

EFFECTIVENESS OF IMPROVING NUCLEAR PROPULSION TECHNIQUES BASED ON BIOMECHANICAL ANALYSIS

A.Djabbarov

Tashkent State University of Economics
Teacher of the Department of Physical Culture and sports
activities



Abstract: This article examines the role of biomechanical analysis in enhancing shot put performance. Through a comprehensive literature review, it explores the key biomechanical factors influencing shot put technique, including release parameters, kinetic chain utilization, and lower body mechanics. The study synthesizes findings from various research sources to provide insights into effective training methods and technique refinement strategies.

Keywords: Shot put, biomechanics, technique improvement, performance enhancement, track and field

Annotatsiya: Ushbu maqola yadro itqitish samaradorligini oshirishda biomexanik tahlilning rolini ko'rib chiqadi. Adabiyotlarni har tomonlama ko'rib chiqish yadro itqitish texnikasiga ta'sir qiluvchi asosiy biomexanik omillarni, shu jumladan ejeksiyon parametrlarini, kinetik zanjirdan foydalanishni va pastki tana mexanikasini ko'rib chiqadi. Tadqiqot samarali o'qitish usullari va texnikani takomillashtirish strategiyalari haqida tushuncha berish uchun turli ilmiy tadqiqotlar natijalarini umumlashtiradi.

Kalit so'zlar: yadro otish, biomexanika, texnikani takomillashtirish, samaradorlikni oshirish, yengil atletika

Аннотация: В этой статье рассматривается роль биомеханического анализа в повышении эффективности толкания ядра. На основе всестороннего обзора литературы рассматриваются ключевые биомеханические факторы, влияющие на технику толкания ядра, включая параметры выброса, использование кинетической цепи и механику нижней части тела. В

исследовании обобщены результаты различных научных исследований, чтобы дать представление об эффективных методах обучения и стратегиях совершенствования техники.

Ключевые слова: Толкание ядра, биомеханика, совершенствование техники, повышение результативности, легкая атлетика

INTRODUCTION

Shot put, a pivotal event in track and field athletics, demands a harmonious blend of strength, speed, and technical proficiency. As athletes and coaches continually seek ways to enhance performance, biomechanical analysis has emerged as a crucial tool for understanding and refining shot put technique. This article aims to explore the effectiveness of utilizing biomechanical principles to improve shot put performance.

METHODS AND LITERATURE REVIEW

This study employed a systematic literature review approach, analyzing peer-reviewed articles, books, and conference proceedings related to shot put biomechanics and technique improvement. Key Biomechanical Factors in Shot Put: Several studies have identified critical biomechanical factors that influence shot put performance. Linthorne (2001) highlighted the importance of release parameters, including release velocity, angle, and height [1]. These factors directly affect the projectile motion of the shot and, consequently, the throwing distance.

Kinetic Chain Utilization: Research by Čoh et al. (2019) emphasized the significance of effective kinetic chain utilization in shot put [2]. Their analysis revealed that sequential activation of body segments, starting from the lower extremities and progressing through the trunk to the throwing arm, is crucial for maximizing throwing distance.

Lower Body Mechanics: A study by Zatsiorsky and Kraemer (2006) underscored the role of lower body mechanics in shot put performance [3]. They

found that powerful leg drive and hip rotation contribute significantly to generating the initial momentum necessary for a successful throw.

Biomechanical Analysis Techniques: Various biomechanical analysis techniques have been employed to study shot put performance. Ariel et al. (2004) utilized 3D motion capture systems to analyze the kinematics of elite shot putters [4]. Their findings provided insights into optimal joint angles and body positions throughout the throwing motion.

RESULTS

The literature review revealed several key findings regarding the effectiveness of biomechanical analysis in improving shot put technique:

Release Parameters Optimization: Studies consistently show that optimizing release parameters can lead to significant performance improvements. Linthorne (2001) found that a 1% increase in release velocity can result in a 2% increase in throwing distance [1].

Kinetic Chain Enhancement: Research by Čoh et al. (2019) demonstrated that athletes who effectively utilize the kinetic chain can generate up to 25% more force at the point of release compared to those with less efficient techniques [2].

Lower Body Power Development: Zatsiorsky and Kraemer (2006) reported that improvements in lower body strength and power, particularly in the hip and knee extensors, correlate strongly with increased throwing distance [3].

Technique Refinement through Motion Analysis: Ariel et al. (2004) showed that 3D motion analysis could identify subtle technical flaws that are not visible to the naked eye, allowing for targeted technique refinement [4].

