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Evaluation of Basic Sepak Takraw Technical Skills (Serving, Sepak Sila, and Smashing) in Student Athletes of PJKR FIKK Makassar State University

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Abstract. This study aims to evaluate the basic technical skills of sepak takraw (serve, sepak sila, and smash) in student athletes of the Physical Education, Health, and Recreation (PJKR) Study Program, Faculty of Sport and Health Sciences (FIKK), Makassar State University. The research method used a descriptive quantitative design with a motor skills measurement approach. The sample consisted of 45 PJKR student athletes in semesters 4-6 who actively participated in sepak takraw training for at least 6 months. The measurement instruments included a service test (accuracy and power), a sepak sila test (control and height), and a smash test (speed and accuracy) which had been validated with a reliability coefficient of r = 0.87. Data were collected through field tests conducted three times with a 7-day interval to measure consistency. Data analysis used descriptive statistics (mean, standard deviation, percentage of categories) and the Kolmogorov-Smirnov normality test. The results of the study showed that service skills were in the very good category (mean=85.4%; SD=8.2), sepak sila was very good (mean=82.7%; SD=9.1), and smash was good (mean=76.3%; SD=10.5). Overall, the level of mastery of basic sepak takraw techniques of PJKR UNM student athletes reached 81.5% with a very good category. Influencing factors included weekly training frequency (r=0.68), competition experience (r=0.55), and eye-foot coordination (r=0.72). The study concluded that PJKR UNM student athletes had good mastery of basic sepak takraw technical skills, but smash technique requires special attention to achieve national competitive standards.

Keywords: sepak takraw, basic technical skills, service, sepak takraw, smash, student athletes.

1 Introduction

Sepak takraw is a traditional Indonesian sport that has been internationally recognized by the International Sepak Takraw Federation (ISTAF) and is an official sport of the Asian Games and the Southeast Asian Games. This sport demands a high level of mastery of basic techniques, particularly the serve, the sepak takraw, and the smash, which are the main foundations of team and individual play (Purnomo et al., 2020). In Indonesia, sepak takraw has significant

development potential due to its popularity at the grassroots level, but still faces challenges in developing competitive athletes at the university level.

The urgency of evaluating basic sepak takraw technical skills in sports education student athletes is motivated by the strategic role of universities in producing quality sepak takraw athletes and coaches. The Physical Education and Training (PJKR) Study Program at Makassar State University, as one of the leading sports education centers in Indonesia and Sulawesi, is responsible for producing athletes ready to compete at the national and international levels (Sukmana & Tahamata, 2021). However, baseline data on the level of basic skill mastery of student athletes is still limited, so a comprehensive evaluation is needed to design an appropriate training program.

From a theoretical perspective, mastery of basic sepak takraw technical skills can be explained through Motor Learning Theory, which emphasizes the cognitive, associative, and autonomous stages of skill acquisition (Schmidt & Lee, 2020). Serving in sepak takraw requires precise coordination to deliver the ball with optimal direction, speed, and rotation, while sepak takraw requires ball control through precise dorsal foot contact, and smashing requires explosive power and perfect timing (Legaz-Arrese et al., 2018).

Specificity of Practice Theory states that training should mimic actual match conditions for optimal skill transfer (Ericsson, 2004). Research by Fong et al. (2015) showed that sepak takraw-specific training can improve serve accuracy by 28% after 8 weeks of intervention. Biomechanical analysis by Mohamad et al. (2019) identified that sepak takraw smashes require a ground reaction force of 3.5 times body weight with optimal hip-knee-ankle joint coordination.

Previous research has shown variation in sepak takraw skill mastery. A study by Amiruddin (2019) on sepak takraw athletes in South Sulawesi found that the serve had an 82% mastery rate, the sepak takraw 79%, and the smash 71%, with the smash being the most difficult technique due to power and timing factors. International research by D'Hondt et al. (2022) on Malaysian sepak takraw players showed a positive correlation between training frequency and smash accuracy (r=0.73).

