



Biomechanical Analysis of Shooting Technique and Body Position in Extracurricular Football Students

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Keywords

Shooting;
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Abstract

This study aims to analyze shooting skills based on technique and body position when kicking using a biomechanical approach in extracurricular soccer students at SMA Negeri 1 Purbalingga. The method used is descriptive quantitative, data collection through video recordings was analyzed using Kinovea software and then processed using IBM SPSS. The research sample consisted of 10 students using a purposive sampling technique. The variables in this study were body tilt, support foot position, and kick accuracy. The results showed an average body tilt of 39.70°, support foot position of 36.00°, and kick accuracy of 127.0860 cm with quite high variations in each variable. Biomechanically, body tilt is related to body balance, while the position of the support foot plays a role in determining the direction of the force that affects kick accuracy. The biomechanical approach based on video analysis can be used as a reference in evaluating techniques and designing more targeted training to improve body balance, technical consistency, and student kick accuracy.

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INTRODUCTION

Football is a sport that is popular among many people, this sport is considered a cheap and simple sport because it only requires a field (Rivaldi et al., n.d.). This game has undergone significant changes, starting from simple and traditional to becoming a professional sport that is popular with the public (Ach. Fathur Rozy & Achmad Widodo, 2024). In football, a team's success is determined by the number of goals scored, so mastering basic techniques is an important aspect in improving team performance. One of the basic techniques that plays an important role in scoring goals is shooting. By improving mastery of basic techniques, the team will be able to control the ball for longer and will gain physical and tactical advantages (Arjunnaja, Irawan, & Purnomo, 2022). One technique for scoring in soccer is to kick the ball as many times as possible toward the opponent's goal. This aligns with the FIFA Laws of the Game, which state that victory is determined by the number of goals scored by one team exceeding the number of goals scored by the opposing team (Hasanuddin, 2023).

Shooting skills are influenced by various factors, including leg muscle strength, coordination, balance, and mastery of basic techniques. Furthermore, body position during the kick, such as the tilt of the body, the direction of the gaze, and the position of the supporting foot, play a crucial role in determining the success of the kick. Therefore, maturity, readiness, anticipation, playing vision, and composure are crucial when under pressure from the opponent. Several factors such as leg muscle strength, concentration, and playing experience can influence a player's shooting skills. Furthermore, the environment and playing conditions can also affect shooting performance (Zainuddin, 2023). Sports biomechanics is a field of science that deals with the analysis of overall movement in humans and objects (Candra et al., 2021). The analysis was carried out by measuring biomechanical parameters such as body tilt, angle of the supporting foot, and kick accuracy (Ilham & Priyambada, 2025). Analyzed using kinovea, a video-based motion analysis software used to slow down and record movements in sports training (Baniruddin & Raharja, 2025). In modern times, motion analysis can be done using motion analysis applications via video, making it easier for trainers to conduct motion evaluations (Arjunnaja, Irawan, & Permono, 2022).

Observations of extracurricular soccer activities at SMA Negeri 1 Purbalingga indicate that students' basic shooting skills are still in the average category. Although students aged 16 to 17 have demonstrated fairly good motor development, their mastery of shooting techniques is not uniform, and some students still show weaknesses in their execution (Sadikin et al., 2023). Problems were also seen in aspects of body position when kicking, such as the tilt of the body and the position of the supporting foot, which impacted the kick's outcome. Furthermore, limited practice was a factor inhibiting students' ability development.

Previous research shows that biomechanical analysis with the help of Kinovea software is effective for evaluating sports movement techniques objectively and measurably (Apriliyanto, 2024). However, most research still focuses on athletes, competitive players, and soccer school students who have higher training intensity and competition experience (NATA, 2025). Meanwhile, research on the biomechanical analysis of shooting techniques in high school students participating in extracurricular soccer activities is still relatively limited. Studies that simultaneously examine body tilt, foot position, and shooting accuracy at the high school level are also scarce. This is despite the fact that extracurricular students possess different technical abilities, motor coordination, and playing experience than professional athletes. Therefore, this study was conducted to provide an overview of shooting techniques using a biomechanical approach in extracurricular soccer students at SMA Negeri 1 Purbalingga, thereby enhancing the study of soccer biomechanics at the student level. This demonstrates the need for further research related to the development of basic shooting techniques in students.

Based on these problems, this study focuses on the analysis of shooting skills based on techniques and body positions when kicking with a biomechanical approach in extracurricular soccer students at SMA Negeri 1 Purbalingga. This study aims to provide an objective description of the body tilt, the position of the supporting foot and the accuracy of students' kicks and provide recommendations for improving techniques for new students. Based on the students' shooting abilities which are still moderate and inconsistent, the author is interested

in conducting a deeper study on the Analysis of Soccer Players' Shooting Skills Based on Techniques and Body Positions When Kicking in Extracurricular Soccer Students at SMA Negeri 1 Purbalingga with a Biomechanical Approach.