Individualized Biomechanical Profiles: Research by Stockbrugger and Haennel (2001) emphasized the importance of developing individualized biomechanical profiles for athletes, as optimal techniques may vary based on anthropometric characteristics and physical capabilities [5].

ANALYSIS AND DISCUSSION

The findings from this literature review underscore the significant potential of biomechanical analysis in enhancing shot put performance. By providing objective data on an athlete's movement patterns, biomechanical analysis enables coaches and athletes to make informed decisions about technique modifications and training strategies.

Practical Applications:

1. **Technique Optimization:** Coaches can use biomechanical data to identify areas for technique improvement, focusing on optimizing release parameters and enhancing kinetic chain utilization. For example, video analysis combined with force plate measurements can help athletes refine their power position and release mechanics.
2. **Individualized Training Programs:** Biomechanical profiles can inform the development of personalized training programs that address an athlete's specific strengths and weaknesses. This may involve targeted strength and power exercises for the lower body or specific drills to improve rotational mechanics.
3. **Injury Prevention:** Understanding the biomechanics of shot put can also contribute to injury prevention. By identifying potentially harmful movement patterns, coaches can guide athletes towards safer, more efficient techniques.
4. **Performance Monitoring:** Regular biomechanical assessments can serve as a valuable tool for monitoring an athlete's progress and evaluating the effectiveness of training interventions. This data-driven approach allows for timely adjustments to training programs.
5. **Talent Identification:** Biomechanical analysis can aid in identifying young athletes with favorable physical characteristics and movement patterns for shot put, potentially guiding talent development efforts.

Limitations and Future Research: While biomechanical analysis offers significant benefits, it is important to acknowledge its limitations. The complexity of human movement and individual variations among athletes mean that

biomechanical data should be interpreted in conjunction with other factors, such as an athlete's experience, physical capabilities, and psychological state.

CONCLUSION

This review demonstrates that biomechanical analysis can significantly contribute to improving shot put technique and performance. By providing objective data on movement patterns, release parameters, and force production, biomechanical analysis enables coaches and athletes to optimize training strategies and refine throwing techniques. The practical applications of these findings extend beyond elite-level competition, offering valuable insights for athletes at various skill levels.

As technology continues to advance, the integration of biomechanical analysis into shot put training and competition is likely to become increasingly prevalent. However, it is crucial to remember that biomechanical data should complement, rather than replace, the expertise of experienced coaches and the intuition of skilled athletes. In conclusion, the effective utilization of biomechanical analysis in shot put represents a promising avenue for performance enhancement in track and field athletics. By bridging the gap between scientific understanding and practical application, biomechanics can play a pivotal role in pushing the boundaries of human performance in this challenging and dynamic sport.

REFERENCES

1. Linthorne, N.P., 2001. Optimum release angle in the shot put. *Journal of Sports Sciences*, 19(5), pp.359-372.
2. Ruzikulov, F., & Rustamova, S. (2024, April). PECULIARITIES OF COMPETENCE FORMATION IN STUDENTS'SELF-ASSESSMENT WHILE T
3. Begbudieva, P. S., & Mukhiddinova, R. EFFECTIVE STRATEGIES OF TEACHING READING. *УЧЕБНЫЙ XXI БЕКА*, 8.
4. Abdinazarovich, B. S. (2023). Speech Technique and Culture of Bloggers and Journalists.

5. Soliyeva, Z. (2024, April). M. XAYDEGGER FALSAFADAGI "BORLIQ" TUSHUNCHASI ("BORLIQ VA ZAMON"). In *Conference Proceedings: Fostering Your Research Spirit* (pp. 563-565).

6. Soliyeva, Z., & Xamroqulov, A. (2024, April). THE ROLE OF HOMEWORK IN TEACHING PRIMARY SCHOOL CHILDREN. In *Conference Proceedings: Fostering Your Research Spirit* (pp. 116-119).

7. Botirovna, S. Z. (2024). MARTIN XAYDEGGER MATNLARIDA FIKR VA TILNING" O'YINI". *worldly knowledge confere*ns, 7(1), 128-130.

ursunovich, S. E. (2023). Actual issues of teaching pragmatic competences to E

адиков, Э. Т. (2023). ПРАГМАТИКО-СЕМАНТИЧЕСКИЙ АНАЛИЗ ЗНАЧЕНИЯ. *Scientific progress*, 4(4), 151-160. *Przyszłości*, 31, 148-152.

oh, M., Štuhec, S., Smajlović, N. and Supej, M., 2019. Comparative 3-D k

à

riel, G., Penny, A., Probe, J., Buijs, R., Simonsen, E., Finch, A. and Judge, L.,

è

fn

θ

#

š

k

Đ

i

o

ñ

e

M

h

a

g