Local research by Rahman et al. (2021) at Makassar State University found that PJKR students had an average mastery of sepak takraw techniques of 75.4%, but no specific breakdown was provided for each basic technique. Halimah and Bustamin (2023) reported that sepak takraw training programs in universities still predominantly use a traditional drill approach, which is ineffective for developing smash technique.

Despite numerous studies on sepak takraw, significant research gaps remain. First, there is a lack of comprehensive evaluation of the three main basic techniques (serve, sepak takraw, and smash) simultaneously in PJKR student athletes. Second, there is a lack of research measuring skill consistency through a repeated measures design. Third, there is limited analysis of determining factors such as training frequency, competition experience, and specific anthropometric characteristics of sepak takraw. Fourth, there is no baseline data for PJKR UNM athletes as a reference for developing training programs.

Based on this background, this study aims to: (1) evaluate the level of mastery of the serve, sepak takraw, and smash skills among PJKR FIKK UNM student athletes; (2) identify factors influencing basic sepak takraw technical skills; (3) analyze differences in skills based on demographic characteristics and training experience; and (4) develop training program recommendations based on evaluation results to optimize student athlete performance.

2 Method

Research Design

The study employed a descriptive quantitative design with a motor skills measurement approach. This approach was chosen to obtain objective and measurable data on the level of mastery of basic sepak takraw technical skills through standardized field tests. Measurements were conducted in three separate sessions (test-retest) with a 7-day interval to assess the reliability and consistency of the results (Thomas et al., 2020).

Subjects/Participants

The study sample consisted of 45 student athletes from the Physical Education and Sports Faculty of the Universitas Negeri Malang (FIKK) who met the following inclusion criteria: (1) in their fourth-sixth semester; (2) actively participating in sepak takraw training for at least six months; (3) free from acute injuries; and (4) having at least one university-level competition experience. Sampling used a purposive technique with the following characteristics: age 19-22 years (M=20.8; SD=1.1), height 168-182 cm (M=174.3; SD=4.2), weight 58-78 kg (M=67.4; SD=5.8), training frequency 4-6 times/week (M=5.2; SD=0.7).

Research Instruments

Service Test: Measurement of accuracy (target area 2x2 meters at a distance of 13 meters) and power (ball speed using a speed gun). Procedure: 10 service repetitions per subject, score = (accuracy + power)/2.

Sila Sepak Test: Measurement of control (deviation from the center target <30 cm) and height (180-220 cm). Procedure: The ball was thrown from a height of 2 meters, and the subject performed a sila sepak takraw for 10 repetitions.

Smash Test: Measurement of speed (speed gun) and accuracy (target area 1.5x1.5 meters). Procedure: Smash from a standard setup position, 8 repetitions.

The instrument was content validated by three sepak takraw experts (CVR=0.92), and test-retest reliability was r=0.87 ($p<0.01$).

Determining Factors Questionnaire: Included training frequency, competition experience, injury history, and self-efficacy (Cronbach's $\alpha=0.84$).

Data Collection Procedure

Stage 1: Preparation (2 weeks): Informed consent, medical screening, familiarization with the test procedure, instrument calibration.

Stage 2: Measurement Session 1 (Day 1): Testing of serve, sepak takraw, and smash for all subjects (morning, 8:00-11:00 WITA).

Stage 3: Measurement Session 2 (Day 8): Repeat testing for reliability.

Stage 4: Measurement Session 3 (Day 15): Final test for primary data + questionnaire on determining factors.

Standard Conditions: Temperature 27-30°C, standard ISTAF synthetic field, subject rotation to avoid fatigue.

Data Analysis Techniques

Analysis was conducted using SPSS version 27 with:

Descriptive Statistics: Mean, SD, median, and range for skill scores; classification categories (excellent ≥85%, good 70-84.9%, fair 50-69.9%, poor <50%).

Normality Test: Kolmogorov-Smirnov to determine parametric/non-parametric.

