Tilaar, Vescovi, & Gonzalez-Badillo, 2007). Incorporating dynamic testing and motion analysis into training routines further allows for precise adjustments to workload and early detection of neuromuscular imbalances (Rahmani, Dalleau, Viale, Hautier, & Lacour, 2000). Biomechanically, throwing is characterized by a well-timed sequence of force production and transmission, beginning from the ground, progressing through the torso, and culminating in the release via the upper limbs (Lanka, 2000). Effective force transfer between the lower and upper body segments requires highly coordinated intersegmental movement. Any disruption within this kinetic chain can diminish energy efficiency, regardless of an athlete's strength levels (Bartlett, 2000). Therefore, comprehensive training involving full kinetic chain exercises–such as rotational throws and multidirectional drills-is indispensable for optimizing force transfer and overall performance (Dorel et al., 2005). The development of strength gains true value when combined with consistent, objective monitoring. Modern measurement tools offer accurate data on movement velocity, muscle-tendon stiffness, and force output, all of which inform the fine-tuning of training programs (Murphy, Watsford, Coutts, & Pine, 2003). For example, monitoring bar speed during bench presses or measuring force during squats using motion capture systems provides realistic insights into an athlete's strength potential (Rahmani, Locatelli, & Lacour, 2004). Furthermore, characteristics such as the stiffness of the triceps surae and the inertia of the upper limb play significant roles in force transmission efficiency and can indicate injury risk if neglected (Rambaud, Rahmani, Moyen, & Bourdin, 2008). Research consistently reveals strong links between throwing velocity and the power generated during maximal or near-maximal efforts, underscoring the need for functional strength training adapted to the sport's specific motor demands (Marques et al., 2007). Additionally, factors often underestimated, such as trunk stability, postural control, and segmental coordination, are critical to executing throwing movements safely and effectively (Bartlett, 2000

Subjects and research

The present exeperiment was realised with the participation of 6 athletes, 3 female and 3 male, aged 16–30 years (m = 22), from the track&field. The all subjects have competitional exeprience 5–10 years of competitional experience

Tabel 1. This table presents anonymized details regarding the subjects involved in the testing process

THROWER	AGE	EVENT	COMPETITIVE EXPERINCE
1	16	Discus throw	10 years
2	18	Shot put	5 years
3	22	Javelin throw	9 years
4	30	Shop put	10 years
5	20	Discus throw	5 years

Organisation of research

For this experiment all the athletes were informed about all the details of the tests, the athletes participated as volunteers. all the throwers received the initial results and the final results. Each thrower received an individualized program for the practiced event

Results and Discussions

Table 2 – Show the results of the 5 jumps single leg test, initial and final testing. It can be seen that the values range.

5 JUMPS SINGLE JEG						
THROWER	INITIAL TESTING			FINAL TESTING		
	LEG	h/cm	Power	LEG	h/cm	Power
1	R.L	16,2	16,50	R.L	30	31,5
	L.L	15	7,34	L.L	28	29,5
2	R.L	16,7	17,25	R.L	28,23	30,2
	L.L	7,1	5,5	L.L	29,2	38,3
3	R.L	7,9	9,10	R.L	26,5	22,4
	L.L	10,24	9,8	L.L	32,3	32,8
4	R.L	16,3	13,3	R.L	28,2	24,5
	L.L	10	15	L.L	26,4	35,6
5	R.L	12,3	16,2	R.L	24,5	28,3
	L.L	6,2	7	L.L	35,3	28,9
6	R.L	12,5	14,7	R.L	26,4	22,1
	L.L	13	10,9	L.L	32,8	36,77

Table 3 – which presents the statistical-mathematical indicators, that the mean increased from the initial to the final test, which records that the athletes improved their skills for the 5 jumps test for strength, from 11.88 to 30.07.

Statistical indicators	Initial testing 5 Jumps Single Leg power	Final testing 5 Jumps Single Leg power
Minim	5,5	22,1
Maxim	17,25	38,3
Amplitude	11,75	16,2
Average	11,88	30,07
Median	12,1	29,85
Modulule	12,1	29,85
Standard deviation	4,11	5,31

Table 4. Results – Wilcoxon test for the initial testing and for the final testing

Rezultate	W	Z	p	r
Test 5 Jumps Single Leg- the right leg power	**30**	**–0,706**	**0,04**	**0,2**
Test 5 Jumps Single Leg- the left leg- power	**10**	**–2,044**	**0,041**	**0,6**

We will structure the analysis of the data obtained for the test statistic and the statistic calculated with the excell program in order to confirm the research hypothesis and see whether the data are confirmed or not.

With the Wilcoxon test I was able to more easily analyze the differences between the two tests performed in this research, so that Z values, alpha significance threshold and effect size could be recorded.

The analyzed results were structured at the numerical level, expressing the performance improvement.

So, for this test, for the right leg, we recorded the Wilcoxon test result, which was 11.5, the Z value, −2.157, the alpha significance threshold, 0.030, as well as the effect size 0.6 (strong effect). The results were considered significant at the alpha significance threshold <0.05 (0.030<0.05). Moreover, for the same sample on the left foot, we noted the Wilcoxon test total (8), the z-value (−2.222), the alpha significance threshold (0.026), as well as the effect size (0.2 – weak effect). The results are considered significant at p<0.05 (0.026<0.05) The null hypothesis is rejected, indicating an increase at the significant level for the jumps performed.

Legend:

W – value for the test, sum of ranks;

p – alpha significance threshold;

Z – Z value;

r – effect size.

Conclusions

Physical exercise plays a fundamental role in improving the performance of throwers. In the training process of a thrower, consistent and well-targeted physical work is essential. It's not just about getting stronger–it's about learning to apply that strength effectively during key moments in competition. Structured exercise routines focused on explosive power and functional movement have been shown to produce visible performance gains over time. The aim is to train the body not only to generate force but to do so precisely when it matters most–within the split-second execution of a throw

Authors' Contributions

All authors have equally contributed to this study.

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