

The Application of Hip Rotation Training to Improve Discus Throwing Technique

(A Classroom Action Research on Physical Education Students of Universitas Pamulang)

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ABSTRACT

This study aims to improve university students' discus throwing technique through the implementation of hip rotation training based on a biomechanical approach. The main issue addressed is the low quality of hip rotation technique and insufficient throwing distance among students enrolled in athletic practicum courses. The research was conducted at the Physical Education Study Program, Universitas Pamulang, involving 24 second-semester students as research participants. The method employed was Classroom Action Research (CAR), carried out over two cycles, each consisting of planning, action, observation, and reflection stages.

The results showed that systematic hip rotation training significantly improved students' discus throwing techniques. The average throwing distance increased from 13.2 meters in the pre-cycle to 15.1 meters in the first cycle, and further to 17.6 meters in the second cycle. Likewise, the percentage of students demonstrating adequate technique rose markedly from 16.7% (pre-cycle) to 58.3% (Cycle I), and reached 87.5% in Cycle II. Hip rotation training effectively enhanced postural stability, body coordination, and energy transfer efficiency during throwing movements.

These findings indicate that hip rotation training is an effective and applicable instructional strategy for improving technical skills in sports, particularly in discus throwing. The biomechanical approach used in this study can serve as a practical learning model for athletics courses in higher education settings. Therefore, integrating hip rotation exercises into physical education curricula is highly recommended to optimize students' motor skill development.

Keywords: hip rotation, discus throw, biomechanics, technical skill, classroom action research

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INTRODUCTION

Sports play a crucial role in the development of human resources, particularly in improving physical fitness, motor skills, and character building among learners (Sajoto, 1995; Bompa & Buzzichelli, 2014). One of the most widely developed sports disciplines in educational settings is athletics, which includes running, jumping, and throwing events (Giriwijoyo & Sidik, 2013). Among these, the discus throw is a technically complex event requiring strength, flexibility, balance, and rotational coordination of the body (Suyadi, 2020; Nurhasan, 2005). Sports activities not only contribute to physical health but also foster psychological aspects such as discipline, sportsmanship, cooperation, and responsibility. In formal education, physical education serves as a medium for cultivating these values through structured and purposeful physical activities (Nurhasan, 2005; Mulyana, 2009).

In higher education, physical education programs are designed to develop students' motor

competence while also imparting fundamental knowledge in the field of sports. The Physical Education Study Program typically includes a curriculum that emphasizes practical mastery of various sports, including athletics. Athletics not only enhances physical fitness but also provides a foundation for advanced motor skills necessary for future physical education teachers (Suyadi, 2020; Giriwijoyo & Sidik, 2013). Among athletic events, the discus throw stands out for its high level of technical complexity, requiring precise coordination of strength, speed, flexibility, and rotational control (Subarjah, 2011; Komarudin, 2017; Sharkey & Gaskill, 2013).

The basic technique of the discus throw consists of several phases: the preliminary stance, rotation, release, and follow-through. Each phase demands body stability and motor control. One of the most important biomechanical elements is hip rotation, which initiates the transfer of kinetic energy from the lower to the upper body and ultimately to the discus (Knudson, 2007; Zatsiorsky, 2008). Ineffective hip rotation disrupts this kinetic chain, reduces release velocity, and limits throwing distance (Yessis, 2000; Mahendra, 2018). Biomechanical factors such as release angle, hip rotational speed, and intersegmental coordination are essential to effective discus performance (Hidayat, 2021; Agus et al., 2022).

However, many students in athletic practicum classes struggle with performing proper body rotation. Initial observations at the Physical Education Program of Universitas Pamulang showed that students tend to rely on arm and shoulder strength without optimal activation of the hip and abdominal muscles. As a result, their throws are often short, unstable, and lack accuracy (Widodo, 2019; Amri, 2020; Rahman, 2021). This deficiency highlights the need for more targeted and systematic training focusing on specific biomechanical skills.

In the context of the discus throw, hip rotation is a crucial component that facilitates angular acceleration, postural balance, and optimal release angle (Krasilshchikov et al., 2010; Subarjah, 2011; Zatsiorsky, 2008). Unfortunately, many students lack exposure to specific training on hip rotation as part of their practicum sessions. Without this focus, the kinetic flow of motion becomes fragmented, limiting overall performance (Widodo, 2019; Hidayat, 2021). Therefore, a biomechanically-based instructional approach is needed, especially one that emphasizes specialized movement training such as hip rotation.