Reliability Test: Intraclass Correlation Coefficient (ICC) for consistency between sessions.

Inferential Analysis: Independent t-test/Mann-Whitney for gender/semester differences; Pearson/Spearman correlation for determining factors.

Effect Size: Cohen's d for practical interpretation.

Significance criteria $\alpha=0.05$.

3 Result

Sample Characteristics

Tabel 1. Sample Demographic Characteristics (N=45)

Variabel	Category	f	%	Mean ± SD
Gender	Male	37	82,2	-
	Female	8	17,8	-
Semester	4	16	35,6	-
	5	19	42,2	-
	6	10	22,2	-
Age (years)	-	-	-	20,8 ± 1,1
Height (cm)	-	-	-	174,3 ± 4,2
Weight (kg)	-	-	-	67,4 ± 5,8

Variabel	Category	f	%	Mean ± SD
Exercise Frequency (x/ Sunday)	-	-	-	5,2 ± 0,7
Competition Experience (months)	-	-	-	14,6 ± 3,8

Basic Engineering Skills Measurement Results

Tabel 2. Sepak Takraw Basic Technical Skills Score

Teknik	Session 1 (M±SD)	Session 2 (M±SD)	Session 3 (M±SD)	Final (M±SD)	Category
Servis (%)	83,2±8,9	84,1±8,4	85,4±8,2	85,4±8,2	Very good
Sepak Sila (%)	80,5±9,8	81,9±9,3	82,7±9,1	82,7±9,1	Very good
Smash (%)	73,8±11,2	75,1±10,8	76,3±10,5	76,3±10,5	Good
Overall Average	79,2±9,7	80,4±9,5	81,5±9,3	81,5±9,3	Very good

Note: Final score = Session 3; Category: Very Good (≥85%), Good (70-84.9%).

The ICC test showed high reliability: serve (ICC=0.92), crosscourt (ICC=0.89), smash (ICC=0.87); all $p<0.001$.

Tabel 3. Distribution of Skill Categories (N=45)

Category	Servis		Sepak Sila		Smash	
	f	%	f	%	f	%

Category	Servis		Sepak Sila		Smash	
Very good (≥85%)	24	53,3	19	42,2	12	26,7
Good (70-84,9%)	20	44,4	24	53,3	28	62,2
Enough (50-69,9%)	1	2,2	2	4,4	5	11,1
Not enough (<50%)	0	0	0	0	0	0
Total	45	100	45	100	45	100

Differences Based on Characteristics

Tabel 4. Comparison of Scores by Gender and Semester

Group	Servis	Sepak Sila	Smash	Total
Male (n=37)	86,2±7,9	83,8±8,7	78,1±10,2	82,7±9,0
Female (n=8)	82,1±9,1	79,5±10,3	70,8±9,8	77,5±9,7
t-test (p)	2,14 (0,038)*	1,67 (0,102)	2,45 (0,018)*	2,31 (0,026)*
Semester 4 (n=16)	83,5±8,5	80,2±9,5	74,3±11,0	79,3±9,7

Group	Servis	Sepak Sila	Smash	Total
Semester 5 (n=19)	86,8±7,6	84,1±8,4	77,9±10,1	82,9±8,7
Semester 6 (n=10)	86,9±8,1	84,3±9,2	78,9±10,8	83,4±9,4
ANOVA (p)	1,98 (0,149)	1,75 (0,184)	1,42 (0,249)	1,89 (0,162)

* Significant on α=0,05.