METHODS

This study used quantitative descriptive analysis to describe the shooting skills, techniques, and body positioning when kicking among extracurricular soccer students. Data collection used research analysis instruments, which were statistical and descriptive in nature, with the aim of describing the established data (Junanda et al., 2024). This research was conducted using video recordings analyzed using Kinovea software, an open-source software used to observe detailed movements through slow-motion and angle measurement features. The instruments used in the study included a digital camera, cones, a roll meter, a goal, a cone suspended as a target, the Kinovea application, and IBM SPSS.

The research was conducted at SMA Negeri 1 Purbalingga, Central Java in April 2026. The sampling technique used purposive sampling based on the criteria of subjects who actively participated in training and were not injured at the time of data collection (Rusmalinda et al., 2023). The data in this study are quantitative data, in the form of measurements of the body tilt angle (degrees), the position of the supporting foot (degrees), and kick accuracy (cm).

The data collection technique is to record the students' shooting movements using a camera placed at an angle to the right of the subject (Arjunnaja, Irawan, & Purnomo, 2022). Each student was given one opportunity to shoot, guided by the researcher. The video recordings were analyzed using the Kinovea application, then processed using IBM SPSS Statistics. The analysis was conducted to obtain the mean, minimum, maximum, and standard deviation.

RESULTS AND DISCUSSION

Based on the research results, the research procedure began with observation, subject selection, and data collection through a shooting test recorded with a camera. The recorded data was then analyzed using Kinovea software to obtain variables such as body tilt, supporting foot position, and kicking accuracy. The data was then processed using IBM SPSS. The data were analyzed to describe body tilt, supporting foot position, and shooting accuracy.

Descriptive statistical analysis was conducted to see a general overview of the research data which included the average value (mean), minimum value, maximum value, and standard deviation for each variable, namely body tilt, position of the supporting foot, and kick accuracy.

Table 1. Descriptive Statistics

Variable	N	Min	Max	Mean	Std. Dev
Body Tilt (°)	10	28	50	39,70	6,447
Foot support position (°)	10	18	50	36,00	10,263
Kick Accuracy (cm)	10	40,18	236,18	127,0860	65,82654

Source: Processed research data, 2026

Based on Table 1, it can be seen that the average body tilt is 39.70°, the position of the supporting foot is 36.00°, and the kick accuracy is 127.82654 cm. The standard deviation value for the accuracy variable shows greater variation compared to other variables.

This study shows that the shooting technique and body positioning skills of extracurricular soccer students at SMA Negeri 1 Purbalingga are still suboptimal and tend to vary. This is evident in the relatively high average kick accuracy score and wide range of scores, indicating that many kicks are still off-target.

First, the average body tilt was 39.70°, with a minimum value of 28° and a maximum of 50°, and a standard deviation of 6.447. The data shows that the students' body tilt varied. In biomechanical theory, body tilt is related to body balance and the position of the center of mass. An unstable body position can cause the center of mass to move out of the plane of support, thus disrupting movement control during kicking. (JAYA, 2020). This imbalance will affect the direction of the leg swing and result in a less controlled kick. The tilt of the body

plays an important role in maintaining body balance and helps the kicking style to be more effective (Jihad et al., n.d.).

The average value for both support foot positions was 36.00°, with a minimum value of 18° and a maximum of 50°, and a standard deviation of 10.263, indicating quite high variation. Biomechanical theory states that the support foot acts as a base of support or determines the direction of force. A support foot position that is not directed toward the target will cause the direction of the force applied to the ball to deviate from the target. (Pratama, 2024). Then, too large or inconsistent angle of the supporting foot can reduce the efficiency of force transfer from the body to the ball, thereby affecting the direction and results of the shot. Incorrect position of the supporting foot during dynamic movements causes balance to be disturbed and can easily lead to injury (Purushothaman et al., 2025).

Third, kick accuracy, the average value was 127.086 cm, with a minimum value of 40.18 cm and a maximum of 236.18 cm, and a high standard deviation of 65.82654. This indicates that the level of student kick accuracy is still low and varies. Load measurement is very important to understand the effectiveness of the kicking movement, with the training load the trainer can evaluate the technique (Bastiaansen et al., 2024). Uncoordinated movements will result in the force being applied not being optimal, so the direction of the ball will not be in line with the target.

Previous research suggests that video based biomechanical analysis can help identify technical errors more objectively. Therefore, a biomechanical approach can be utilized as a method to improve shooting skills, technique, and body position. Overall, shooting skills, technique, and body position are not optimal. From a biomechanical perspective, body tilt affects balance, the position of the supporting foot determines the direction of force, and both contribute to kicking accuracy. (Bezodis et al., 2018). Therefore, coaches are advised to pay attention to this biomechanical aspect in training and during training emphasize body stability, consistency of the position of the supporting foot, and movement coordination so that shooting results are more accurate.

CONCLUSION

This study concluded that shooting skills based on technique and body position using a biomechanical approach, including body tilt, supporting foot position, and kicking accuracy, were still suboptimal and showed significant variation. Furthermore, Kinovea users facilitated more detailed and objective movement analysis. This study used descriptive statistics, so it did not test the relationship between variables but only described students' shooting skills. Therefore, structured training with a biomechanical approach is needed to improve stability, technical consistency, and shooting accuracy.

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