Hip rotation training has been found effective in strengthening the core muscles, enhancing coordination between the upper and lower body, improving hip flexibility, and developing control over rotational techniques (Bompa & Buzzichelli, 2014; Rosidi, 2021). Exercises such as twist rotations, hip thrusts, and resistance band rotational drills have shown positive results in improving rotational efficiency and performance in throwing sports (Knudson, 2007; Gallahue & Ozmun, 2006; Bailey et al., 2009).

To address the challenges identified, this study was conducted using Classroom Action Research (CAR) aimed at improving students' discus throwing techniques through systematic and progressive hip rotation training. CAR was chosen for its practical, reflective, and continuous nature,

enabling immediate pedagogical responses to identified issues (Kemmis & McTaggart, 1988; Susilo, 2020). The research was conducted in two action cycles, each comprising planning, implementation, observation, and reflection.

Based on the background above, this study seeks to: (1) determine whether the implementation of hip rotation training can improve discus throwing technique among students of the Physical Education Study Program at Universitas Pamulang; and (2) analyze the extent to which such training influences performance outcomes, particularly throwing distance. The results are expected to serve as a reference for developing biomechanically-based instructional models in higher education sports programs.

MATERIALS AND METHODS

This study employed a Classroom Action Research (CAR) approach using the spiral model by Kemmis and McTaggart (1988), which consists of four stages in each cycle: planning, acting, observing, and reflecting. CAR was chosen for its relevance in addressing real-time problems in classroom settings and for improving the instructional process, particularly in discus throw techniques through hip rotation training.

Participants

The participants were 24 fourth-semester students from the Physical Education Study Program, Universitas Pamulang, who were enrolled in the athletics practicum course. The sample was selected through purposive sampling based on the following criteria: active course attendance, willingness to participate in all training sessions, and limited prior mastery of discus throw technique based on preliminary observation.

Research Setting and Duration

The research was conducted over 8 weeks during the even semester of the 2024/2025 academic year at the Universitas Pamulang athletics field, equipped with discus throw facilities. Each cycle lasted for 4 weeks, with two training sessions per week.

Research Procedure

The action research was carried out in two cycles with the following steps:

- Planning: Designing hip rotation training drills based on biomechanical principles.
- Action: Delivering instruction on discus throw techniques integrated with structured hip rotation training.
- Observation: Collecting data using performance observation sheets and recording throwing distances.
- Reflection: Evaluating the effectiveness of the training and improving the intervention for the next cycle.

Data Collection Techniques

- Observation: To assess students' discus throw techniques before and after the intervention.
- Performance Test: Measuring throwing distance in each cycle.
- Documentation: Recording training and learning processes using notes and video.
- Interviews: Limited interviews with selected students for qualitative feedback on the training experience.

Research Instruments

- Technique observation sheet: Based on biomechanical indicators such as body position in the preparatory phase, hip rotation, arm-leg coordination, and balance during release.
- Throwing result assessment form: Measuring discus throw distance in meters.
- Field notes and training videos: As supporting documentation.

Data Analysis

Data were analyzed using both quantitative descriptive and qualitative approaches. Quantitative data (throwing distances) were compared between cycles to identify performance improvement.

Qualitative data (from observation and reflection) were analyzed through data reduction, display, and conclusion drawing (Miles & Huberman, 1994). Success criteria included significant improvement in hip rotation technique and meeting the minimum performance benchmarks set for discus throwing.

RESULTS

Pre-Cycle Observation

The pre-cycle phase aimed to identify students' initial discus throwing abilities prior to the intervention. Observations revealed that most students lacked adequate technique, particularly in the hip rotation phase. Movements relied heavily on arm and shoulder strength, with minimal hip involvement, leading to poor coordination and ineffective discus release.

The average throwing distance in the pre-cycle was 13.2 meters, and only 16.7% of students demonstrated acceptable technique based on biomechanical indicators. These findings justified the need for specific training interventions to enhance technical efficiency and improve performance outcomes.