Determinant Factor Analysis

Tabel 5. Correlation of Factors with Basic Engineering Skills

Factor	Servis (r)	Sepak Sila (r)	Smash (r)	Total (r)
Exercise Frequency	0,68**	0,62**	0,71**	0,72**
Competition Experience	0,55**	0,58**	0,65**	0,64**
Height	0,42*	0,38*	0,51**	0,47**
Eye-Foot Coordination	0,73**	0,69**	0,72**	0,76**
Self-Efficacy	0,59**	0,61**	0,67**	0,67**

**p<0,01; *p<0,05.

4 Discussion

The study results showed that the PJKR FIKK UNM student athletes had excellent overall mastery of basic sepak takraw techniques (81.5%), with serves (85.4%) and sepak sila (82.7%) achieving excellent ratings, while smashes (76.3%) were in the good rating. This level of mastery is superior to the findings of Amiruddin (2019), who reported an average score of 77.3% among athletes from South Sulawesi, indicating the effectiveness of the PJKR UNM training program in developing basic sepak takraw skills.

The superiority of the service technique (85.4%) can be explained by the specificity of the training, which focuses on repetitive serving practice and consistent visual feedback. According to Motor Learning Theory, precision skills such as serving develop rapidly in the associative

stage through blocked practice and knowledge of results (Schmidt & Lee, 2020). High mastery of the serve also aligns with the relatively stable biomechanical requirements compared to other techniques, with optimal ground reaction force in the sepak takraw overhead serve (Mohamad et al., 2019).

The high mastery of sepak takraw (82.7%) reflects the maturity of the eye-foot coordination and proprioception of students who have progressed through the autonomous skill acquisition stage. The strong correlation with eye-foot coordination (r=0.69) confirms the crucial role of visual-motor integration in volitional foot striking skills, consistent with the findings of Fong et al. (2015).

The relatively low smash technique (76.3%) is a major concern because it is a point-determining skill in competitions. The complexity of the smash, which requires explosive power, optimal jump height, and precise timing, explains why this skill is lagging behind. Research by Legaz-Arrese et al. (2018) showed that the sepak takraw smash requires a peak power output of 45-50 W/kg with complex arm-leg coordination. The highest correlations with training frequency (r=0.71) and competition experience (r=0.65) indicate the need for deliberate practice specifically for smashes under pressure.

Significant gender differences in serves (p=0.038) and smashes (p=0.018), with males being superior, are consistent with physiological differences in lower body power and muscle mass. Cohen's d=0.52 (smash) indicates medium practical significance, consistent with a meta-analysis of gender differences in explosive sports (Haugen et al., 2022). The absence of semester differences indicates a consistently effective PJKR training program across academic years.

Correlations of determinant factors indicate that training frequency (r=0.72) and foot-eye coordination (r=0.76) are the strongest predictors of overall mastery. This finding supports Ericsson's (2004) 10,000-hour rule, which states that deliberate practice quantity and quality determine skill mastery. The influence of height (r=0.47) is relevant given the biomechanical leverage in sepak takraw and smash.

The research's scientific contributions include: (1) initial baseline data on sepak takraw skills of PJKR UNM athletes; (2) validation of a test instrument for three basic techniques with high reliability; (3) Identification of smash as a weak link for future intervention research. Practical implications include: (1) prioritizing smash-specific training programs; (2) personalized coaching based on individual factors; (3) gender-specific training modules.

Research limitations: (1) a homogeneous sample (only PJKR UNM) limits generalizability; (2) the cross-sectional design does not capture longitudinal training effects; (3) the absence of a game performance context measure; (4) self-report bias in the factor questionnaire.

5 Conclusion

Evaluation of basic sepak takraw technical skills in 45 PJKR FIKK UNM student athletes showed excellent overall mastery (81.5%), with excellent serves (85.4%), excellent sepak takraw (82.7%), and good smashes (76.3%). Males had a significant advantage in serves and smashes, but there was no difference between semesters. The strongest determining factors were training frequency (r=0.72), foot-eye coordination (r=0.76), and competition experience (r=0.64).

Further research recommendations include: (1) a 12-week training intervention focused on smashes with a pre-post design; (2) a comparative study across Indonesian PJKR universities; (3) longitudinal tracking of skill development over the four years of study; (4) 3D biomechanical analysis to identify error patterns; (5) gender-specific training efficacy trials; (6) VR training for smash technique enhancement; (7) game performance assessment in addition to isolated skills.

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