Cycle I Results

In the first cycle, students received progressive hip rotation training, focusing on core strengthening, static hip rotations, and biomechanical mechanics of rotation in discus throwing. The results indicated a notable improvement in both technique and performance:

- Average throwing distance: increased to 15.1 meters
- Students demonstrating proper technique: 58.3%

However, some students struggled with maintaining balance during rotation and synchronizing

movement rhythm during the release phase.

Cycle II and Reflection

Reflections from Cycle I informed the refinement of training strategies in Cycle II, which emphasized rotation speed, hip explosiveness, and dynamic drills such as resistance band hip rotation and pivot throws.

Results in Cycle II showed optimal performance improvements:

- Average throwing distance: reached 17.6 meters
- Students with proper technique: increased to 87.5%

Students executed hip rotations more effectively, resulting in greater discus acceleration and more controlled release. The technique became more stable and rhythmic, leading to longer and more efficient throws.

Tabel Hasil Penelitian

Tahapan	Rata-rata Jarak Lempar (m)	Teknik Memadai (%)
Pra-Siklus	13,2	16,7%
Siklus I	15,1	58,3%
Siklus II	17,6	87,5%

"The table above illustrates the progressive improvement in performance at each stage of the research. The implementation of hip rotation exercises has proven to have a significant impact on enhancing students' discus throwing technique skills."

Grafik Hasil Penelitian

Grafik di bawah ini menggambarkan tren peningkatan rata-rata jarak lempar dan persentase teknik memadai dari pra-siklus hingga siklus II:



Summary of Findings

The results of the study indicate that:

- Hip rotation exercises improved the efficiency of body rotation techniques.
- The average throwing distance increased consistently across each cycle.
- The percentage of students with adequate technique significantly increased from 16.7% to 87.5%.
- Biomechanics-based training models proved effective in sports practicum learning within the higher education setting.

DISCUSSION

This study aimed to improve students' discus throw technique through the implementation of hip rotation exercises based on a biomechanical approach. The findings demonstrated significant improvements in both the rotational technique and throwing performance, as seen in the increased average throwing distance and the proportion of students demonstrating adequate technique in each cycle.

Effectiveness of Hip Rotation Exercises on Discus Throw Technique

The study showed that hip rotation training significantly contributed to enhancing students' fundamental discus throwing techniques. These exercises improved core and hip engagement as the primary movers in the rotational phase of the throw. According to Knudson (2007) and Zatsiorsky (2008), hip rotation is a crucial part of the kinetic chain that facilitates energy transfer from the lower to the upper body in explosive movements such as discus throw. The systematically applied exercises in this study aligned with these biomechanical principles, initiating movement from large muscle groups

(hips, abdomen, back) and progressing to the arms and hands for optimal disc release.

Improvement in Average Throwing Distance

The increase in average throwing distance from 13.2 meters (pre-cycle) to 17.6 meters (cycle II) confirms that hip rotation training directly impacted performance. Research by Mahendra (2018) and Widodo (2019) indicates a positive correlation between hip strength, rotational speed, and throwing distance. With more effective rotation, angular velocity increased, generating greater momentum. These results also align with Subarjah (2011), who noted that throwing events rely heavily on efficient force transfer between body segments, and specific rotational training is an appropriate method to achieve this.

Enhancement of Technical Quality

The technical improvement from 16.7% (pre-cycle) to 87.5% (cycle II) highlights the students' substantial progress in mastering biomechanical movement sequences. Hip rotation training helped improve body stability, movement coordination, and control during disc release. This supports the views of Bompa & Buzzichelli (2014), who emphasized the importance of core muscle strength and rotational movement control in technique-based sports learning.

Active and Reflective Learning through Classroom Action Research

The Classroom Action Research (CAR) model used in this study enabled students to learn actively, reflectively, and progressively. The repeated learning cycles allowed for systematic and responsive evaluation of techniques. According to Kemmis & McTaggart (1988), CAR is effective in enhancing learning practices due to its participatory and corrective nature. This was evident in the technical and performance improvements observed from cycle I to cycle II.

Relevance of Biomechanics-Based Training in Physical Education Curriculum

This research emphasizes the importance of biomechanical learning approaches in athletics practicum courses at the university level. Hip rotation training not only improved physical performance but also equipped students with a deeper understanding of bodily mechanisms in executing specific techniques. Gallahue & Ozmun (2006) argue that biomechanical awareness helps students develop efficient motor skills and prevent injury due to incorrect movements.

Comparison with Previous Studies

The findings of this study are consistent with prior research by Agus et al. (2022), Rosidi (2021), and Bailey et al. (2009), which showed that hip rotation training improves movement quality and accelerates explosive phases. The results also reinforce the studies of Amri (2020) and Hidayat (2021), who found that immature rotational technique is a key barrier to optimal discus throw performance.

In conclusion, this discussion confirms that hip rotation training is an effective and practical approach for improving students' fundamental discus throw techniques and aligns well with the development of athletics practicum curricula in physical education study programs.

REFERENCES

- Agus, R., Wahyudin, D., & Suherman, U. (2022). Efektivitas Latihan Rotasi Pinggul dalam Meningkatkan Jarak Lemparan Cakram. *Jurnal Pendidikan Olahraga dan Kesehatan*, 10(1), 22–30.
- Amri, A. (2020). Analisis Teknik Lempar Cakram pada Mahasiswa Pendidikan Jasmani. *Jurnal Sport Science Indonesia*, 8(2), 115–123.
- Bailey, R., Collins, D., Ford, P., MacNamara, B., Toms, M., & Pearce, G. (2009). Participant development in sport: An academic review. *Sports Coach UK*.
- Bompa, T., & Buzzichelli, C. (2014). *Periodization Training for Sports* (3rd ed.). Human Kinetics.
- Gallahue, D. L., & Ozmun, J. C. (2006). *Understanding Motor Development: Infants, Children, Adolescents, Adults* (6th ed.). McGraw-Hill.
- Hidayat, R. (2021). Korelasi antara Teknik Rotasi dan Jarak Lemparan pada Lempar Cakram. *Jurnal Ilmu Keolahragaan*, 6(1), 44–51.
- Kemmis, S., & McTaggart, R. (1988). *The Action Research Planner*. Victoria: Deakin University.
- Knudson, D. (2007). *Fundamentals of Biomechanics* (2nd ed.). Springer.
- Mahendra, A. (2018). Analisis Biomekanika pada Gerakan Lempar Cakram. *Jurnal Pendidikan Jasmani*, 5(2), 100–108.
- Rosidi, A. (2021). Latihan Rotasi Pinggul terhadap Peningkatan Teknik Lempar Cakram. *Jurnal Keolahragaan*, 9(1), 37–43.
- Subarjah, H. (2011). *Pembelajaran Atletik di Perguruan Tinggi*. Bandung: FPOK UPI.
- Widodo, S. (2019). Evaluasi Teknik Lempar Cakram Mahasiswa Pendidikan Jasmani. *Jurnal Olahraga Rekreasi*, 6(2), 65–73.
- Yessis, M. (2000). *Explosive Running*. McGraw-Hill.
- Zatsiorsky, V. M. (2008). *Biomechanics in Sport: Performance Enhancement and Injury Prevention*. Blackwell Science.
- Sajoto, M. (1995). *Pembinaan Kondisi Fisik*. Jakarta: Depdikbud.
- Sharkey, B. J., & Gaskill, S. E. (2013). *Fitness and Health* (7th ed.). Human Kinetics.
- Nurhasan, D. (2005). *Pendidikan Jasmani dalam Konteks Pembelajaran Motorik*. Jakarta: Departemen Pendidikan Nasional.
- Suyadi. (2020). *Dasar-Dasar Ilmu Keolahragaan*. Bandung: Alfabeta.
- Komarudin. (2017). Biomekanika Olahraga Lempar Cakram. *Jurnal Ilmiah Keolahragaan*, 7(1), 56–64.
- Mulyana, D. (2009). *Karakter dan Olahraga dalam Pendidikan*. Jakarta: Rajawali Pers.
- Giriwijoyo, H. Y. S., & Sidik, D. Z. (2013). *Ilmu Faal Olahraga: Fungsi Tubuh Manusia pada Olahraga untuk Kesehatan dan Prestasi*. Bandung: PT Remaja Rosdakarya.